INSTITUTIONAL GRAMMAR 2.0 QUICK REFERENCE

This quick reference provides an overview of key features of IG 2.0 as detailed in the IG 2.0 Codebook.

Institutional Grammar 2.0

The Institutional Grammar 2.0 (IG 2.0) specifies an integrated syntax for capturing information represented in regulative and constitutive institutional statements. The IG 2.0 allows for the operationalization of the syntax at three levels of expressiveness. It is specifically motivated by the three overarching objectives:

- presents an ontologically consistent syntax that is tailored to capturing institutional information relating to regulation of behavior and parameterization of systems
- fostering comprehensive and reliable structural and semantic representation of institutional statements
- enhancing versatility of the IG across disciplines, methods, and techniques.

Institutional Statement

In the Institutional Grammar, the focal unit of analysis is an institutional statement. An institutional statement describes expected actions for actors within the presence or absence of particular constraints, or parameterizes features of an institutional system. An institutional statement takes one of two general functional forms: regulative and constitutive.

Regulative Statements

Describe actions linked to specific actors within certain contextual parameters. Composed of some/all of the following components with the corresponding syntactic labels:

Attribute	an actor that carries out or is expected to carry out the action of the statement
Aim	action associated with actor
Context	statement context
Object	a receiver of action
Deontic	a prescriptive operator that describes how strongly an action is compelled or restrained
Or else	Consequence of violating action specified in the aim

Constitutive Statements

Constitute or otherwise parameterize features of a system. Composed of some or all of the following components with the corresponding syntactic labels:

Constituted Entity	entity defined, modified or otherwise characterized in the institutional statement
Constitutive Function	action that functionally characterizes entity with or without reference to properties
Context	statement context
Constituting Properties	properties linked to entity as mediated by the constitutive function
Deontic	operator defining pre/proscriptiveness of action
Or else	Consequence of violating constitutive function

Organic farmers must comply with organic farming regulations immediately following certification or else face revocation of organic certification.

Starting January 1, the Department of Agriculture is the certifying authority or else the organic program cannot be administered.

Syntactic Components

Listed here are syntactic components of regulative and constitutive statements. Some of these are necessary and some are sufficient, and all components may be explicitly or implicitly represented in institutional design.

Regulative Statements	Constitutive Statements
Attribute An actor (individual or corporate) that carries out, or is expected to/to not carry out, the action (i.e., Aim) of the statement. The Attribute may also contain descriptors of the actor.	**Constituted Entity** The entity being constituted, reconstituted, modified or otherwise directly affected within an institutional statement.
Aim The goal or action of the statement assigned to the statement Attribute.	**Constitutive Function** An action that constitutes a Constituted Entity, or reflects the functional relationship between Constituted Entity and Constituting Properties.
Context The context instantiates settings in which the focal action of a statement applies, or qualifies the action indicated in an institutional statement. The former type of Context is referred to as an "Activation Condition." The latter type of Context is referred to as an "Execution Constraint." Both can occur in a given institutional statement, including multiples of either type. Where no explicit Activation Condition is specified, the context clause is by default "under all conditions". Where no explicit Execution Constraints are specified, the context clause is by default "no constraints".	**Context** The context instantiates settings in which the focal action of a statement applies, or qualifies the action indicated in an institutional statement. The former type of Context is referred to as an "Activation Condition." The latter type of Context is referred to as an "Execution Constraint." Both can occur in a given institutional statement, including multiples of either type. Where no explicit Activation Condition is specified, the context clause is by default "under all conditions". Where no explicit Execution Constraints are specified, the context clause is by default "no constraints".

Necessary Components

| Regulative Statements	Constitutive Statements
Object The inanimate or animate part of an institutional statement that is the receiver of the action captured in the Aim. Objects can be of direct or indirect nature. Indirect objects are objects that are affected or targeted by the application of the Aim to direct objects. Objects can both be real-world entities, or abstract ones (e.g., beliefs, concepts).	**Constituting Properties** Constituting properties specify properties linked to entity as mediated by the constitutive function.
Deontic A prescriptive operator that defines to what extent the action of an institutional statement is compelled, restrained, or discretionary.	**Deontic** A prescriptive operator that defines to what extent the action of an institutional statement is compelled, restrained, or discretionary.
Or else An incentivizing provision associated with the action indicated in a particular institutional statement that can exist wholly within an institutional statement, or be represented in a nested institutional statement.	**Or else** An incentivizing provision associated with the action indicated in a particular institutional statement that can exist wholly within an institutional statement, or be represented in a nested institutional statement.

Sufficient Components

Nesting Principles

The IG 2.0 accommodates two types of nesting of institutional statements to characterize logical relations between two or more institutional statements.

Horizontal Nesting

Describes a logical combination of two or more statements to capture institutional content comprehensively.

Allows for the representation of multiple institutional statements that convey co-occurring or alternative actions.

Combinations are captured with logical operators signaling co-occurrence (AND), inclusive disjunction (AND/OR) or exclusive disjunction (XOR)

Utilizes parentheses to signal precedence of respective statement combinations.

Vertical Nesting

Describes a relationship of two or more statements, in which the leading statement (monitored statement) describes an action that is regulated by a second statement nested in the Or else component (consequential statement).

Allows for the representation of multiple institutional statements that convey coupled actions that follow from one another in the form of a consequential relationship.

Utilizes parentheses to signal precedence of the respective statements.
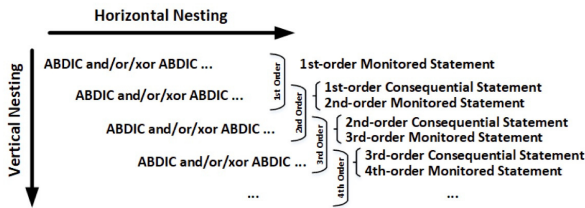
The combination of both nesting approaches affords the representation of complex institutional arrangements, both in terms of institutional content (horizontal nesting) and enforcement characterization (vertical nesting).

Horizontal Nesting Example

Organic farmers must either comply with organic farming standards and accommodate regular reviews of their practices, or organic farmers must seek special permission from inspector for alternative compliance assessment mechanisms.

("Organic farmers must comply with organic farming standards" AND "Organic farmers must accommodate regular reviews of their practices") XOR ("Organic farmers must seek special permission from inspector for alternative compliance assessment mechanisms").

Organic farmers must annually acknowledge and comply with organic farming standards.

"Organic farmers must acknowledge and (AND) comply with organic farming standards"

Vertical Nesting Example

Organic farmers must comply with organic farming regulations, or else certifiers must revoke the organic farming certification.

("Organic farmers must comply with organic farming regulations", OR ELSE "Certifiers must revoke the organic farming certification."
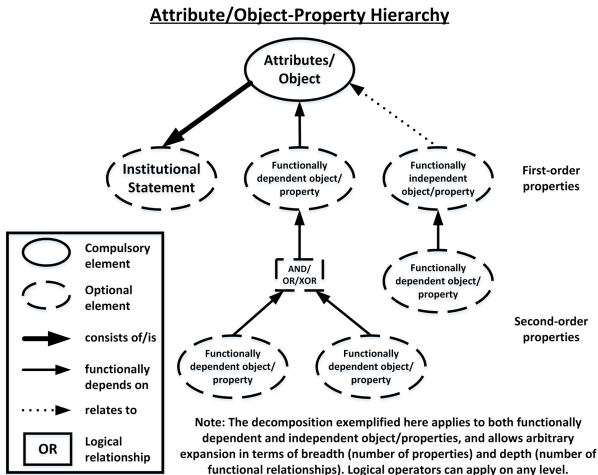

Multi-level Nesting Example

Organic farmers must comply with organic farming regulations and accommodate regular review of their practices, or else certifiers must suspend or revoke the organic farming certification, or else the USDA may revoke certifier's accreditation.
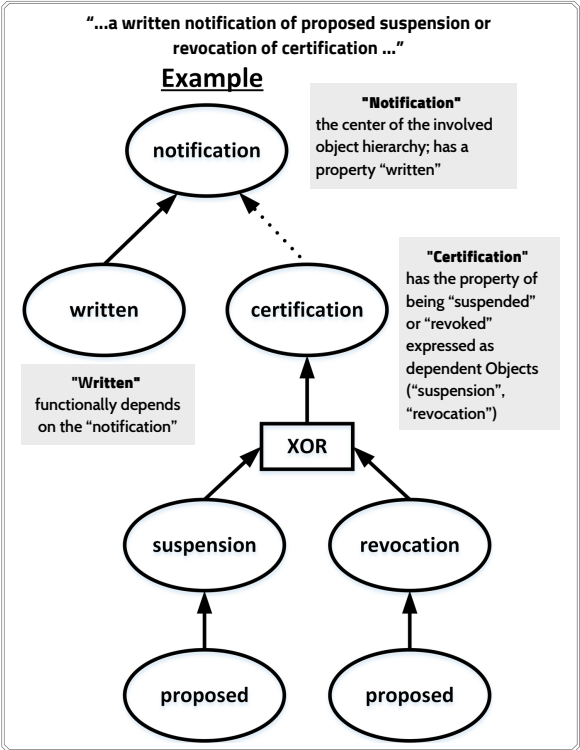
("Organic farmers must comply with organic farming regulations" AND "Organic farmers must accommodate regular review of their practices"), OR ELSE ("Certifiers must suspend or revoke (XOR) the organic farming certification"), OR ELSE "USDA may revoke certifier's accreditation".

Attribute/Object-Property Hierarchy

IG 2.0 relies on the conceptual representation of an Attribute/Object-Property hierarchy as shown in the first figure. As shown in the figure, statements can reflect a hierarchy of objects and properties of objects centered around the Attribute/Object component that essentially captures component dependencies of different kinds, specifically functional or non-functional dependencies.

Attribute/Object-Property Hierarchy

Note: The decomposition exemplified here applies to both functionally dependent and independent object/properties, and allows arbitrary expansion in terms of breadth (number of properties) and depth (number of functional relationships). Logical operators can apply on any level.

Logical operators signal the relationship amongst different objects and/or properties, as shown in the following example.

"...a written notification of proposed suspension or revocation of certification ..."

Example

"Notification" the center of the involved object hierarchy; has a property "written"

"Certification" has the property of being "suspended" or "revoked" expressed as dependent Objects ("suspension", "revocation")

"Written" functionally depends on the "notification"

Interpretational note: "Writtenness" alone does not make sense with an object it refers to, the existence of a certification does not rely on the notification (i.e., it is functionally independent), and has a self-contained property hierarchy (suspended, revoked, proposed). Certification shares the property of being "proposed" in the first place.
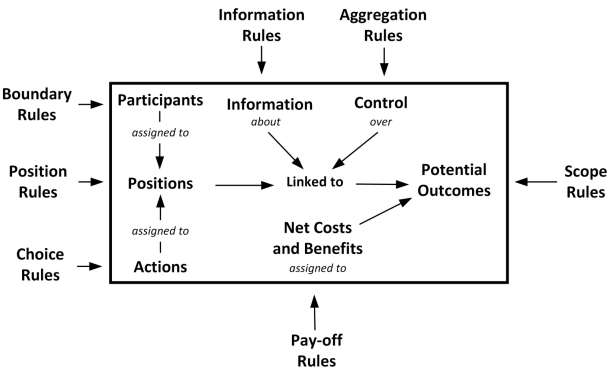
The Action Situation

The action situation describes the setting in which institutional statements operate, and in the case of regulative statements, specifically the mapping between actors, actions, outcomes and the associated payoffs.

Defined as an institutionally governed setting in which two or more actors interact, in relation to which specific outcomes emerge.

Action situations are governed by a configuration of seven types of rules that can correspond to institutional statements, and be regulative or constitutive in kind.

	Rules specify ...
Position Rules	positions that actors can occupy within an action situation
Boundary Rules	eligibility criteria for occupying those positions
Choice Rules	operational actions linked to actors occupying certain positions
Scope Rules	intended goals or situational outcomes
Information Rules	channels of information flow
Aggregation Rules	guidance on collective decision making
Pay-off Rules	incentives tied to particular actions

Some statements contain clauses that instantiate action situations or actions within an existing action situation. Some statements contain context clauses that simply qualify actions within an existing action situation.
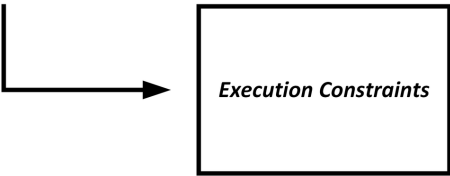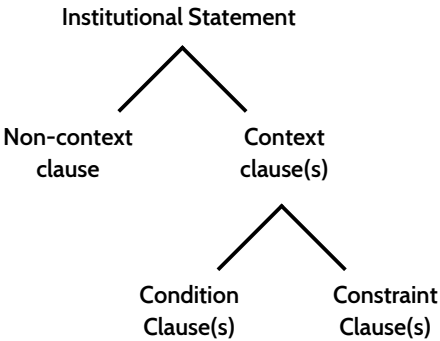
Activation Condition & Execution Constraint Principles

Activation Condition

Context clauses which serve an instantiation function, as well as describe Attribute or Object changes
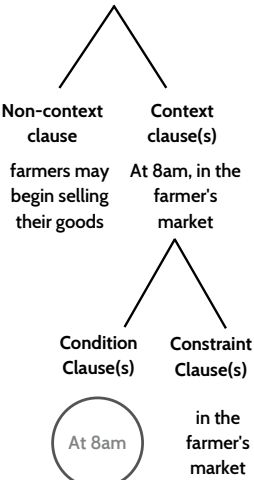
Execution Constraint

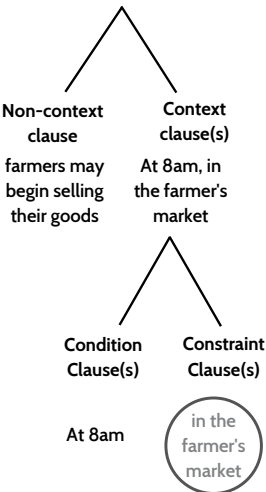Context clauses which qualify action

Institutional Statement

Non-context clause

Context clause(s)

Condition Clause(s)

Constraint Clause(s)

Activation Condition Example

Institutional Statement

At 8am, farmers may begin selling their goods in the farmer's market

Non-context clause

farmers may begin selling their goods

Context clause(s)

At 8am, in the farmer's market

Condition Clause(s)

Constraint Clause(s)

At 8am

in the farmer's market

Execution Constraint Example

Institutional Statement

At 8am, farmers may begin selling their goods in the farmer's market

Non-context clause

farmers may begin selling their goods

Context clause(s)

At 8am, in the farmer's market

Condition Clause(s)

Constraint Clause(s)

At 8am

in the farmer's market

Decision Heuristics

Decision heuristics can be employed to aid in the identification of activation conditions and execution constraints. These heuristics are designed to help the analyst determine if a context clause in question is an activation condition or an execution constraint.

Identifying Activation Conditions

☐ The clause instantiates a discrete setting (constrained temporally, spatially, or otherwise) and/or event that activates the non-condition clauses of the institutional statement (i.e., noncontext clauses along with potential constraint clauses) as a whole.

> _**Upon receiving final notice of non-compliance**_, farmers shall cease sale of any product bearing the USDA organic farming label._
>
> _**Starting January 1**, the Department of Agriculture is the certifying authority._
>
> _**Upon entry into the house**, visitors must remove shoes._

Identifying Activation Conditions in Regulative Statements

☐ The clause instantiates a) a change in attributes linked to a statement's activity or b) a change in attribute role.

> _Between the hours of 6pm and 6am on Mondays, members of neighborhood watch residing in blocks 7-10 will assume night patrol activities._

☐ The clause instantiates a change of the object(s) linked to the statement's activity.

> _Starting Dec. 15th, inspectors must exclusively use the revised inspection form._

Identifying Activation Conditions in Constitutive Statements

☐ The clause instantiates a change in the Entity that is being constituted.

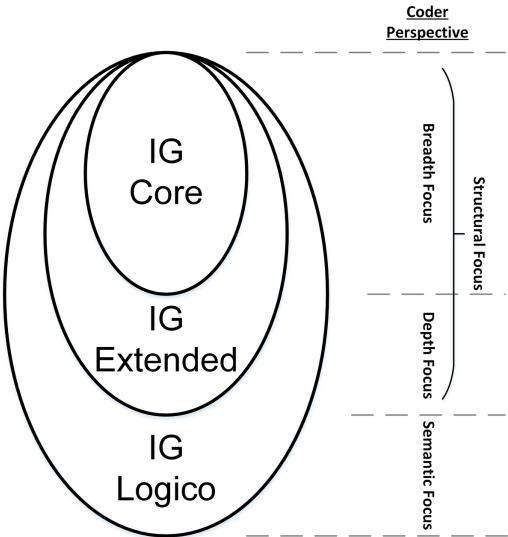> _In the event that the Board Chair position becomes vacant, the Vice-Chair is the chief executive of the Council._

☐ The clause instantiates a change in the constituting properties of the entity that is constituted, reconstituted or otherwise affected in the institutional statement.

> _Starting Dec. 15th, organic farming is agricultural production that does not involve the use of synthetic chemicals or genetically modified organisms._

Institutional Grammar 2.0 Coding Levels

The IG 2.0 identifies three levels of encoding to provide flexible accommodation of coding necessities based on the complexity of encoded data, as well as the analytical objectives of the coder: IG Core, IG Extended, and IG Logico.

IG Core	IG Extended	IG Logico
Enables basic, structural analysis of institutional statements. Encoding at this level is designed to be human readable and moderately comprehensive in the detail with which syntactic properties of institutional statements are captured.	Enables more detailed structural analysis of institutional data than IG Core and accommodates computational application to aid in institutional coding and analysis. Encoding at this level is designed to be human readable, moderately computationally tractable, and moderately comprehensive in the detail with which syntactic properties of institutional statements are captured.	Designed to support semantic analysis of institutional statements wholly relying on computational tools. Encoding at this level is designed to be moderately human readable, computationally tractable and comprehensive in the detail with which syntactic properties of institutional statements are captured.

Symbol Reference for IG Coding Examples

	Component
A	*Certifier* (A)
I	*Certifier* (A) *monitors* (I) *farmers.*
B_{dir}	*Certifier* (A) *administers* (I) *certifications* (B_{dir}).
B_{ind}	*Certifier* (A) *registers* (I) *certification* (B_{dir}) *for organic farmer* (B_{ind}).
B	*... notification* (B_{dir}) *of suspension* (B_a ,B1) *or revocation* (B_a,B2) *of certification* (B_a) *...* Here, the functionally independent object certification (Ba) is root of a property structure consisting of two objects as properties [suspension (B1), revocation(B2), both of which are annotated with reference to the certification.
D	Regulative: *Certifier* (A) *must* (D) *monitor* (I) *farmers* (B_{dir}). Constitutive: *From 1st January onwards* (C_{ac}), *Council* (E) *shall* (D) *be responsible* (F) *for adherence with food production standards* (C_{ex}). Alternative example: *From January 1st onward* (C_{ac}), *there shall* (D) *be* (F) *a National Organic Standards Advisory Council* (E) *within the Department of Agriculture* (C_{ex}).
C_{ac}	Regulative: *Upon accreditation* (C_{ac}) *certifier* (A) *must* (D) *monitor* (I) *farmers* (B_{dir}). Constitutive: *From 1st January onwards* (C_{ac}), *Council* (E) *shall* (D) *include* (F) *organic farming representatives* (P) *to review chemical allowances within organic food production standards* (C_{ex}).
C_{ex}	Regulative: *Certifier* (A) *must* (D) *monitor* (I) *farmers* (B_{dir}) *at any time* (C_{ex}). Constitutive: *From 1st January onwards* (C_{ac}), *Council* (E) *shall* (D) *include* (F) *organic farming representatives* (P) *to review chemical allowances within organic food production standards* (C_{ex}).
E	*From 1st January onwards* (C_{ac}), *Council* (E) *shall* (D) *include* (F) *organic farming representatives* (P) *to review chemical allowances within organic food production standards* (C_{ex}).
P	*From 1st January onwards* (C_{ac}), *Council* (E) *shall* (D) *include* (F) *organic farming representatives* (P) *to review chemical allowances within organic food production standards* (C_{ex}).
F	*From 1st January onwards* (C_{ac}), *Council* (E) *shall* (D) *include* (F) *organic farming representatives* (P) *to review chemical allowances within organic food production standards* (C_{ex}).

	Attributes, Object, Entity and Property Components
prop	*Certified* (A,prop1) *organic* (A,prop2) *farmers* (A) *must* (D) *respond* (I) *to formal* (B_{dir}, prop1) *certification requirements* (B_{dir}). *... proposed* (Ba,B1prop;Ba,B2,prop) *suspension* (Ba,B1) *or revocation* (Ba, B2) *of certification* (Ba) *...*

	Logical Operators
AND, OR, XOR, NOT	*Certifiers must review applications and* (AND) *must not* (NOT) *approve applications by offenders.*

	Component	Statement
( )	*Certifier* (A) ... where A identifies the certifier as an attribute in a given institutional statement. *Certifier* (A, animate) ... where A identifies the certifier as an attribute in a given institutional statement, and animate is an additional annotation.	(stmt AND stmt); (stmt AND (stmt OR stmt)), where stmt represents an institutional statement combined with other institutional statements using logical operators (AND, OR, XOR, and potentially NOT). Where individual components are combined, the same applies.
[ ]	*They* [farmers (A)] *must comply with the certification regulation ...,* where [farmers (A)] characterises the inferred actor.	stmt1[stmt2], where stmt1 represents a monitored statement, and stmt2 the corresponding consequential statement

	Component
{ }	*Certifier* (A) *believes* (I) {*farmer* (A) *violates* (I) *code of conduct* (B)}(C_{ex}) In this example, the execution constraint (C_{ex}) of a given institutional statement is substituted with another institutional statement.

Coding Regulative Statements - Examples

IG Core	IG Extended	IG Logico
Attribute	**Attribute**	**Relation-centric Semantic Annotations**
Certified (A, prop) farmer (A) must (D) submit (I) an organic systems plan (Bdir) annually (Cex).	A certified (A,prop1) farmer (A) {whose certification (Bdir) is suspended (I) by the Secretary (A) under this section (Cex)}(A,prop2) may (D) at any time (Cac) submit (I) a recertification (Bdir, prop) request (Bdir).	(When [program manager (A) performs (I)] an inspection (Bdir) of an accredited (Bind,prop1) certifying (Bind,prop2) agent (Bind)) by the [AND] (Program Manager (A) reveals (I) any noncompliance (Bdir) with the Act (ref="policy") or regulations in this part (ref= "Section") (Cex,effect))} (Cac,proc), [Program Manager] (A) a written (Bdir, prop1) notification (Bdir) of noncompliance (Bdir,prop2) shall (D) be sent (I) to the certifying agent (Bind).
Object	**Object**	**Logical relationships among statement components**
Organic (A, prop) certifier (A) must (D) send (I) farmer (Bind) notification of compliance (Bdir) within thirty days of inspection (Cex).	The Program Manager (A) shall (D) send (I) a written (Bdir, prop) notification (Bdir) of proposed (Ba,1,prop; Ba,2,prop) suspension (Ba,1) or revocation (Ba,2) of certification (Ba) to certified (Bind,prop1) organic (Bind,prop2) farmer (Bind).	({When [Program Manager (A)] reveals (I) any non-compliance (Bdir) [by the accrediting (Bind,prop1) certifying (Bind,prop2) agent (Bind)] with the Act (ref="policy")(Cex,eff){[under the condition that] (Program Manager (A) [performs (I)] inspection (Bdir) of an accredited (Bind,prop1) certifying (Bind,prop2) agent (Bind))
Aim	**Aim**	**Cross-component Semantic Annotations**
Organic (A, prop) certifier (A) must (D) send (I) farmer (Bind) notification of compliance (Bdir).	See IG Core for example.	{When [Program Manager] (A; type=animate;role=experiencer) reveals (I) any non-compliance (Bdir; type=inanimate [by the accrediting (Bind,prop1) certifying (Bind,prop2) agent (Bind;type=animate; role=originator] with the Act (type=inanimate,ref="policy") or regulations in this part (ref="section") (Cex,eff)}(Cac), [Program Manager (A; type=animate; role=originator)] shall (D) [send (I)] a written (Bdir,prop1) notification (Bdir; type=inanimate) of noncompliance (Bdir,prop2) to the certifying (Bind,prop1) agent (Bind; type=animate;role=recipient)
Deontic	**Deontic**	**Institutional function annotations**
Organic (A, prop) certifier (A) must (D) send (I) farmer (Bind) notification of compliance (Bdir).	See IG Core for example	{When [Program Manager] (A; type=animate;role=experiencer) reveals (I;function=detect violation) any non-compliance (Bdir; type=inanimate [by the accrediting (Bind,prop1) certifying (Bind,prop2) agent (Bind;type=animate; role=originator)] with the Act (type=inanimate,ref="policy") or regulations in this part (ref="section") (Cex,eff)}(Cac), [Program Manager (A; type=animate; role=originator)] shall (D) [send (I; function=sanction)] a written (Bdir,prop1) notification (Bdir; type=inanimate) of noncompliance (Bdir,prop2) to the certifying (Bind,prop1) agent (Bind; type=animate;role=recipient).
Context	**Context**	
Upon entrance into agreement with organic farmer to serve as his/her certifying agent (Cac), organic certifier (A) must (D) inspect (I) farmer's operation (Bdir) within 60 days (Cex).	{Upon entrance (I) into agreement (Bdir) with organic farmer (A) to serve as his/her certifying agent (Cex, purp)} (Cac,proc), organic certifier (A) must (D) inspect (I) farmer's operation (Bdir) within 60 days (Cex, timeframe).	

IG Core	IG Extended	IG Logico

Or else | **Or else** |

<u>Vertical nesting</u>: Certified (A, prop1) organic (A, prop2) farmers (A) must not (D) apply (I) synthetic chemicals (Bdir) to crops (Bind) at any time (Cex) once organic certification is conferred (Cac), or else [certifier (A) will (D) revoke (I) certification (Bdir) from farmer (Bind)].

See IG Core for example.

<u>Horizontal nesting within vertically-nested statement</u>: Certified (A, prop1) organic (A, prop2) farmers (A) must not (D) apply (I) synthetic chemicals (Bdir) to crops (Bind) at any time (Cex) once organic certification is conferred (Cac), or else [(certifier (A) will (D) revoke (I) certification (Bdir) from farmer (Bind)) XOR (certifier (A) will (D) fine (I) farmer (Bdir))].

Coding Constitutive Statements - Examples

IG Core	IG Extended	IG Logico
Constituted Entity	**Constituted Entity**	**Constitutive Function annotations**
There is hereby (Cex) established (F) a public (E, prop) Food Security Advisory Board (E).	There is hereby (Cex) established (F) a standing (E, prop1), public (E, prop2) Food Security Advisory Board (E).	Starting January 1st (Cac), the Connecticut Food Policy Council (E) shall (D) be (F; confunc=organization) within the Department of Agriculture (Cex).
Constitutive Function		
There is hereby (Cex) established (F) a public Food Security Advisory Board (E).		
Constituting Properties	**Constituted Property**	
The Committee (E) shall (D) consist (F) of a President, Secretary, and Treasurer (P).	The Council (E) consists of (F) elected (P,prop1) officials (P) resident in the electorate (P,prop2).	
Deontic		
A majority of the members of the Council (P) shall (D) constitute (F) a quorum (E).		
Context	**Context**	
From 1st of January onward (Cac), Food Policy Council reporting requirements (E) apply (F) for any communication (P) between the Council and Regional Council (P, prop) in addition to communal provisions (Cex).	Upon the declaration of the Secretary (Cac, Prc) [AND] from the 1st of January onward (Cac, tim), Food Policy Council reporting requirements (E) apply (F) for any communication (P) between the Council and Regional Council (P, prop) in addition to communal provisions (Cex, met).	
Or else		
In student recruitment plans (Cex), diversity (E) must (D) mean (F) diversity in race, religion, sexual orientation and gender (P), or else plan (E) is (F) void (P)		

Context Taxonomy

The circumstances taxonomy captures contextual characterizations with respect to temporal, spatial and various other descriptors that capture institutional context more accurately.

	Subtypes	Examples
Temporal (tmp): Conditions/Constraints associated with time - the when	Point in time (tim): References to specific points in time	"Starting at 10am ..."
	Time frame (tfr): References to time frames	"between 10am and 5pm"
	Frequency (frq)	"annually"
Spatial (spt): Conditions/Constraints associated with spatial representations - the where	Location (loc): References to specific locations	"At main street corner ..."
	Direction (dir): References to directions, inclusion of intermediary locations	"Toward the airport ..."
	Path (pth): References to pathways	"over the hill"
Domain (dom): Conditions/Constraints associated with a specified actvitiy or topical realm	Domain (dom) - References to a specifed topical or activity realm	"For drinking water, ..." "During decision-making, ..."
State (ste): Conditions/Constraints associated with state and state modification - the what; potentially external to action situation	State (ste) - References to a specific state	"when traffic light is red ..."
	State transition (tra) - References to a change in state	"when traffic light switches from red to green ..."
Procedural order (prc): Conditions/Constraints associated with explicit or implied execution order. Operationally, this can include expressions of input into the activity identified in the institutional statement		"Following a departmental review, ..." "Upon completion of the training ..."
Method (met): Conditions/Constraints associated with manners or means by which an action is performed	Manner - Action as method	"by handshake"
	Instrument - Artefact as method	"by car"
Purpose/Function (pur): Conditions/Constraints describing the purpose or intent of an aim; generally output of action		"... for the purpose of maintaining compliance"
Observed state/Outcome/Effect (eff): Conditions/Constraints describing a change in the environment emanating from the observed actor(s) or environmental effects, including the observation of compliance/non-compliance.		"When pollution is detected ..." "If individuals' commitment to sustainability is reduced ..."

Constitutive Functions Taxonomy

Constituted entities can be represented in institutional statements in their actual form, or be the policy itself. Constitutive function annotations emphasize the specific role a constitutive function entertains with respect to the constituted entity and/or the linkage of constituted entity and constituting properties. The constitutive functions taxonomy provides categories and illustrative examples of functions observed for different constituted entity types.

Entity		Policy	
Definition	Actor, Object, Role, Action	Life Cycle	"comes into force", "concludes"
- Intensional	- "is"		
- Extensional/by ascription	- "does"	Relationship	"amend", "substitutes"
Composition	"consists of"		
Organization	"is embedded in", "relates to"	Intent	Indication of purpose or spirit
Lifecycle	"established", "terminated"	Information	information about policy
Conferral	"is assigned"		