

# ${SPML}^{TM}$

The Systems  $Planning^{SM}$  Modelling Language (SPML<sup>TM</sup>) is a set of coordinated syntactic and semantic rules, organised in *techniques* that correspond to important 'low-level' planning tasks (Perdicoúlis, 2014b). Since its original publication (Perdicoúlis, 2010), SPML<sup>™</sup> has been developing with practice. This folio consolidates the developments documented in various issues of the Systems Planner, and is intended for use in further applications as an authoritative, updated, and concise reference.

ABBR. <sup>a</sup>	Ref.	Таѕк	Documentation
RBP <sub>[T]</sub>	(§1)	Represent system structure and function	Perdicoúlis (2010, 2011b)
HBS <sub>[T]</sub>	(§1)	Represent static hierarchical structure	Perdicoúlis (2011a, 2013d)
CAD <sub>[T]</sub>	$(\S1)$	Represent static non-hierarchical structure	Perdicoúlis (2017a,b)
CPD <sub>[T]</sub>	$(\S{2})$	Represent processes concisely (global POV)	Perdicoúlis (2010, 2011b, 2013a)
EPD <sub>[T]</sub>	$(\S{2})$	Represent processes in detail (global POV)	Perdicoúlis (2010, 2013b)
PPD <sub>[T]</sub>	(§2)	Represent processes in detail (actor POV)	Perdicoúlis (2010, 2013c)
IFD <sub>[T]</sub>	(§2)	Represent information flows in abstracted processes	Perdicoúlis (2015a, 2017b)
TCD <sub>[T]</sub>	(§2)	Represent coupled money & product/ service flows	Perdicoúlis (2010, 2013e)
DCD <sub>[T]</sub>	(§3)	Represent causal mental models and reasoning	Perdicoúlis (2010, 2011b, 2014a)
TMU <sub>[T]</sub>	(§4)	Represent content semantics by text-based annotations	Perdicoúlis (2010, 2011b)

<sup>a</sup> The 'rules' of the techniques are detailed in the tables below, followed by examples

#### Systems 1



System diagram rules  $- RBP^a$ ,  $HBS^b$ ,  $CAD^c$ 

Semantic category	Text	Example	Graphic
System element <sup><math>d</math></sup> (plain)	quantifiable noun <sup><math>e</math></sup>	population, satisfaction	element
System element $(\text{compound})^f$	quantifiable noun	population (upper); units (lower)	element notes
Causal relationship $(RBP)^g$	sign of relative change	+/-	+
Delay (when relevant)	delay; time lag	DELAY/ D	
U-association <sup><math>h</math></sup> (CAD, RBP, HBS) <sup><math>i</math></sup>	comment (optional)	duplication, in sync, cf.	********
D-association <sup><math>j</math></sup> (CAD)	comment (optional)	is, has, requires	
Hierarchy (HBS)	(none)	(N/A)	
Feedback loop (RBP)	type: <i>reinforcing/ balancing</i> name (optional)	symbol and/ or text	Cbal
Labels (optional)	auxiliary marking	Х, Ү, Ζ	X

<sup>*a*</sup> Reverse Blueprints (RBP)

<sup>b</sup> Hierarchical Breakdown Structures (HBS)

<sup>c</sup> Concept Association Diagrams (CAD) — similar to concept maps (Perdicoúlis, 2012a)

 $^{d}$  Nodes are best represented as text; shapes and colours should be used with discretion

<sup>e</sup> Expressed in its positive version — e.g. happiness instead of unhappiness (Sterman, 2000, p.153)

 $^{f}$  The 'extra' information of compound nodes can be alternatively represented as mark-up (§ 4) <sup>g</sup> Variants: descriptive ('is')  $\longrightarrow$ ; stochastic ('may be') ----->; normative ('must be') ~

 $^{h}$  Un-directed association

<sup>*i*</sup> Types of association may be created with varying line weights and/ or colours (e.g. within or across themes) <sup>j</sup> Directed association



Generic Reverse Blueprint (RBP)



Generic Hierarchical Breakdown Structures (HBS)



Concept Association Diagram (CAD) for 'project' (Perdicoúlis, 2017a)



## Process diagram rules — $CPD^a$ , $EPD^b$ , $PPD^c$ , $IFD^d$ , $TCD^e$

Semantic Category	Text	Example	GRAPHIC
State (CPD)	noun; identifiable state	information, data	state
State (EPD, PPD)	noun; identifiable state	water (upper); liquid (lower)	element state
Action (CPD)	verb or noun	produce $(v.)/$ production $(n.)$	action
Action (TCD)	actor (upper); verb or noun (lower)	author (upper); write/ writing (lower)	actor action
Action (EPD, PPD)	verb or noun; noun, adverb, or adjective; noun;	build/ construction; unibody; manufacturer	action   method   actor
To next state $(\_PD)^{f}$ ; Resource flow (TCD) Backwards (feedback)	product or service $(optional)^g$	publishing; 12 issues per year	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Information flow	$(\text{optional})^h$		and the second s
Money flow $(TCD)^i$	charge, rent, income	€ 3,000 p.a.	€ · <b>x</b>
Feedback loop (IFD)	type: <i>single/ multi</i> (IFD) name (optional)	symbol and/ or text	multi
Labels (optional)	auxiliary notes	start, end	START
Conjunctions (optional)	union, split/ decision	and, or	[or]

<sup>a</sup> Concise Process Diagrams (CPD)

<sup>b</sup> Extended Process Diagrams (EPD)

<sup>c</sup> Personalised Process Diagrams (PPD) <sup>d</sup> Information Flow Diagrams (IFD)

<sup>e</sup> Transaction Chain Diagrams (TCD)

<sup>f</sup> Variants: descriptive ('is')  $\longrightarrow$ ; stochastic ('may be') ----->; normative ('must be')  $\longrightarrow$ <sup>g</sup> e.g. when linking outcome (Z') to concern (Y) in qualitative simulation (Perdicoúlis, 2014d)

<sup>*h*</sup> e.g. the relations ('use', 'design') between the facets of the SF2<sup>TM</sup> vision (Perdicoúlis, 2014c) <sup>i</sup> Specialised *information flow*, reserved for monetary values



Splits and unions of actions and states in CPD (Perdicoúlis, 2013b,c)

state 1	action 1methodoperator 1	state 2	action 2methodoperator 2	state 3
properties		properties		properties

Generic Extended/ Personalised Process Diagram (EPD/ PPD)





Information Flow Diagram (IFD) for an explanation (Perdicoúlis, 2015b)

reply

3 Plans



Semantic category	Text	Example	Graphic
Element (general case) Objective <sup><math>bc</math></sup> (Z) Outcome <sup><math>d</math></sup> (Z')	quantifiable noun <sup><math>e</math></sup>	population	element
$\operatorname{Concern}^{f}(\mathbf{Y})$	quantifiable noun	satisfaction	element
Action (X)	verb (upper); appication point (lower)	install (upper); lamps (lower)	element action
Causality (physical)	verb	causes, provokes	
Causality (logical)	verb; logical term	means, requires; therefore	
Association <sup><math>g</math></sup>	comment (optional)	efficacy (to be inferred)	*********
Effect (general case) <sup><math>h</math></sup>	quantifiable noun	increase (n.), occurrence <sup><math>i</math></sup>	effect
Effect (cumulative) <sup><math>j</math></sup>	quantifiable noun (upper); receiving element (lower)	significant increase (upper); $[CO_2]$ (lower)	effect element
Effect (feedback only)	verification (e.g. $Z'$ to $Y$ )	facilitates <sup>*</sup> , resolves <sup>*k</sup>	effect
Loop (optional)	labelled loop	symbol and/ or text	Cloop
Labels (optional)	auxiliary notes	social impact	SOCIAL

<sup>*a*</sup> Descriptive Causal Diagram (DCD)

<sup>b</sup> Intended state, more specific than the concern (Y)

<sup>c</sup> Objectives (Z) either *specify* or *constrain* the concern (Y), depending on the stakeholder/ PoV  $^{d}$  Ideally, the 'mirror image' of the objective (Z)

<sup>e</sup> Expressed in its positive version — e.g. happiness instead of unhappiness (Sterman, 2000, p.153)

 $^{f}$  More abstract than objectives (Z)  $^{g}$  Un-directed association, as in CAD or RBP (§ 1)

<sup>h</sup> Typically marked on a relationship arrow

<sup>*i*</sup> This is a more abrupt phenomenon (0/1), whereas 'increase' is gradual (with or without a disclosed pattern)  $^j$  Added to a compound node (v. § 1) — typically an outcome (Z')

 $^{k}$  The asterisk (\*) indicates value judgement



Generic Descriptive Causal Diagram (DCD)

#### Text Mark-Up (TMU) 4

#### Narrative 4.1

Documents describing situations, processes, and/ or plans generally contain sufficient information to reveal causality dynamics, and the task is facilitated by approprite mark-up.

## Document mark-up

Semantic Category	Text	Example	Mark-Up
System element	quantifiable noun	population, satisfaction	CAPS, colour
Action	verb & specifier	install, create policy	boldface, colour
Causality	verb	causes, provokes	teletype, colour
Effect	quantifiable noun	increase (n.), new attribute	italics, colour

## The QUICK BROWN FOX jumps over the LAZY DOG, and this causes distress to the DOG.

## Semantic formatting

#### 4.2'XYZ' positioning

All SPML<sup>™</sup> diagrams can be marked-up in an 'XYZ' notation to relate their elements to the planning problem. While the complete 'XYZ' set is an integral component of the plans expressed in DCD ( $\S$  3), 'XYZ' functions can be identified in system and process elements (§ 1 and § 2 respectively).

## 'XYZ' notation

Semantic Category	Meaning	Mark-Up
Concern (Y)	intended state — $abstract/$ general	Y, (Y <sub>1</sub> )
Objective (Z)	intended state — concrete <sup><math>a</math></sup>	$Z, Z_1, Z_{\texttt{la}}$
Action (X)	conceived action ${}^{bc}$ — concrete or abstract/ general ${}^{d}$	$X, X_1, X_{1a}$
Outcome $(Z')$	$forecast^e$ state — concrete	$Z^\prime,\ Z^\prime_1,\ Z^{\prime\prime}$

<sup>a</sup> Considered either as 'breakdown' (e.g. single stakeholder) or 'condition' (e.g. competing stakeholders)

<sup>b</sup> In most planning problems, the action represents the solution <sup>c</sup> In systems (§ 1): application point; in plans (§ 3): action plus its application point

<sup>d</sup> For each particular objective, action can be conceived either in general (strategic) or specific (operational) terms  $^{e}$  Simulated result of the action

Sample Reverse Blueprint (RBP) with partial 'XYZ' mark-up

#### 4.3Node values

Descriptive (e.g. observed) or normative (e.g. intended) values and related information next to selected nodes is a useful *aide-memoir*, in combination with the 'XYZ' mark-up (Perdicoúlis, 2019).

Node values

Semantic Category	Options	Mark-Up
Obtention	directly obtained, calculated, estimated	DIR, CAL, EST
Meta	source (e.g. HR), method (e.g. count), units (e.g. °C)	HR, count, $^{\circ}C$
Nature	descriptive (e.g. observed), normative (e.g. objective)	OBS, OBJ
Relative value	comparing to a reference value (e.g. increase)	increase
Absolute value	abstract (e.g. strength) or concrete (e.g. 12-gauge)	12-gauge



Sample Reverse Blueprint (RBP) with 'XYZ' mark-up and a set value for Z



Mark-up of the efficiency index with its explicit computational view (Perdicoúlis, 2019)

#### Graphic SWOT<sup>™</sup> 4.4

SPML<sup>™</sup> diagrams may accommodate special studies such as Graphic SWOT<sup>™</sup> (Perdicoúlis, 2015c, 2018), provided that compatibility with the main 'XYZ' notation is ensured.

Graphic SWOT<sup>TM</sup> notation

Semantic Category	Meaning	Mark-Up
Strength	currently satisfactory state	s
Weakness	currently unsatisfactory state	W
Opportunity	potentially satisfactory state	0
Threat	potentially unsatisfactory state	Т
Leverage point	application point of an action (generic)	LEVERAGE
Loop priming point	capable of starting up a positive feedback loop	PRIMING



Sample Reverse Blueprint (RBP) with partial 'SWOT' mark-up



Sample Concise Process Diagram (CPD) illustrating the 'SWOT logic'

## Bibliography

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