Sign complexity

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Abstract

The degree of complexity conveyed by 'signs' as expressions of reality underpins the ways in which understanding is sought and action is conceived. The variety of options is founded on interesting historical developments and shapes the practice of planning.

1   Overview

Human interest in 'signs'[1] dates back to antiquity, evidenced in practices as varied as haruspicy[2], weather forecasting, and medical diagnoses. Regardless of the motives and means, the drive is practically associated with the conception of appropriate action in a complex world.

The *par excellence* study of signs is credited to Hippocrates[3] and his *semeiosis*[4] (Danesi, 2001; Sebeok, 2001), in which physical or behavioural phenomena[5] are associated with diseases in a coincidental — i.e. symptomatic[6] — rather than causal reasoning. Since certain signs may be common in different diseases, *diagnosis*[7] becomes necessary to identify exactly what ails the patient — mostly as a pattern or *syndrome*[8], and possibly with a suggestion regarding the cause. The explicit reasoning regarding the *conception* of the treatment is generally not an object of enquiry[9], so the emphasis is given directly to the *prognosis*[10] — the utmost practical concern of the patient's welfare as well as of the physician's success.

Over time and across diverse fields of knowledge, *semiotics* becomes the overarching 'study of signs', encompassing *inter alia* human communication, psychology, medicine[11], logic, and cognitive science

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[1] From *signum* [L], mark, token; related to σημείον [Gk], sign — from σῆμα [Gk], mark.

[2] Divination through the observation of entrails (σπλαχνομαντεία [Gk]).

[3] End of the 5th C. BC.

[4] Σημείωσις [Gk], (an)notation.

[5] From φαίνεσθαι [Gk], to seem, to appear — from φαίνειν [Gk], to bring to light, to uncover, to reveal.

[6] From συμπίπτειν [Gk], to coincide, to happen.

[7] Διαγιγνώσκειν [Gk], to distinguish, to discern — from δια- [Gk], apart + γιγνώσκειν [Gk], to know; equivalent to *discernere* [L], from *dis-* [L], apart + *cernere* [L], to separate.

[8] From συν- [Gk], together + δράμειν [Gk], to run.

[9] Inductive processes concerning the formulation of a 'general rule' or hypothesis and based on individual observations and/ or scientific research are generally beyond the scrutiny of the scientific method (Perdicoúlis, 2014d).

[10] In general, a forecast of the likely outcome of a situation; in a medical context, the likely course of a condition — from προ- [Gk], before + γιγνώσκειν [Gk], to know.

[11] *Semiology* is an alternative term for *semiotics*, at least in the medical context.

(Johnson-Laird, 1980). While semiotics sets out to understand the object- and culture-specific structures beneath the production and interpretation of signs, it tends to study *simple* signs such as symptoms[12], signals[13], icons[14], indexes[15], symbols[16], and names[17] (Sebeok, 2001).

In an 'enlightenment' call, John Locke[18] defines *Semiotike*[19] as the third branch of science, complementing *Physica*[20] and *Practica*[21], responsible for *'the understanding of things'* and *'conveying [. . .] knowledge to others'*. In such an onerous attribution, the complexity of signs naturally surpasses words and extends well into the realm of *ideas* to provide the 'ways and means' to 'attain and communicate' *Physica* and *Practica* (Locke, 1689, Book IV, Ch. XXI) — i.e. ideas that are complex *mental models*, or 'small-scale models of [. . .] reality' (Craik, 1943, p.61). Such comprehensive models can help identify action alternatives, 'imitate'[22] physical processes, and ultimately make predictions (Craik, 1943, pp.51–52). Formal mental models in the fields of logic and linguistics limit their complexity to the capacity of syllogisms and semantics[23] (Johnson-Laird, 1980), but comprehensive dynamic mental models are commonly used in fields such as System Dynamics (Sterman, 2000), Systems Thinking (Senge, 2006), and Systems Planning℠ (Perdicoúlis, 2010) in a spirit and function similar to Locke's *Semiotike*.

2   Planning styles

As encapsulated in strategy schools (Mintzberg et al., 1998; Perdicoúlis, 2014a) and learning models (Perdicoúlis, 2010, 2014a, 2015), planning[24] can be carried out at various levels of effort, with associated advantages and risks[25]. While the *thoroughness of understanding* and the *integrity of the conception of action* are intrinsically important in planning[26], they are conditioned by the *complexity of the signs* employed — from symptoms and symbols to comprehensive dynamic mental models. Table 1 summarises three indicative planning styles explored in this section.

Planning Style		Effort/ Advance	Sign Complexity	Thoroughness of Understanding	Integrity of the Conception of Action
Sparse	(§ 2.1)	Low/ Low	loose points	patterns	reactive
Cursory	(§ 2.2)	Mid/ Mid	set of points	computations	prescriptive
Concerted	(§ 2.3)	High/ High	system model	dynamics	proactive

Table 1   Summary of the planning styles explored in §§ 2.1 to 2.3

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[12] 'Warning signs', depending on the species.
[13] e.g. bird song, pupil size.
[14] Resemble their referent (e.g. photographs)
[15] Referring to something in time or space (e.g. smoke indicates fire).
[16] Stand for their referent in an arbitrary, conventional way (e.g. a cross figure for Christianity)
[17] Unique identifiers assigned to the member of a species.
[18] 17th C. empiricist philosopher and physician.
[19] Σημειωτική — the 'doctrine of signs'.
[20] *'the nature of things, as they are in themselves, their relations, and their manner of operation'*.
[21] *'that which man himself ought to do, as a rational and voluntary agent, for the attainment of any end'*.
[22] More recently used as 'simulate' — from *simulare* [L], to imitate, to copy, to pretend.
[23] The branch of linguistics and logic concerned with meaning — *cf.* semiotics and semiology.
[24] Planning is considered broadly as the operation of preparing for the future (Perdicoúlis, 2014f).
[25] e.g. vague or arbitrary mental models with dubious relation to reality (Perdicoúlis and Glasson, 2011).
[26] e.g. as in the Explicit Planning™ modus operandi of Systems Planning℠ (Perdicoúlis, 2014e).

2.1   *Sparse* planning style with data-driven signs

Based on the Data learning model (Perdicoúlis, 2014a) as well as the Design, Planning, and Positioning schools (Mintzberg et al., 1998), the *Sparse* planning style is *objective* because it is data-based, and *flexible* because it is not committed to any particular mental model for the system or situation — Figure 1.
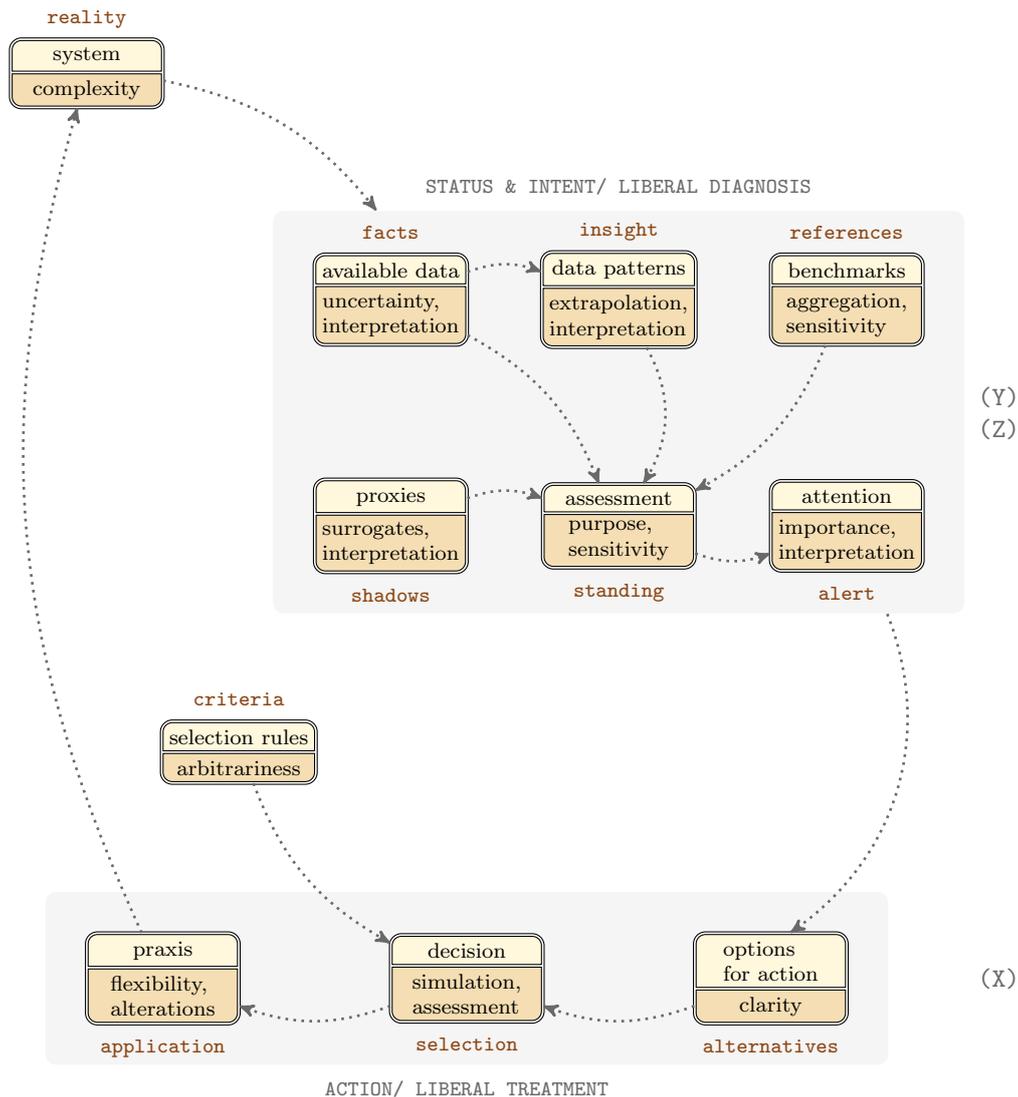

FIGURE 1   The *Sparse* planning style is *objective* and *flexible*

The *Sparse* planning style is reminiscent of the medical protocol — and not in a particularly explicit rendition: a 'diagnosis' of the situation is made by available data and contains non-disclosed concerns (Y) and objectives (Z); the 'treatment' (X) is suggested by 'experience', 'tradition', or 'creativity'; finally, the selection of the best alternative for action is typically dictated by 'common sense'.

2.2 *Cursory* planning style with systematised plain signs

Based on the Imprinted learning model (Perdicoúlis, 2014a) as well as the Entrepreneurial and Learning schools (Mintzberg et al., 1998)[27], the *Cursory* planning model is *systematic* because it represents reality by a prepared generic mental model[28] such as sets of key performance indicators (KPI), which renders its operations relatively *fast* — Figure 2.
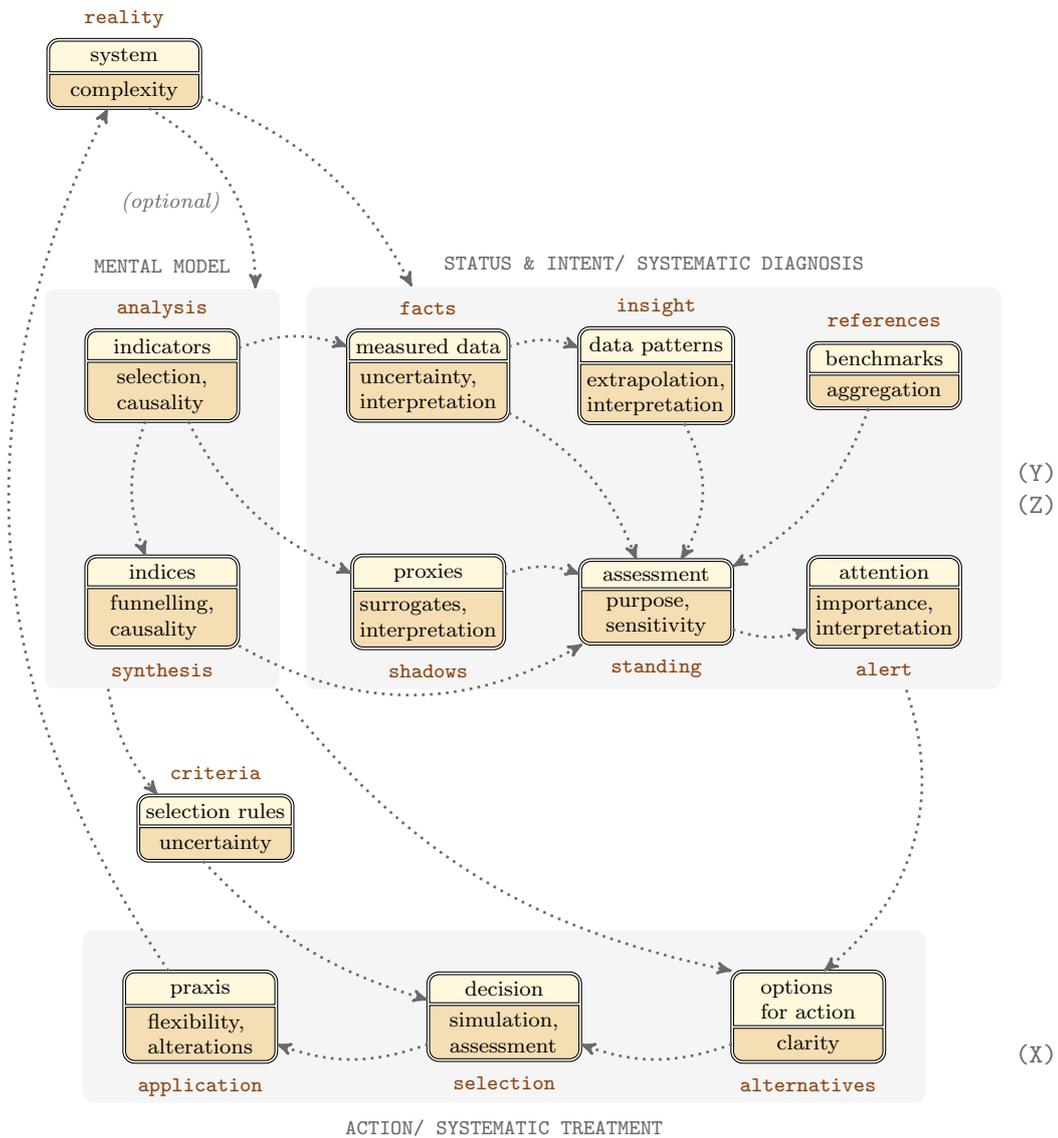

FIGURE 2   The *Cursory* planning style is *systematic* and *fast*

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[27] And also by the Deeper learning model (Perdicoúlis, 2014a) and the Cultural and Environmental schools (Mintzberg et al., 1998) when the mental model relates to the reality — v. 'optional' link in Figure 2.
[28] Which may or may not represent the system of interest — v. previous footnote.

The *Cursory* planning style is also reminiscent of the medical protocol, albeit in a more organised rendition: the 'diagnosis' of the situation is systematic, but still contains non-disclosed concerns (Y) and objectives (Z); the 'treatment' (X) is adapted in part to the generic 'system' model, but is likely to be prescriptive — i.e. recommended with authority, backed by confidence in systematisation; finally, the selection of the best alternative for action is observes criteria moulded by the mental model, albeit with some uncertainty associated with measurements.

2.3   *Concerted* planning style with tailored complex signs

Based on the Systems learning model (Perdicoúlis, 2014a) as well as the Cognitive school (Mintzberg et al., 1998), the *Concerted* planning style is *comprehensive* and also *laborious*, as it requires significant investment in preparing a tailored dynamic mental model of the system or situation of interest — Figure 3.
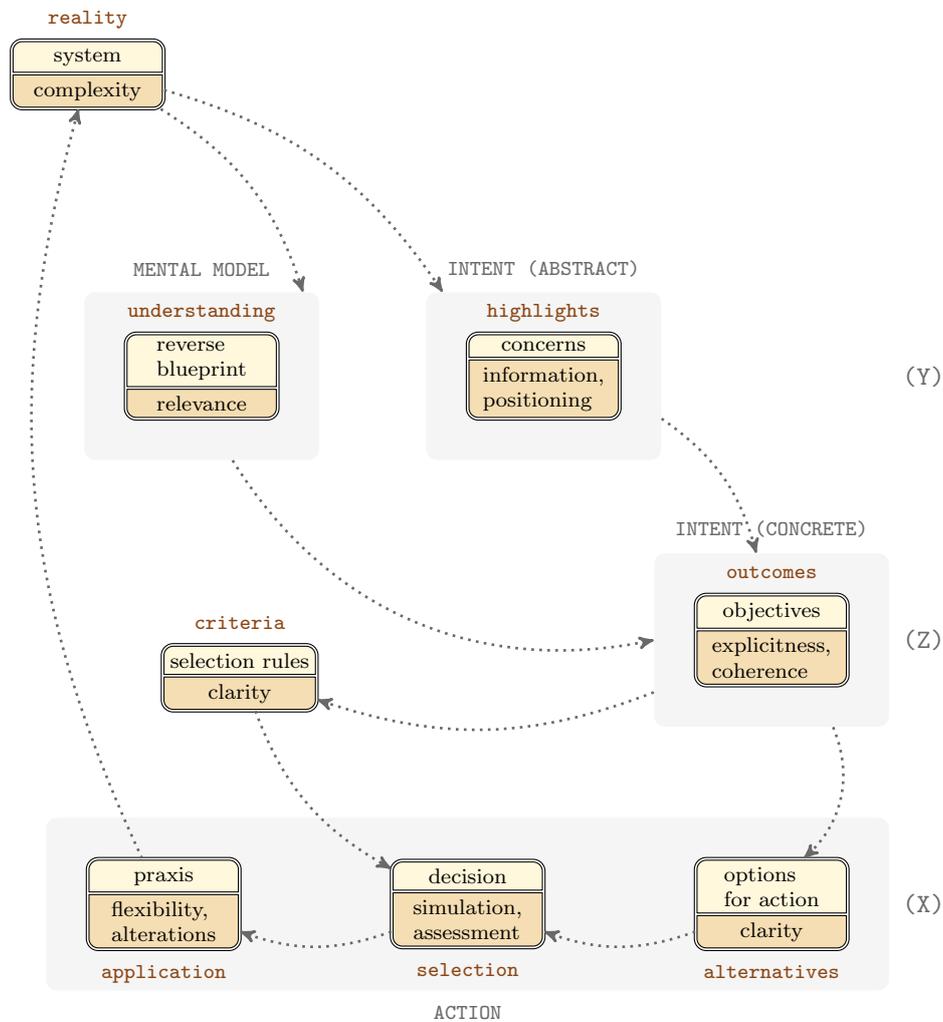

FIGURE 3   The *Concerted* planning style is *comprehensive* and *laborious*

The *Concerted* planning style is strongly intent-oriented: the 'diagnosis' is replaced by strong, pro-active statements regarding abstract concerns (Y) and concrete objectives (Y); without a 'diagnosis', the situation of interest is painstakingly replicated in a system model; the action (X) sought is to satisfy the objectives (X); finally, the criteria for the selection of the most appropriate action are shaped after the objectives rather than the system itself, which makes assessment more fair[29].

3   Discussion

The use of 'signs' in the three planning styles (§§ 2.1 to 2.3) as mental models suggests two interesting perspectives: (a) the internal complexity of the signs, from individual points to dynamic system models, and (b) the function of the signs (or mental models) in key planning aspects, such as the understanding that underpins the planning operation, the way that action is conceived (e.g. through adequate understanding), and even further in the formulation and application of criteria for the selection of the most appropriate action.

Figures 1 to 3 are information flow diagrams, or IFD (Perdicoúlis, 2014b), which are mental models (i.e. signs) of the complex kind — hence, an example of a *Concerted* planning style. The nodes in the figures represent key elements of the planning process (e.g. objectives, decision) with their identification in the upper part of each box, their main characteristics (e.g. complexity, clarity) in the lower part of each box, and a label indicating their function (e.g. outcomes, understanding) above each box. The relations (dotted arrows) represent information flows that indicate the dynamics between the elements in the planning process.

Considering their 'output over input' ratio[30], the three planning styles (§§ 2.1 to 2.3) are technically equivalent: Table 1 indicates that the 'advance/ effort' ratio is equal to one in each case. Hence, someone planning 'under pressure' is likely to prefer the *Cursory* style, at the same time lowering their expectations of a planning experience with deep understanding and control of the situation. On the contrary, if 'simplicity, elegance, and goodness'[31] are to be valued, then the *Concerted* planning style is the more suitable one, and a sizeable amount of investment must be expected.

For attenuating the *caveat emptor* onus of the user, the people and institutions who actually prepare and promote the individual planning styles — for instance, the 'planning schools' — have their own responsibility to inform their potential clients about the 'other options'. And while the planning schools are free to create 'a planning style for everyone', perhaps the ideal should be to aim for 'the best possible way to plan', involving 'signs' that promote human understanding rather than 'fast' planning operations or 'sticking to the facts' and going not much further.

4   Conclusion

The majority of planning schools and learning models adopt a reduced sign complexity in data- (*objective* and *flexible*) and indicator-based (*systematic* and *fast*) planning styles (§§ 2.1 and 2.2). *Comprehensive* and *laborious* planning styles, employing complex signs as tailored mental models (§ 2.3), offer more attention to the planning operation but remain uncompetitive at the same 'advance/ effort' ratio as the mainstream alternatives, probably appealing merely to *aficionados*.

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[29] i.e. action is assessed by its actual (Z′) against intended outcomes (Z).

[30] Based on the engineering concept of efficiency (Perdicoúlis, 2014c).

[31] This is the Systems Planning℠ 'assessable' interpretation of efficiency (Perdicoúlis, 2014c).

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