T U T O R I A L

A Systematic Unified Framework For Conceptual Engineering

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Abstract Conceptual engineering is the fast-moving research field that means to provide a method to assess and improve any of our concepts working as cognitive devices, that is: to identify conceptual deficiencies, elaborate ameliorative strategies, and prescribe normative guidelines as to whether and how to use a concept. The aim of the SUFCE tutorial is to provide a systematic overview of the program of conceptual engineering so designed, with a focus on its foundational issues and methodological framework. It is divided into three sessions.

Keywords Philosophical methodology, Theory of cognition, Theories of concepts.

Tutorial Sessions

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Introduction

Topic Conceptual engineering = method for the cognitive optimization of conceptual apparatus: assessment and improvement of concepts as cognitive devices.

- **Aim.** Systematic overview > Conceptual engineering = research program.
- **Question.** How to make conceptual engineering a usable method?
- **Hypothesis.** Implementing conceptual engineering < Foundational theorizing = conceptually engineering 'conceptual engineering' (w.r.t. its subject matter): **<Q1>**
  - ***Issue (A).*** What are 'concepts' (as cognitive devices)?
  - ***Issue (B).*** What is 'engineering' (in the case of conceptual cognition)?
- **Outcome.** Well-founded systematic unified framework: usable method = maximum scope, maximum impact, and easiest applicability.

Structure. Basis = systematic reconstruction of conceptual engineering [Sect. 1] < (Re-)engineering projects: 'concept' and 'engineering' (for conceptual engineering) [Sect. 2] >> Methodological framework = procedural template [Sect. 3].

1 The research program

Overall strategy Conceptual engineering < Meta-theoretical level (as research program): new take on philosophy as study of concepts[1] >> Systematization = theoretical framework [Sect. 1.1] + practical implementation [Sect. 1.2].

1.1 Theoretical framework

Outline Conceptual engineering (as theoretical program) = rebooting conceptual analysis << Triple characterization: general background [Sect. 1.1.1] + subject matter [Sect. 1.1.2] + epistemology [Sect. 1.1.3].

1.1.1 General background

Purpose 'Conceptual engineering' (a.k.a. 'conceptual ethics' [see Sect. 1.2]) = recent label(s) [2][2] >> Promoting philosophy beyond itself [8–11, 14].

- **Basic idea.** Cognition = sense-making process (viz. shaping a worldview): **<Q2>**
  - ***Principle (1).*** Aboutness: human cognitive activity = about something;[3]

[1] Vs. theoretical level: conceptual engineering = fast-moving research field at the intersection of philosophies of mind, language, cognition, and epistemology < Conceptions of the subject matter of conceptual engineering [Sect. 1.1.2] (viz. 'concepts' and '[cognitive] engineering' [cf. Sect. 2]).
[2] Label also used by Brandom [3] to denote the kind of naturalized conceptual analysis promoted by Dretske, Fodor, and Millikan (about representational content).
[3] E.g. sounds pattern, economic progress, falling of bodies.

- ***Principle (2).*** Conceptuality: access intended things, make them intelligible, act on them = design and use of concepts.[4]

▸ **General claim.** Quality of cognitive activity < quality of concepts [8, 10, 14, 64, 72]: "the better our concepts are, the better our cognition will be".[5]

Outcome Relevance = all intellectual disciplines/any rational activity >> Non-conceptual impact = pervasive and profound [8, 10, 11, 14, 72]. **<Q3>**

1.1.2 Subject matter

Principle Top-down approach = foundational theorization of conceptual engineering [see fn. 22] >> Specification: subject matter of conceptual engineering.

▸ **Alternative.** Topic of conceptual engineering << Two (± explicit) positions [14]:

- ***Positive wing.*** Conceptual engineering = about 'engineering concepts': about (cognitive) engineering ∧ about concepts;
- ***Negative wing.*** Conceptual engineering = not about 'engineering concepts': not about (cognitive) engineering ∨ not (really) about concepts:[6]
  - *Unprincipled views.* Topic of conceptual engineering = concepts, subject matters, or terms, more or less indistinctly [7, 65, 80];
  - *'Austerity framework'.* Topic of conceptual engineering = way in which we talk about topics (vs. concepts) [11]. **<Q4>**

▸ **Argument.** Reductio: conceptual engineering ≠ concepts/engineering → 'conceptual engineering' = misnomer (viz. mislabelled research program): **<Q5>**

- ***Self-discrediting predicament.*** Concept of 'conceptual engineering' = bad case of conceptual engineering;[7]
- ***Blind spot issue.*** No application of the so-called 'Master Argument' to the concept of conceptual engineering.[8]

Outcome 'Bootstrapping challenge' [41]:[9] theorizing the concepts of 'concept' and of '(cognitive) engineering' [Sect. 2] (viz. anti-foundational neutrality). **<Q6>**

1.1.3 Epistemology

Purpose Expected output (conceptual engineering): method for the cognitive optimization of our conceptual apparatuses [8, 11, 14, 76].

[4] E.g. phoneme, GDP metrics, 'force' (in mechanics).
[5] E.g. percentage of recyclable waste thanks to good selective sorting concepts.
[6] NB. 'conceptual engineering without concepts' [38] (a.k.a. 'no concept wing' [72]) = dominant position among conceptual engineers (yet, never with strong theoretical justification) [Sect. 2.1].
[7] Advice: relabelling 'conceptual engineering' = 'ethics of terminology', 'lexical engineering', etc.
[8] Master Argument [12] = general and radical critical stance towards concepts: any concept could have been engineered otherwise, no reason that concepts have been optimally engineered, every concept should be critically assessed (and improved if need be) [cf. Sect. 1.1.3].
[9] Viz. how to conceptually engineer conceptual engineering? [41 (see also 14, 72, 81)]

- **Target domain.** Conceptual apparatuses (schemes/repertoires) < Cognitive take = representational (artifactual) cognitive devices [8, 10, 14, 32, 63, 76]:
  - ***Status of concepts.*** Being designed and used — intentionally or non-intentionally — by human cognitive agents [28, 65];
  - ***Function of concepts.*** Making cognitive agents shape and edit (their understanding of) reality to meaningfully interact with it [11, 29, 32, 65, 81].
- **Attitude/Stance.** 'Ameliorative interventionism' = possibility to re-engineer our conceptual apparatuses (for the better!) [39 (also 5, 6)]:
  - ***Argument.*** Conceptual apparatus: present state = product of historical contingency: could have been and could be engineered otherwise [25, 64].[10]

Outcome Conceptual engineering < Implementation as ameliorative project >> Three main approaches: metaphysical, semantic, and pragmatic [72, 81]. **<Q7>**

1.2 Practical implementation

Outline Conceptual engineering (as practical program) = ameliorative project << Three constitutive features[11] = evaluation [Sect. 1.2.1] + normativity [Sect. 1.2.2] + 'constructivity' [Sect. 1.2.3] (viz. specification of conceptual ethics [cf. 14, 72]).[12]

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Remark 1 (Amelioration). Conceptual (re-)engineering = *de novo* engineering (of non-existing concepts) + re-engineering (of existing, deficient concepts).

1.2.1 Evaluative dimension

Purpose Evaluative operation [10, 29, 65]: assessment of a conceptual state = information and directions for the elaboration of ameliorative strategies [Sect. 1.2.2].

- **Basic principle.** 'Functionalism': concepts = tools (+ function) [14, 28, 65, 81]:
  - ***Question.*** 'What is the concept C?' (cf. classical conceptual analysis) >> 'What does the concept C do?' [20, 65] (or: 'what do we do with C?' [48]).
- **Application.** Process: functional assessment of the (cognitive) quality/performance of concepts [29] << Alternative = two possible strategies [cf. Sect. 3.2.2]:
  - ***Monism/Absolutism.*** Unique-univocal standard = scientific rationality [72];[13]
  - ***Pluralism/Relativism.*** Multiple-plurivocal standards = context-dependence (e.g. dependence on the conceptual system to be integrated, etc.) [9, 81].

[10] Vs. conceptual realism: concepts = human-independent entities [25, 65].

[11] NB. three constitutive features of conceptual engineering = three successive phases of the application of the methodological framework of conceptual engineering to a specific case study — yet, possible independent practical implementation of the three features/phases (despite their interdependence within a conceptual engineering project).

[12] NB. evaluation + normativity = conceptual ethics [63, 64] >> conceptual ethics + productive-creative take on concepts as cognitive tools (a.k.a. 'constructivity') = conceptual engineering.

[13] Cf. Carnap [18, 19]: "conceptual re-engineering for theoretical purposes" [5] << Ideology = rationalist and scientist revisionary project [6, 26, 27].

Outcome Success-condition = identification of potentially improvable features — e.g. of conceptual deficiencies (theoretical/practical) [10, 11, 72, 76].

1.2.2 Normative dimension

Purpose Normative operation [10, 29, 65]: prescription of ameliorative strategies (< Basis = information and guidelines of the assessment operation [Sect. 1.2.1]).

- **Basic principle.** Re-engineering project: prescription = conceptual change:
  - ***Questions.*** 'What concepts do we have?' >> 'What concepts should we have?' [26, 63–65, 72] (+ 'whether and how we should use a given concept?' [8]).[14]
- **Application.** Process: functional improvement of the (cognitive) quality/performance of concepts << Alternative = main strategies [14, 26, 65, 72]: **<Q8>**
  - ***Conservative.*** Preservation of the current conceptual state (after evaluation);
  - ***Progressive.*** Modification of the current conceptual state (after evaluation):
    - *Moderate*. Revisionary strategy = identity-preserving conceptual change: modification of conceptual extension/intension with topic preservation;
    - *Radical*. Transformative strategy = introduction of new concept and modification of topic or subject matter (substitution/replacement).[15]

Outcome Success-condition = elaborating actionable ameliorative strategies — e.g. for fixing the identified conceptual deficiencies [10, 11, 72, 73] [Sect. 1.2.1].

1.2.3 Constructive dimension

Purpose Constructive operation [32, 81 (also 5, 6, 26)]: implementation of ameliorative strategies < Basis = prescription of the normative operation [Sect. 1.2.2].

- **Basic principle.** Productive-creative ('poietic' [32]) project: implementation = new conceptual state << Two constitutive features:
  - ***Trade-offs.*** Transformation process >> Combination: gains/looses [27] — possibly, with no unique and context-independent optimal solution [48];
  - ***Open-endedness.*** Re-engineered/Newly engineered concept < Possible iteration = target of a new re-engineering project/process [5, 6, 26, 27].
- **Application.** (Re-)engineering projects: target = (re-)engineerable concepts:
  - ***Tractable concepts.*** Qualifying property << Many options (± liberal) [14]:

[14] NB. given the functionalism of conceptual engineering [Sect. 1.2.1], "whether or not to use a concept may ultimately depend (in part) on how it ought to be used if it is used" [8: 1096].

[15] Variant of radicalism: eliminative strategy = elimination of the old concept, along with its topic or subject matter, and without any substitution/replacement.

- *Option (1)*. Being philosophical or philosophically interesting [29, 44, 72]—possibly, due to some intrinsic inconsistency [70, 72][16] or invalidity [48];[17]
- *Option (2)*. Being deficient, philosophically or not [6, 10, 26, 27, 73];[18]
- *Option (3)*. Belonging to 'open-texture' concepts (deficient or not) [80];
- *Option (4)*. Being designed to solve open questions (viz. "not answerable in principle empirically or mathematically" [32: 293]);[19]
- *Option (5)*. Being any concept whatsoever [76].[20]

Outcome Success-condition = making conceptual apparatuses cognitively better[21] [72, 76]—e.g. fixing the identified conceptual deficiencies [10, 11, 72, 73]. **<Q9>**

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Conclusion (Section 1)

Systematization outcome = no account of what concepts are (as cognitive devices) + no account of what engineering is (in the case of conceptual cognition)[a] << **Foundational gap:** no understanding of the subject matter of conceptual engineering ⇒ **Implementability failure:** conceptual engineering = useless piecemeal method (viz. no overall grip on its target domain).

[a] Especially, no use of the literature on concepts and cognition in the cognitive sciences and their philosophy for the purposes of conceptual engineering (except [48]).

2 The foundational issues

Overall strategy Conceptual engineering < Implementability (as method) >> Theorization: epistemological foundations of conceptual engineering [cf. Sect. 1] = concept of 'concept' [Sect. 2.1] + concept of '(cognitive) engineering' [Sect. 2.2].[22]

[16] Conceptual inconsistency (df.): "a concept is inconsistent iff it has inconsistent constitutive principles [. . .], either with each other or with otherwise uncontroversial facts." [73: 257/260]

[17] Conceptual invalidity (df.): "A concept is invalid if and only if the inferences it disposes us to draw are deficient in some way or other." [48: 223]

[18] Possible follow-up = typology of conceptual deficiencies: theoretical/semantic deficiencies (e.g. non-sense, inconsistency, super-imposition, non-naturalness, etc.) vs. practical/non-semantic ones (e.g. with moral, political, social, etc. detrimental effects) [11, 76].

[19] Cf. 'radical therapeutic program' [72] = conceptual engineering + 'metrological naturalism' << Methodological principle: measurement theory = "guide or model in philosophical theorizing".

[20] I.e. independently of any deficiencies to be fixed [76] and without limitation to any 'conceptual fixed points' or 'bedrock concepts' [11 (cf. 20, 29)].

[21] NB. relativization = for the cognitive agents + with respect to the concept's cognitive functions.

[22] NB. Crossed perspectives on conceptual engineering (as research program) >> Top-down perspective: theories of concepts and cognitive engineering = prior requirements for the theorization of conceptual engineering vs. Bottom-up perspective: theory of concepts (and cognitive engineering?) = expected upshot of the theorization of conceptual engineering [13].

2.1 Theory of concepts

Outline Re-engineering project: concept of 'concept' (for conceptual engineering) << Basic alternative = philosophical/psychological frameworks [45, 46, 48]: evaluation-normativity [Sect. 2.1.1, 2.1.2] + constructivity [Sect. 2.1.3].[23] **<Q10>** **<Q11>**

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Remark 2 (Research context). Conceptual engineering: philosophical framework [5, 8, 20, 63–65] > psychological framework [48 (see also 38, 63, 65, 76, 81)].

2.1.1 The philosophical framework

Background Mainstream analytic philosophy ∈ philosophical framework: simplistic model of concepts > simplistic approach to concepts [45, 46, 48].

- **Philosophical model.** Concepts = semantic entities + definitional structure:
  - ***Status.*** Separately necessary and jointly sufficient properties:
    - *Features*. Independent influence + equal importance/weight;
    - *Specification*. Epistemological (a priori) + semantic (analytic);
  - ***Function.*** Subsumption criteria (objects) and identity conditions (concept).[24]
- **Philosophical approach.** Focus = semantic constituency >> Goal = delivering "a priori, analytic truths about the world" [48: 209].[25]
- **Philosophical framework.** General assessment = useless/inadequate conception of concepts (for conceptual engineering):
  - ***Justification.*** Mismatch with the cognitive focus of conceptual engineering (viz. focus on concepts as artifactual *cognitive* devices).[26] **<Q12>**

Outcome Prescription = semantic break: abandonment and rejection of the semantically-based conception of concepts (for conceptual engineering).

2.1.2 The psychological framework

Background Mainstream analytic philosophy ∉ psychological framework: more complex model of concepts > more complex approach to concepts [45, 48 (cf. 37)].

- **Psychological model.** Concepts = cognitive entities + processing structure: **<Q13>**
  - ***Status.*** Body of information about some referent << Default retrieval from long-term memory (speed + automaticity + context-independence):
    - *Features*. Interdependent influence + unequal importance/weight;

[23] Vs. minimalism/neutrality of mainstream (bottom-up [fn. 22]) approaches [8, 63] (cf. <Q6>).
[24] Correlative function of philosophical model: fixing the propositional contents of thoughts [46].
[25] Correlative goal of the philosophical approach: determining "the condition under which people can have propositional attitudes about the object of their attitudes" [46: 199].
[26] Additional justification = failure of classical conceptual analysis: failure to successfully analyze any concept and failure to identify the basic features of concepts.

  - ⁎ *Specification*. Non-epistemological (⊀ apriori/aposteriori dichotomy) + non-semantic (⊀ analytic/synthetic dichotomy).
- ***Function.*** Operativeness in higher cognitive processes (e.g. category abstraction, category induction, inferences).[27]

▸ **Psychological approach.** Focus = psychological efficiency >> Goal = delivering "empirical propositions about the mind" [48: 209/32].[28]

▸ **Psychological framework.** General assessment = useful/adequate conception of concepts (for conceptual engineering):

- ***Justification.*** Match with the cognitive focus of conceptual engineering (viz. focus on concepts as artifactual *cognitive* devices).[29]

Outcome Prescription = naturalistic turn: adoption and development of a psychologically-informed conception of concepts (for conceptual engineering).

2.1.3 Re-engineering the key concept

Purpose Naturalization: 'concept' < psychological framework [Sect. 2.1.2] << Combination = hybrid theories [35, 42, 43] + conceptual pluralism [45, 61, 83]. **<Q14>** **<Q15>**

▸ **Assumption.** Bodies of information:[30] multiple different types (context-dependent use/task-appropriate activation) < Basic kinds = three variants [45]:[31] **<Q16>**

- ***Exemplars.*** Conceptual content = some particular exemplary instance(s) < Conceptual extension (membership): resemblance [e.g. 50, 77];
- ***Prototypes.*** Conceptual content = lists of typical properties < Conceptual extension (membership): statistical/probabilistic satisfaction [e.g. 67–69];
- ***Theories.*** Conceptual content = structured body of theoretical knowledge < Conceptual extension (membership): explanandum[32] [e.g. 15, 16, 36].

▸ **Proposal.** Concept of 'concept' = multiply realizable functional kinds:[33]

- ***Role.*** Functional kinds: concepts = execution of specific causal/explanatory functions in higher cognitive processes (e.g. categorization, inferences, etc.);
- ***Status.*** Multiple realizability: concepts = realizable by different task-appropriate/context-dependent basic kinds (viz. exemplars, prototypes, theories):

[27] Correlative function: determining people's ways of thinking about something [48 (cf. 37)].
[28] Correlative goal: explaining the higher cognitive competences of an agent [45, 46].
[29] Additional justification = prospects of rebooted conceptual analysis: experimentally implementable method of cases 2.0 [see 48: Sect. 7.7 ('A case study: The lay concept of innateness')].
[30] Body of information = belief-like states ∋ default knowledge (stable core) + background knowledge (varying 'surface' — neither connected, nor coordinated) [47, 49] [Sect. 2.1.2].
[31] NB. Allogeneity hypothesis (hybrid theories): different bodies of information = parts of single, highly structured concepts (with unifying core) vs. heterogeneity hypothesis (pluralism/eliminativism): different bodies of information = distinct concepts (without common core).
[32] Viz. causal, functional, generic, and/or nomological explanatory principles.
[33] Issue: difference between three basic kinds of concepts = combination of default and background knowledge (as for hybrids) or variation of background knowledge only (as for pluralism).

⋆ *Ordering*. Abstraction progress: exemplars < prototypes < theories [46]. **<Q17>**

Outcome Implementation: expected upshot = maximum scope for the method of conceptual engineering on the world of our everyday life [cf. Sect. 1.2.3].[34] **<Q18>**

2.2 Theory of cognition

Outline Re-engineering project: concept of '(cognitive) engineering' (for conceptual engineering) << Basic alternative = computational/multi-E frameworks: evaluation-normativity [Sect. 2.2.1, 2.2.2] + constructivity [Sect. 2.2.3].

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Remark 3 (Research context). Conceptual engineering: state-of-the-art = no account whatsoever for how a theory of conceptual engineering fits into an overall theory of cognition (viz. cognitive engineering) [cf. 10]. **<Q19>**

2.2.1 The computational framework

Background Mainstream analytic philosophy ∈ computational framework: restricted model cognition > restricted approach to cognition [34, 58, 66, 82].

- **Computational model.** Cognition = (semantic-)information processing[35] << Principle = cycle: input–processing/computing–output [Two variants]:
  - ***Cognitivism.*** Information-processing = rule-governed symbols manipulation: serial digital computation on symbolic-local information;[36]
  - ***Connectionism.*** Information-processing = ANNs:[37] parallel analog computation on distributed/superimposed sub-symbolic information.[38]
- **Computational approaches.** Focus = mind as thinking entity: central planner (cognitivism)/decentralized controller (connectionism) << Perspective = isolationism: individualism and internalism.[39]
- **Computational framework.** General assessment = useless/inadequate conception of cognition (for conceptual engineering):
  - ***Justification.*** Mismatch with the instrumentalist focus of conceptual engineering (viz. focus on concept as *artifactual* cognitive *devices*).[40]

Outcome Prescription = computational break: abandonment and rejection of a computational conception of cognition (for conceptual engineering).

[34] NB. match with the conceptual ecumenism proclaimed, but never warranted, by some mainstream versions of conceptual engineering [e.g. 8, 63].
[35] Viz. storing, manipulating, re-producing information.
[36] NB. model = computer + logic.
[37] Viz. artificial neural nets = neuron-like units (levels of activation + weighted interconnections).
[38] NB. model = neurophysiology + statistics.
[39] NB. background ideology: worldless mind + mindless world.
[40] Additional justification = no (straightforward) support from the computational framework for the conception of concepts as multiply realizable functional kinds [Sect. 2.1.3]

2.2.2 The embodied-embedded framework

Background Mainstream analytic philosophy ∉ embodied-embedded framework: holistic model cognition > holistic approach to cognition [24, 59, 84]. **<Q20>**

- **Multi-E model.** Cognition = (semantic-)information construction << Principle = interaction (coordinated/coupled): mind/brain–body–environment: **<Q21>**
  - ***Characterization.*** Information-construction = production of sensorimotor representations << Byproducts of interactions with the environment:[41]
    - *Feature (1).* Information-construction ∈ cognitive practices [51, 54, 55]; **<Q22>**
    - *Feature (2).* Transformation = feedback loop: mind ⇄ world [52, 56, 57]. **<Q23>**
- **Multi-E approaches.** Focus = mind as acting entity: integrative constructor << Perspective = relationalism: inter-individualism and externalism.[42]
- **Embodied-embedded framework.** General assessment = useful/adequate conception of cognition (for conceptual engineering):
  - ***Justification.*** Match with the instrumentalist focus of conceptual engineering (viz. focus on concept as *artifactual* cognitive *devices*).[43]

Outcome Prescription = multi-E turn: adoption and development of a embodied-embedded conception of cognition (for conceptual engineering).

2.2.3 Engineering the key concept

Purpose Embodiment-Embeddedness: '(cognitive) engineering' << Combination = cognitive integrationism [51] + epistemological constructionism [1, 32, 33]. **<Q24>** **<Q25>**

- **Assumption.** Concept-construction ∈ cognitive niche construction [21, 22]: **<Q26>**
  - ***Principle.*** 'Embodied-embedded conception of concepts' [25: 104 (see aslo 64)]: sensorimotor processes (modal) = constitutive of conceptualization;[44]
  - ***Corollary.*** Conceptualization (viz. concept-construction) = variant of information-construction [∈ enculturated cognitive practices (Sect. 2.2.2)];
  - ***Lemma.*** Enculturated cognitive practices (df.) ⊂ cognitive niche construction.
- **Proposal.** Concept of 'cognitive engineering' (in the case of concept)[45] = information modeling process of in our cognitive niche construction: **<Q27>**
  - ***Status.*** Information-modeling: enculturated (embodied-embedded) production of semantic artifacts out of the interaction with the environment [32];

[41] NB. models = cybernetics + robotics.
[42] NB. background ideology: worldful mind + mindful world.
[43] Additional justification = (straightforward) support from the embodied-embedded framework for the conception of concepts as multiply realizable functional kinds [Sect. 2.1.3 (cf. Sect. 2.2.3)].
[44] NB. not in contradiction with concepts as amodal context-independent semantic correlates of symbols << Possible combination: presentationalist, act-based theory of intentionality [40].
[45] Cf. epistemic engineering (df.): "organizing our physical environment in ways that enhance our information-processing capacities" [79: xii].

- ***Function.*** Niche construction: shaping and editing the understanding of the environment so as to meaningfully interact with it [32].

Outcome Implementation: expected upshot = maximum impact for the method of conceptual engineering on our worldview [cf. Sect. 1.2.3].[46] **<Q28>**

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Conclusion (Section 2)

Re-engineering outcome = empirically-informed accounts of what concepts are (as cognitive devices) and of what engineering is (in the case of cognition) << **Epistemological theorization:** proper understanding of the subject matter of conceptual engineering ⇒ **Implementability prospect:** conceptual engineering = well-founded framework (+ overall grip on its target domain).

3 The methodological framework

Overall strategy Conceptual engineering < Actionability/Applicability (as method) = template procedural method: adaptable set of step-by-step instructions >> Two versions: original [Sect. 3.1] and rebooted [Sect. 3.2].

3.1 Template procedural method 1.0

Purpose Carnapian method for explicating concepts [18, 19] = fundamental framework < Justification: match with the three constitutive features (viz. evaluativeness, normativity, and constructivity [Sect. 1.2]) of conceptual engineering. **<Q29>**

- **Principle.** Explication = re-engineering concepts + theoretical purposes [5]: **<Q30>**
  - ***Feature.*** Monism/Absolutism [Sect. 1.2.2]: rationalism-scienticism [26, 27]. **<Q31>**
- **Process.** Three step process: clarification of the explicandum > elaboration of an explicatum > application of the explicatum to relevant contexts [5, 6, 26].
- **Standard.** Conceptual re-engineering < four criteria of adequacy = similarity[47] + exactness + fruitfulness[48] + simplicity:
  - ***Tension.*** Similarity vs. fruitfulness = paradox of analysis (special case) [27]. **<Q32>**

Outcome Limitations = focus on individual concepts (instead of conceptual systems) + linear structure of the process (without feed-back effects) [5, 6].[49]

[46] NB. match with the non-conceptual transformational power proclaimed, but never warranted, by some mainstream versions of conceptual engineering [e.g. 8, 72].
[47] Double characterization = sameness of aboutness/topic (semantic) + sameness of function/purpose (pragmatic) — in both cases, with context-dependence of similarity criterion [5, 27].
[48] Double characterization = predictive power and testability (context of justification) + production of new knowledge (context of discovery) [27].
[49] Additional limitation: application restricted to theoretical/scientific concepts [cf. Sect. 1.2.3].

3.2 Template procedural method 2.0

Outline Rebooting Carnapian method of explication (for conceptual engineering as research program) << Two operations: procedural recast of Carnapian explication [Sect. 3.2.1] + template upgrading of Carnapian explication [Sect. 3.2.2].

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Remark 4 (Research context). Additional complementary template procedural methods: constructionism [31–33][50] and conceptual modeling [44][51] — along with the formalized/experimental reframing of Carnapian explication [23, 62, 74, 75].

3.2.1 Recast procedural method

Purpose Explication 1.0 < Recast: 'constructional definitions' and 'reflective equilibrium' [6] >> Overcoming: first two limitations of explication 1.0 [Sect. 3.1].

- **#0| Input.** Collected, processed, cleaned data from remote sources [Sect. 3.2.2].
- **#1| Regimentation.** Conceptual data << Clarification = production of a regimented concept[52] > Three main dimensions:
  - ***First dimension.*** Syntactic = identification of structural properties (e.g. logical form, lexicological status, etc.);
  - ***Second dimension.*** Semantic = specification of the intended conceptual system (+ status/function of the target concept in the intended system);
  - ***Third dimension.*** Pragmatic = determination of the range of relevant uses and typology of the meaningful applications.
- **#2| Assessment.** Regimented concept (individually and systemically) << Assessment = identification of improvable features < Three basic criteria:
  - ***Primary criterion.*** Fruitfulness = suitability for generalizations [see fn. 48];
  - ***Secondary criteria.*** Exactness (e.g. unambiguity, consistency, precision...) and simplicity (viz. with respect to the definition and rules of use).
- **#3| Improvement.** Improvable conceptual features (e.g. deficiencies) << Amelioration = engineering of better concepts < Two essential conditions:
  - ***First condition.*** Flexible similarity to the old concept [see fn. 47] with respect to the three main conceptual dimensions [Step 1];
  - ***Second condition.*** Increased usefulness with respect to the three basic criteria of adequacy (fruitfulness, exactness, simplicity) [Step 2].

[50] Three core components: method for choosing a problem and a model to study it as a problem space (Minimalism), method for observing and analyzing a problem space (Method of levels of abstraction), method for devising the model to study the problem space and for investigating the resulting minimalist problems (Constructionism) [32: 294 ff.].

[51] Conceptual modelling (df.): "an iterative process through which a stable equilibrium is reached between a concept or a collection of concepts as explanandum and a (somewhat) formal representation of it." [44: 133]

[52] Cf. process of obtaining a stable phenomenon out of local situated facts/data [44].

- **#4| Ratification.** Re-engineered/Newly engineered concept (selection and introduction)[53] << Final test = evaluation in terms of improvement with respect to the three criteria of adequacy [Steps 2-3] < Two cases (positive/negative):
  - ***First case.*** Positive evaluation = implementation of the resulting operational concept in the intended conceptual system;
  - ***Second case.*** Negative evaluation = start of a new iteration [Step 1].

Outcome Explication 1.0 < Procedural recast = easily actionable method: 'mechanization' of why, when, how to use conceptual engineering. **<Q33>**

3.2.2 Upgraded template method

Purpose Explication 1.0 < Upgrading: 'pragmatic method' [81] and naturalized analysis [48] >> Overcoming: third limitation of explication 1.0 [Sect. 3.1].[54] **<Q34>**

- **Descriptive mode.** Combination = three components + three purposes:
  - ***Components.*** Data provider for the the regimenting task [Sect. 3.1, 3.2.1]:[55]
    - *Component (1).* Historical = reverse conceptual engineering [9, 25, 64];[56] **<Q35>**
    - *Component (2).* Systematic = description of the conceptual environment (viz. relation to other concepts and cognitive practices) [5, 9, 81];[57] **<Q36>**
    - *Component (3).* Experimental = description of conceptually constitutive bodies of information (a.k.a. 'belief-like states' or 'bliefs') [48]. **<Q37>**
  - ***Purposes.*** Specifications for the regimenting task [Sect. 3.1, 3.2.1]:
    - *Purpose (1).* Making explicit (opaque) concepts [2, 48]; **<Q38>**
    - *Purpose (2).* Assessing the cognitive conduciveness of concepts [4];
    - *Purpose (3).* Squaring the manifest images of the world (viz. folk theories) and the (irreducibly plural) scientific images of the world [48]. **<Q39>**
- **Prescriptive mode.** Identification/determination: functional body of information to be adopted for executing a cognitive task in a specific context [48]: **<Q40>** **<Q41>**
  - ***Three options.*** Conservation, revision, replacement [14, 81] [Sect. 1.2.2]. **<Q42>**

[53] NB. concept introduction by a definition and along with rules of use.
[54] NB. bi-modal method = descriptive + prescriptive (interdependence).
[55] Viz. informal clarification of the explicandum (in the case of explication 1.0 [Sect. 3.1]) or collection, processing, and cleaning of data (in the case of explication 2.0 [Sect. 3.2.1]).
[56] Data of conceptual history/genealogy: descriptive facts about the emergence of a given concept or a set of concepts (how, when, or why) + descriptive facts about the past use of a given concept or set of concepts after its/their emergence [64].
[57] NB. sources of ecological information = human and social sciences: anthropology, sociology, and linguistics (especially, historical, anthropological, sociological) [48, 64, 81].

Outcome Explication 1.0 < Template upgrading = wide applicability: relevance and usefulness across a wide range of different areas.

⋆

Conclusion (Section 3)

Rebooting outcome = optimally implementable and highly transferable method << **Epistemological foundation:** adequate theories of concepts and cognition for conceptual engineering [Sect. 2] ⇒ **Implementation:** conceptual engineering = well-founded systematic unified framework.

Conclusion

Topic Conceptual engineering = method for the cognitive optimization of conceptual devices: assessment and improvement of concepts as cognitive devices.

- **Challenge.** Making conceptual engineering a usable method << Developing conceptual engineering as a well-founded systematic unified framework.
- **Strategy.** Implementing conceptual engineering (as a method) < Foundational theorizing = conceptually engineering 'conceptual engineering' (w.r.t. its topic):
  - ***Step (1).*** Conceptual engineering (research program) < Systematic overview: state-of-the-art >> Result = identification of foundational issues [Sect. 1].
  - ***Step (2).*** 'Concept' < Re-engineering: multiply realizable functional body of information >> Result = maximum scope [Sect. 2.1];
  - ***Step (3).*** '(Cognitive) engineering' < Engineering: information-modeling of the cognitive niche construction >> Result = maximum impact [Sect. 2.2];
  - ***Step (4).*** Conceptual engineering (method) < (Re-)Construction: template procedural method >> Result = implementable/transferable method [Sect. 3].

Outcome Epistemologically-founded systematic unified framework = usable method >> Worldview re-shaping = control over our cognitive activities [48, 71].[58] **<Q43>** **<Q44>**

Annex: Quotations

<Q1> "Many of those who write about conceptual engineering are unclear on the exact nature of the entities being engineered. [...] The first item on the agenda for such views should be to specify what concepts are, and then present an account of how concepts so construed can be engineered." [11: 141]

<Q2> "For just as the engineer studies the structure of material things, so the philosopher studies the structure of thought. Understanding the structure involves seeing how parts function and how they interconnect. It means knowing

[58] Vs. "Inscrutable–Lack of Control–Will Keep trying" principle [11].

what would happen for better or worse if changes were made. This is what we aim at when we investigate the structures that shape our view of the world. Our concepts or ideas form the mental housing in which we live." [2: 2]

<Q3> "The first point here is that our conceptual repertoire determines not only what we can think and say but also, as a result, what we can do and who we can be. In other words, which concepts we use has an important impact on the space of possible actions and lives available to us." [8: 1091-2]

<Q4> "Conceptual engineering and amelioration are mislabeled: it's not about improving concepts — in fact, it's not about concepts at all. The process involves better ways to talk about topics, e.g. belief, marriage, and what we ought to do. As a corollary, I don't think a theory of Conceptual Engineering is hostage to a theory of what concepts are. And that's good because the nature of concepts is one of the most disputed topics in philosophy and psychology: there's a plethora of theories, no agreement on theoretical role, and significant pressure towards eliminativism (Machery 2009)." [11: 104]

<Q5> "The kind of thing philosophers and psychologists call 'concepts' play no role in my theory. There's no psychological or individualistic thing or event classifiable as a 'concept' that's changing or being engineered. So 'conceptual engineering' isn't a great label <(or even a very bad one)>" [11: 53 <mn.>]

<Q6> "Philosophers have a range of different theories of concepts. [. . .] The views that I develop here in this paper not depend on a specific, fully developed view of concepts, and, indeed, are compatible with a wide range of leading theories from the philosophy of mind and philosophy of cognitive science of what concepts are." [63: 846]

<Q7> The *metaphysical approach* means "to evaluate our concepts for naturalness or fundamentality", the *pragmatic approach* "to evaluate our concepts for how well they work", and the *semantic approach* "to evaluate [the constitutive principles for a concept] using our toolkit for evaluating beliefs" [72].

<Q8> "There is no reason, after all, that one can't advocate for a conservative view in conceptual [engineering], rather than a reforming or revolutionary one" [63: 842].

<Q9> Epistemic Limiting Procedure: "A representational device should be ameliorated iff (1) There is all-things-considered reason to do so and (2) The amelioration does not translate into epistemic loss" [76: 10].

<Q10> "There's of course already a smorgasbord of options for how to think about concepts [. . .]. However, and this is the strange part, those who talk of conceptual engineering as operating on concepts don't start by making choices on this smorgasbord. They often just talk about 'concepts', their engineering, and then leave it at that." [11: 141]

<Q11> "Philosophical and psychological theories of concepts are not meant to answer the same questions and are thus not competing. Typically, by concept, philosophers refer to that which allows people to have propositional attitudes (beliefs, desires, etc.) about the objects of their attitudes. [...] A theory of concepts in philosophy attempts to determine the conditions under which people can have propositional attitudes about the objects of their attitudes (Fodor 1998, 2008; Peacocke 1992, 2008), but not to explain the properties of our higher cognitive competences. By contrast, psychologists attempt to explain the properties of our categorizations, inductions, and so forth, but they do not attempt to determine the conditions under which people are able to have propositional attitudes about the objects of their attitudes. Furthermore, psychologists do not need to hold, and typically do not hold, that we are able to have propositional attitudes about the objects of our attitudes by virtue of having specific bodies of knowledge about them." [46: 199]

<Q12> "For instance, most philosophers analyzing concepts by means of the method of cases have missed the fact that typically people do not form bliefs [i.e. belief-like states] about necessary and sufficient membership conditions and the fact that typicality gradients are an important manifestation of concepts." [48: 234]

<Q13> "A concept of *x* is a body of knowledge about *x* that is stored in long-term memory and that is used by default in the processes underlying most, if not all, higher cognitive competences when these processes result in judgments about *x*." [45: 12]

<Q14> "Hybrid theories of concepts grant the existence of several types of bodies of knowledge, but deny that these form distinct concepts [as both conceptual pluralism and conceptual eliminativism do]; rather, these bodies of knowledge are the parts of concepts." [46: 204]

<Q15> "On pluralism, concepts should be thought of as being constituted by multiple representational kinds, with the particular kind of concept used on an occasion being determined by the context." [83: 145]

<Q16> "There are two ways of explaining what hybrids are. On one view, hybrids are theories on which there are multiple different kinds of conceptual representation, each of which is available to be activated for use depending on the nature of the case. [...] It is clear that, on this interpretation, hybrid theories are indistinguishable from pluralism, since they are similarly committed to the use of distinct kinds of conceptual representations in task-appropriate ways. [...] On another, more prominent view, hybrids are theories on which concepts are identified with single representations that possess two or more distinct components that have significantly different characteristics — i.e., they represent different information, are processed in distinctive ways, etc. These theories are at least potentially different from pluralism, since they posit single concepts, albeit large and highly structured ones, for each category the subject can entertain thoughts about." [83: 167-168]

<Q17> For example, you may start with a concept of 'dog' as the particular exemplary instance of your pet 'Fido' which the other members of its extension resemble [concept-as-exemplar], then turn it into a list of typical properties statistically/probabilistically satisfied by the members of that extension (e.g. quadruped, hairy etc.) [concept-as-prototype], and later develop it as a structured body of theoretical explanatory principles about dogs (causal, functional, generic, and nomological) [concept-as-theory].

<Q18> "We would like to cast as wide a net as possible. Eliminativists about concepts will hopefully be able to massage our discussion to fit the mold of their favorite metaphysics of mental representation. [. . .] Theorists with diverse views on the nature of content ought to be able to engage in conceptual ethics without talking past each other." [8: 1095]

<Q19> "I think it is an under-appreciated point that conceptual engineering, no less than civil, does not take place in a vacuum, and that it is extremely important to note and be responsive to the inferential connections between the term in question (whether one we are considering revising or eliminating) and our other terms and broader practices." [81]

<Q20> "Embodied cognition is the thesis that at least some of our cognitive states and processes [(causally) depend upon or] are constituted by bodily processes that are not brain-bound. Embedded cognition is the thesis that our cognitive systems are located in and interact with [and (causally) depend upon] the surrounding physical and social environment." [57: 2]

<Q21> Cognitive systems/processes are grounded in, or even partly constituted by, bodily activities [*embodied cognition*], which are themselves located in external environments [*embedded cognition*] that are in turn involved in cognition [*extended cognition*] through their being-brought-forth-as-significant by the cognitive agents [*enacted cognition*].

<Q22> "Cognitive practices are embodied and normatively constrained ways to interact with epistemic resources in the cognitive niche in order to complete a cognitive task. [. . .] Cognitive practices are embodied, socio-culturally shaped interactions with epistemic resources in the cognitive niche." [30: 1-2]

<Q23> "[C]ognition is the coordination of bodily processes of the organism with salient features of the environment, often created or maintained by the organism. A coordinated process allows the organism to perform cognitive tasks that it otherwise would be unable to; or allows it to perform tasks in a way that is distinctively different and is an improvement upon the way that the organism performs those tasks via neural processes alone." [53: 563]

<Q24> "Cognitive integration is a model of how our minds become enculturated. Enculturation rests in the acquisition of cultural practices that are cognitive in nature. The practices transform our existing biological capacities, allowing us to complete cognitive tasks, in ways that our unenculturated brains and bodies will not allow." [57: 4 (cf. 55: 29)].

<Q25> "Constructionism is in plain contrast to any mimetic approach in epistemology and the philosophy of information, according to which reality is approached through some reproductive or representational mechanism. Ideas, mental images, corresponding pictures, concepts, and so forth are supposed to be mere copies or portraits of some otherwise mysterious reality in itself. From the constructionist point of view, on the contrary, knowledge is a modeling process, which shapes and edits reality to make it intelligible." [32: 301]

<Q26> Drawing from evolutionary biology [60, 78], the concept of 'cognitive niche construction' was introduced and defined by Clark [21: 256] as "the process by which animals build physical structures that transform problem spaces in ways that aid (or sometimes impede) thinking and reasoning about some target domain or domains" — e.g. the expert bartender who "line[s] up differently shaped glasses in spatial sequence corresponding to the temporal sequence of drinks orders" [21: 256].

<Q27> "Constructionism holds that knowledge is acquired through the creation of the right sort of semantic artifacts, information modeling, in other words." [32: 291]

<Q28> "[W]hat concepts we have fixes what thoughts we can think. [...] Arguably, our conceptual repertoire determines not only what beliefs we can have but also what hypotheses we can entertain, what desires we can form, what plans we can make on the basis of such mental states, and accordingly constrains what we can hope to accomplish in the world. Representation enables action, from the most sophisticated scientific research, to the most mundane household task. It influences our options within social/political institutions and even helps determine which institutions are so much as thinkable. Our social roles, in turn, help determine what kinds of people we can be, what sorts of lives we can lead. Conceptual choices and changes may be intrinsically interesting, but the clearest reason to care about them is just that their non-conceptual consequences are pervasive and profound." [8: 1096-7]

<Q29> "Carnap has plausibly identified four criteria that often play a role in conceptual explication. One could even defend a stronger claim: Carnap's four criteria as well as their relative importance govern by default (and thus defeasibly) conceptual explication." [48: 214-5]

<Q30> "The task of making more exact a vague or not quite exact concept used in everyday life or in an earlier stage of scientific or logical development, or rather of replacing it by a newly constructed, more exact concept, belongs among the most important tasks of logical analysis and logical construction. We call this the task of *explicating*, or of giving an explication for, the earlier concept; this earlier concept, or sometimes the term used for it, is called the *explicandum*; and the new concept, or its term, is called an *explicatum* of the old one." [17: 7-8]

<Q31> "By an explication we understand the transformation of an inexact prescientific concept, the *explicandum*, into an exact concept, the *explicatum*." [18:

1]

<Q32> "In its simplest form, the two premises of the paradox are: for an analysis to be correct, the *analysans* must be identical to the *analysandum*; but for the same analysis to be informative, the *analysans* must be somehow different from the *analysandum*. The conclusion is that no analysis can be both correct and informative: if an analysis is correct, it is not informative; if it is informative, it is not correct." [27: 212]

<Q33> "There may not be a set of criteria that is applicable to all explications; rather, the criteria required for assessing a proposal may depend on the circumstances surrounding the explication, including the domain the explicandum belongs to (mathematics, mathematized science, non-mathematized science, etc.) and the goals of the conceptual reformist. Furthermore, the importance of the criteria may vary from context to context." [48: 214-5]

<Q34> "First, in practice conceptual analysis is often partly descriptive and partly prescriptive, and it is also often difficult to identify which component of an analysis is descriptive, and which is prescriptive: Analysis often describes the content of a concept and regiments it in one stroke. [...] Second, descriptive conceptual analysis provides the background for prescriptive conceptual analysis." [48: 217]

<Q35> "As a matter of methodology, however, it might be more perspicuous to admit historical context as another variable that can potentially impact our conceptual ethics. Which concepts are available for use can affect which concepts ought to be used." [9: 1105-6]

<Q36> "Inquiry is but a fragment of human activity. Whether our aims are practical, theoretical, or some mixture thereof, they can easily affect which concepts we ought to use." [9: 1105]

<Q37> "Analyzing a concept consists in identifying a subset of people's bliefs about the members of the extension of this concept — those bliefs that are retrieved by default from long-term memory. These bliefs specify properties of the members of the extension of this concept." [48: 212]

<Q38> "It is not the case that possessing a concept C is sufficient for knowing, or being able to know, its content or the inferences it underwrites, and one of the things philosophers can do, one of the functions of conceptual analysis, is to reveal the content of concepts or the inferences it underwrites." [48: 220-1]

<Q39> "An important philosophical task is to find out where the scientific image is an extension or a refinement of the manifest image, and where these two images are incompatible. [...] Naturalized conceptual analysis can contribute to articulate the manifest image; importantly, it can also play a role in articulating the scientific image: Scientific concepts then become the target of analysis." [48: 226]

<Q40> "Where functions vary, the criteria for evaluating, retaining, rejecting or rejigging extant concepts will vary accordingly." [81]

<Q41> "As an example, we may take biological explications of berry which exclude blackberries and strawberries but include aubergine and bananas. In a culinary context, such explications seem inappropriate because they simply do not even approximately deal with what we count as berries in this context; from the culinary perspective, the biologist has just changed the subject." [5: 1219]

<Q42> "Consider the following passage from chapter 32 of Moby Dick : 'I take the good old fashioned ground that the whale is a fish, and call upon holy Jonah to back me. This fundamental thing settled, the next point is, in what internal respect does the whale differ from other fish. Above, Linnaeus has given you those items. But in brief they are these: lungs and warm blood; whereas all other fish are lungless and cold blooded.' Here, there is a clear sense in which Ishmael and Linnaeus do not or at least need not differ on the nonlinguistic issues. For example, Ishmael and Linnaeus might agree that whales are like typical fish in their superficial qualities, while they are like mammals in various biological respects that are relevant for scientific purposes. They simply differ on the broadly verbal matter of whether to use 'fish' for the superficial kind or the scientific kind. But there need not be any clear definitional gloss of 'fish' either for Linnaeus or for Ishmael." [20: 519]

<Q43> "Through conceptual engineering, we can take some control over what we can think, say, do, and be." [72: 5]

<Q44> "The processes involved in conceptual engineering are for the most part inscrutable, and we lack control of them, but nonetheless we will and should keep trying." [11: 73]

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