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UNPACKING THE MICRO-FOUNDATION APPROACH AND MULTI-LEVEL ANALYSIS FOR INNOVATION RESEARCH

David W. VERSAILLES

EURAM 2024 annual conference
Symposium S06-04

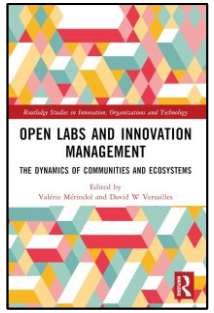
chaire **newPIC**

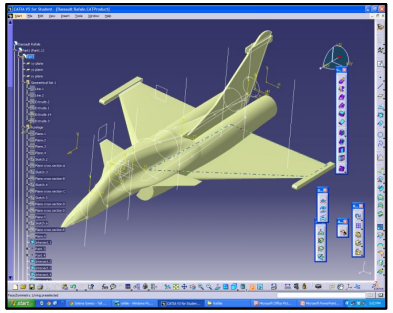
Nouvelles Pratiques pour l'Innovation et la Créativité

PARIS SCHOOL OF BUSINESS
F-75013 PARIS, France

Agenda for the symposium

- Methodological issues related to the micro-foundations approach, and to multi-level analysis
- Instances of research designs based on the micro-foundations approach
- References
- Contact details

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Symposium Micro-foundations

METHODOLOGICAL REFERENCES FOR THE MICRO-FOUNDATIONS APPROACH

Big research questions

- **What is the locus of the analysis?**
- **What is the unit of analysis underlying the research question?**
- **What are the links between parts and wholes?**

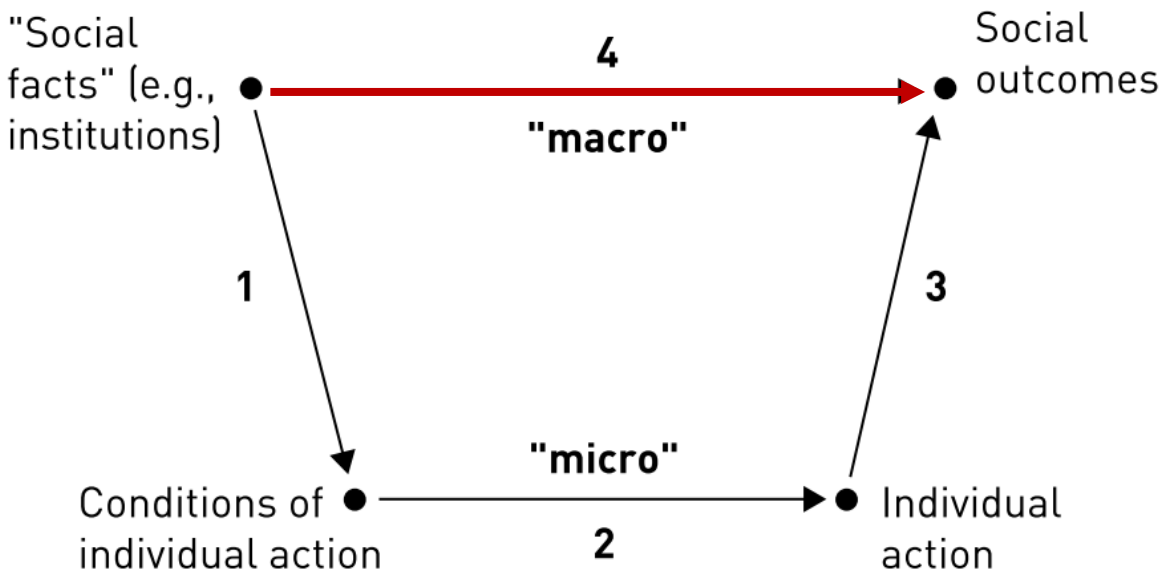
- ***The decidability of a research question depends on the proper design of field research protocol, which is a question independent of the conclusion's truth-status (discussion of scientific status and potential for generalization).***

“Methodological plumbers”

- The micro-foundations approach is an instance of “small-m” methodology
  - It deals with ways of cooking a research protocol,
    not with establishing a new reference model in the (social sciences) methodology.
  - It deals with ways of investigating causal links, and
    relationships between constituents of the whole

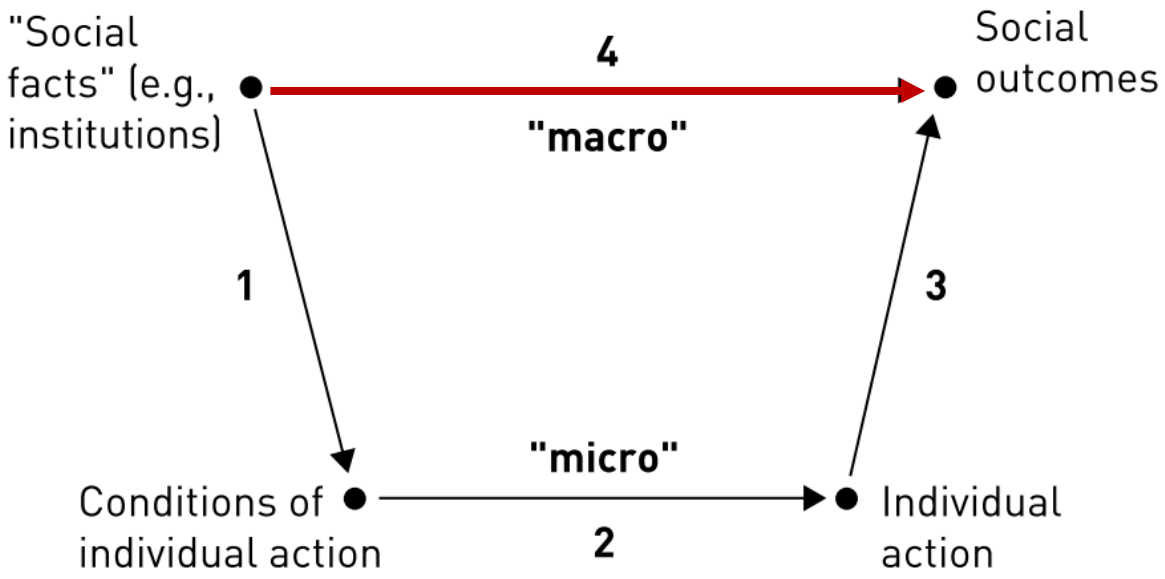
- The micro-foundations approach introduces
  the support of “methodological plumbers” (sic Boland, 2003, 4)
  with recommendations about:
  - The design of field research protocols
    (locus of analysis, unit of analysis, unit of data collection)
  - The nature and content of data collection,
    Expectations about the quality of collected data
  - The modalities of triangulation during data analysis

Multi-level analysis
Coleman's bath tube



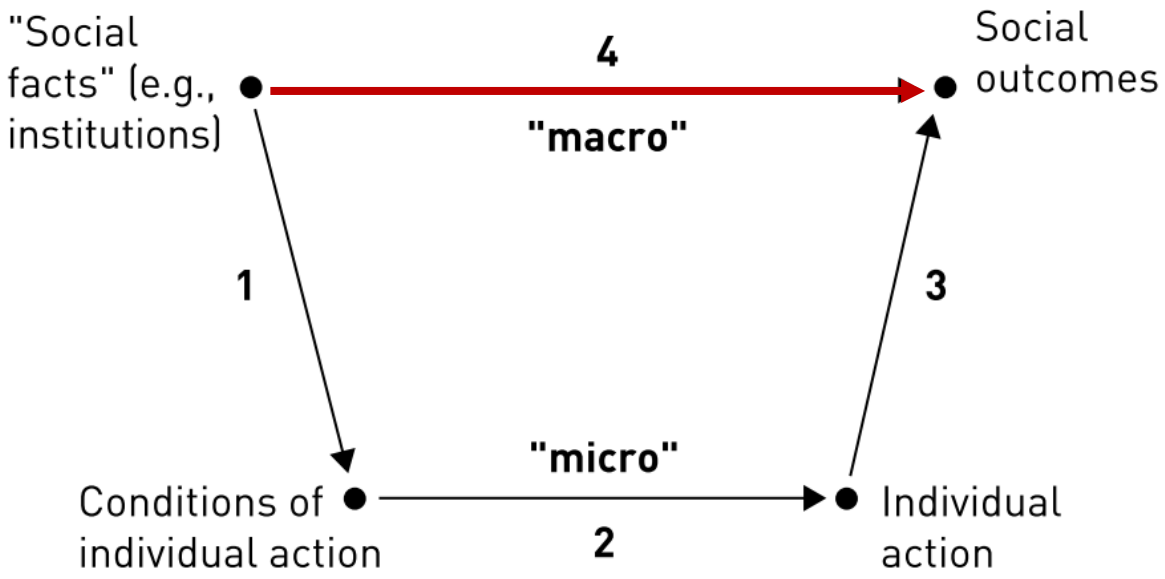
- **There is no direct macro-to-macro *causal* link**
- **Contingencies (situational features) do not *force* individual behaviors as programmed agents would picture in line with behaviorism psychology postulates. Indeterminism prevails.**
- **Macro and social outcomes emerge from human actions and interactions: they are the "*the result of human action, but not of human design*" (Ullman-Margalit, 1977).**

Causal links versus Constituents



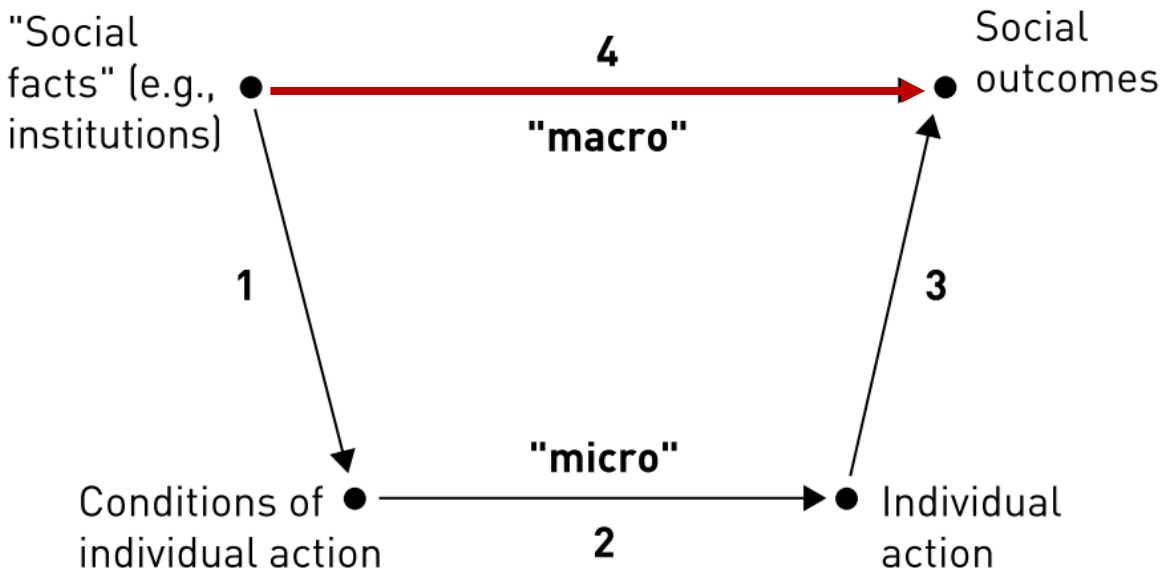
- It is important to understand the difference between "missing links" and "causal incompleteness" when designing a research protocol (cf. Abel, Felin, Foss, 2008).
- Constitutive relations represent elements of the relation between parts and wholes
  but asserting that a constituent is part of a whole does not mean that the part *causes* the whole.
- Causal links depend on logically causal and temporal precedence.
- *Properties of the parts and properties of the whole should be analytically separable to play a role in the explanation of the whole, and of interactions*

Explanations require situational analysis



- **Causal explanations track causal dependencies.**
- **Constitutive explanations track constitutive dependencies.**
- ***Organizations and "higher-level" structures exhibit properties that are not those of their constituents. Situational analysis and institutional individualism are mandatory steps toward explaining social outcomes, routines, capabilities, and collective competences.***
- ***It is methodologically impossible to propose explanations of social phenomena ("social outcomes")*** **solely** ***elaborating on individualistic drivers. (cf. Ylikovski, 2014, section 7,4).***

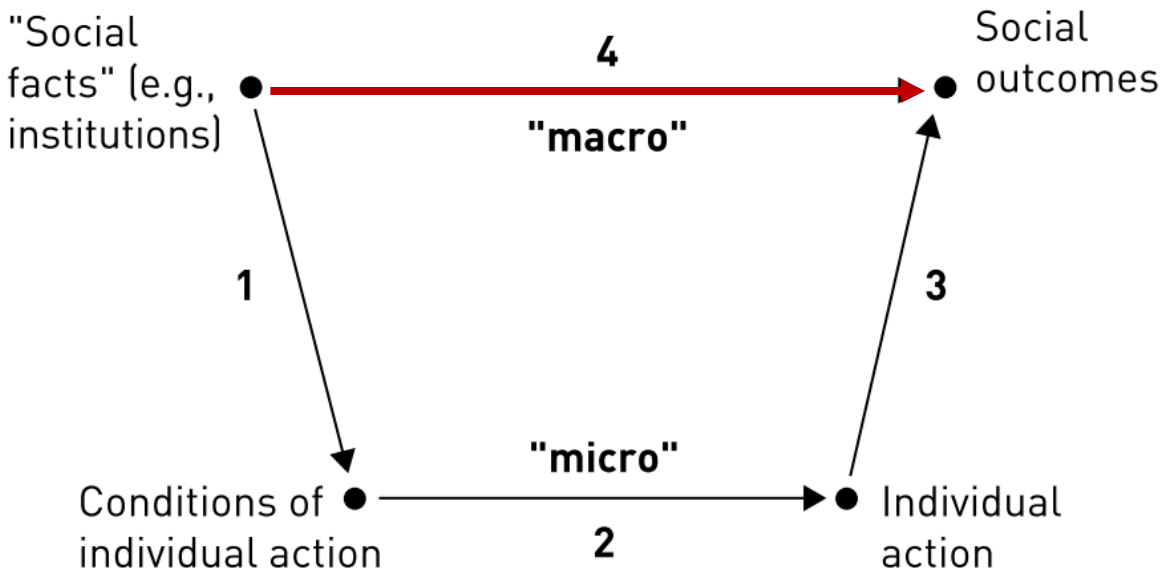
Multi-level analysis
Coleman's bath tube



- ***Constitutive explanations ALWAYS locate at micro-scale (Ylikoski, 2013).***
- ***Properties of the parts should be analytically separable to play a role in explaining the whole, and inter-level relations.***
  - ***Inter-level relations can be causal***
  - ***There is no macro-to-macro causal mechanism***
  - ***Routines and capabilities represent macro-causes IF their content is independent from micro-variables.***

(Abell, Felin, Foss, 2010; Versailles & Foss, 2019)

Seminal references



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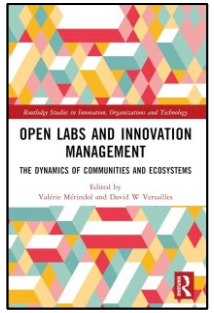


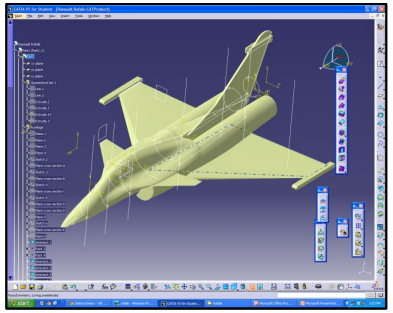

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PRACTICAL RECOMMENDATIONS

Rationales for research design building

Key issues	Practical instantiations
Unit of data collection	Nodes, arrows, bridge assumptions, and transformation rules in Coleman's "bathtub"
Multi-level perspective	Sampling has to cover all stakeholder categories having a local or comprehensive point of view - about processes, judgments, conditions of action, and - about team/ group/ company/ social outcomes
Data collection focus	Judgments, decisions, behaviors, processes, routines, rules (implicit or explicit), institutional designs, reactions to organizational constraints; Events as they occur in everyday life, Attention on real-time versus retrospective assessment of decisions, Evaluation of the nature of risks and radical uncertainty
Data codification method	Operational definitions of concepts picturing actual actions and managerial All categories of activities
Quality assessment	Systematic triangulation of stakeholders, and of data sources

Source: Versailles and Foss, 2019

Steps in documenting research

1	LITERATURE REVIEW	• Investigation of scientific publications and of their applicability • Identification of a research question for your own research • Expectations on eventual contributions (business oriented?)
2	METHOD	• Selection of the methodological posture • Identification of research design • Consistence between research question and field research
3	FIELD RESEARCH	• Identification of the adequate activities on the “field”
4	DATA COLLECTION	• Collection of primary and secondary data (triangulation) • Elaboration of monographies, field research reports, transcripts
5	DATA REDUCTION	• Codification of ALL data collected against the variables, concepts and definitions introduced in the literature review
6	DATA DISPLAY	• Presentation of data making sense for the research question
7	DATA ANALYSIS	• Interpretation of data, elaboration of statistics on primary data* • Confrontation of data collected to the literature review • Analysis of eventual biases
8	DISCUSSION & CONC	

Merindol & Versailles, EMR, 2020
Boundary objects and resource orchestration

Project commissioned by the French Ministry of Defense (OED) as part of the prospective and strategic research program (EPS 2013/42) after a competitive call for tenders, under the title
“Dual use technologies and innovation in the Defense industry”.

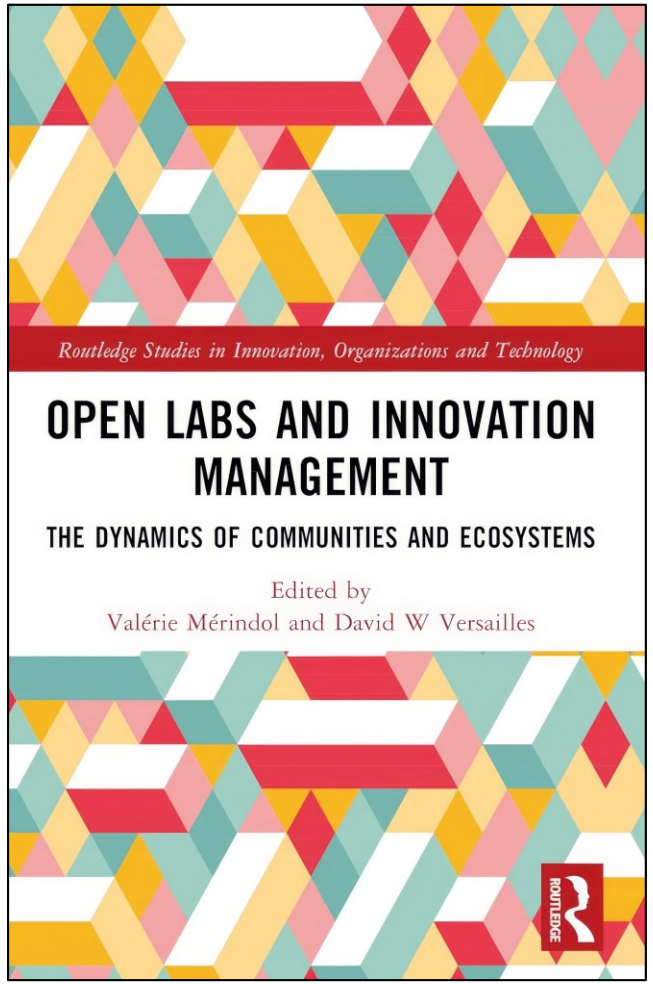
The article focuses on the articulation of activities performed by local and global managers around boundary objects in the aerospace industry.

DOI: https://10.1111/emre.12231

Non-participant observation about dual-use technologies

1	LITERATURE REVIEW	• Definition of the relevant research questions (KO meeting) • Definition of the appropriate theoretical framework (exec.) • Identification of key issues to be investigated with field research
2	METHOD	• Exploratory and theory-building case study • Abductive method aligned with Grounded Theory • Micro-foundations approach; endogenous perspectives
3	FIELD RESEARCH	• THALES, in France, with 7 domains of investigation • Double triangulation (3 sources of data, 3 sources of interviews)
4	DATA COLLECTION	• 7 domains for case study comparison • 4 brainstorming sessions, 47 interviews, 10 days part. observ.
5	DATA REDUCTION	• Correspondence between literature review and interviews • Redaction of extensive case studies
6	DATA ANALYSIS	• Convergence towards synthetic tables and graphs • Confrontation towards initial hypotheses
7	DISCUSSION & CONC	• Theoretical and applied contributions (FR MoD + THALES)

Merindol & Versailles, Routledge, 2023
Boundary objects and resource orchestration



Several research projects commissioned Bpifrance with different rounds of data collection and progressive expansion of field research from innovation intermediaries located in the Paris region to other French regions, in the EU (Catalonia), in Canada, or Asia.

The chapters focus on managerial processes inside innovation intermediaries, for facilitating innovation communities, and in interactions with ecosystem actors.

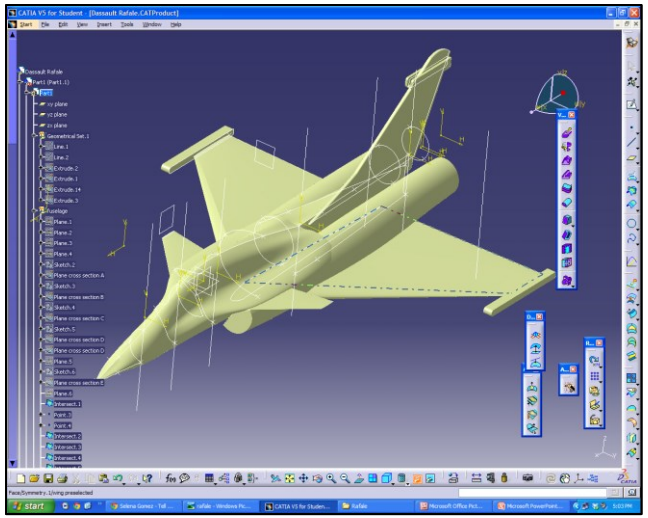
ISBN: 978-0-367-61278-8 (hbk),
978-0-367-64639-4 (pbk)
978-1-003-12558-7 (ebk)

DOI: 10.4324/9781003125587

Innovation intermediaries and open labs

1	LITERATURE REVIEW	• Definition of the relevant research questions • Definition of the appropriate theoretical framework (exec.) • Identification of key issues to be investigated with field research
2	METHOD	• Exploratory and theory-building case study • Inductive or Abductive method aligned with Grounded Theory • Micro-foundations approach; endogenous perspectives
3	FIELD RESEARCH	• Direct observation and immersion with residents; • Comparison between several cases; long immersion; interviews
4	DATA COLLECTION	• Systematic notes about daily experience to build distance • Interview transcripts; precise interview guidelines.
5	DATA REDUCTION	• Correspondence between literature review and interviews • Redaction of cases zooming out from personal “rapport” • Analysis of separation between “rapport” and “distance”
6	DATA ANALYSIS	• Confrontation towards initial hypotheses
7	DISCUSSION & CONC	• Theoretical and applied contributions (generalization?)

Versailles & Mérindol, MI 2019
Boundary objects and resource orchestration



The article takes advantage of extensive research projects in the history of technology (Dassault's Mirage IV) and industrial organization (Dassault's Rafale) to compare ways of working about a physical and a digital boundary object.

The article characterizes the properties of physical versus digital boundary objects used for Dassault's Mirage IV and Rafale programs (types, granularity, malleability, openness, completeness). It then identifies the impact of these properties on the sensing, seizing, and reconfiguring phases.

DOI: https://id.erudit.org/iderudit/1066072ar
http://doi.org/10.7202/1066072ar

Steps in documenting research

1	LITERATURE REVIEW	• Investigation of scientific publications and their applicability • Identification of a research question about boundary objects • Identification of key topics re. properties of boundary objects
2	METHOD	• **Selection of the methodological posture suited to the comparison between an "old" and closed program, and a contemporaneous program (framed by confidentiality rules)**
3	FIELD RESEARCH	• **50 unstructured and semi-structured interviews in the aerospace industry, the Fr AF, and the Fr administration**
4	DATA COLLECTION	• **Collection of primary and secondary data (triangulation)**
5	DATA REDUCTION	• **Codification of ALL data collected against the variables, concepts, and definitions; STRONG focus on metrics for reduction of data comparing 2 programs with original timelines**
6	DATA DISPLAY	• Presentation of data making sense for the research question
7	DATA ANALYSIS	• Confrontation of data collected to the literature review • Analysis of eventual biases
8	DISCUSSION & CONC	

Data collection

50+ interviews

- Conception and aircraft design engineers (in charge of the aircraft program, or subsystems)
- Engineers and test pilots for each program
- Executives in charge of acquisition and program management (R&D, retrofit) for the French Defense procurement agency (DGA)
- Maintenance engineers for both programs and for subsystems
- Users (pilots, flight officers, engineer officers, squadron leaders and mission commanders)

Management of confidentiality of data

- The authors were “insiders”, with missions about industrial organization, organizational design, Defense R&D policies
- Clearances obtained because of the author’s positions inside the Fr AF
- Unlimited access to “informants” with high technological or mission-related profiles, and to “local culture”
- Unlimited access to challenge data analysis with the “informants”, and unlimited access to access additional “informants” to add “groundness”
- Trusted interactions with “informants”

From research design to data codification

TABLE 1
Synthesis of propositions on Boundary objects and Dynamic capabilities

Dynamic (managerial) capabilities	Sensing	Seizing	Reconfiguring
Subsequent cognitive capabilities	– Perception – Attention	– Problem-solving – Decision-making – (Reasoning)	– Communication – Overcome resistance to change
Heterogeneity of cognitive capabilities	Generate congruence in cognition	Install joint learning processes (co-evolution)	Installation of cooperative activities
Propositions on boundary objects (BO)	P#1 BO generate the cognitive space (bridge model) required for "Sensing"	P#1 The BO's bridge model facilitates the "Seizing"	P#4 Interactions around the BO support the change process in improving acceptability and alignment, and lower resistance to change
		P#2 The BO provides cumulative access to D-I-K empowering a team for the "Seizing"	
		P#3 BOs create convergence for team-based "Seizing"	
	P#5 Reduced transaction costs improve the management of complexity		

Source: Adapted from Helfat and Peteraf, 2015

Type: physical versus digital/ virtual boundary object; bridge versus mental model

Openness: Entry costs in the boundary object and observability of artifacts
Reappropriation of the object: Ability to interpret data and phenomena, and to articulate knowledge

Malleability: Options to accommodate new problems with the same boundary object

Granularity: Ability to accommodate unexpected levels of details during the investigation of the problem (e.g., with "layers" of additional data, or information)

Completeness: Ability of the boundary object and its users to cope with the appropriate volume of data

TABLE 2
Metrics for the data reduction process

Boundary object	Metrics used for data reduction
Type	2 boundary objects types: *physical* (tangible objects) vs. *virtual* (or *digital*) (bytes and bits, stored in computers and databases)
	Context: Bridge model vs. Mental model
	Cognitive usefulness, i.e. the relevance for the BO users: Pseudo-quantitative assessments, from "no utility", to "weak" or "low", "medium" and "high"
Granularity	2 directions: the volume of information and data available, and the options for disambiguation. Assessments for both directions go with pseudo-quantitative scales, from "void" to "high".
Malleability	The BO's ability at accommodating issues and problems that it was not intended for: this eventually requires a pseudo-quantitative scale from "void" and "low" to "high". It concretizes also with the ability at introducing new layers of data if required.
Openness	The metrics account for the capacity at handling new communication and collaboration issues with the other BO users, and therefore goes with pseudo-quantitative from "void" and "weak" to "high".
	The cost of entry into the BO from the perspective of adapting to new BO users: pseudo quantitative from "void" to "weak" and "high".
Completeness	The metrics relates to the volume of available data, or to the ability of sharing tacit knowledge and reaching "mutual" vs. "common" understanding with the other BO users.
	To be also assessed: the cost of entry into the BO from the perspective of completeness only.

Data display

TABLE 3
Implementation of the boundary objects in the Mirage IV and Rafale programs

BO properties	Detailed description	Mirage IV	Rafale
Type	Architecture	Modular architecture	Integral architecture
- Bridge model	Crossing boundaries between worlds	Physical model	3D digital model
	Joint understanding	Interdisciplinary common framework	Coordination
- Mental model	Joint problem resolution	Joint learning process on a physical model	Joint learning process with a digital model
	Understanding gaps	Trial and error process	Abstraction, codification
Granularity	Comprehensive and detailed information	No limit in the technical domains linked to the physical BO	No limit
	Options for disambiguation	Easy addition of details on the BO domains	Easy addition of any additional detail
Openness	Acceptation of new contributors	HIGH	LOW
	Entry costs in the BO (new BO users)	LOW	HIGH
	Observability of processes	HIGH	UNEASY (codif, abst)
	Re-appropriation by BO users	HIGH and EASY	UNEASY (codif, abst)
Malleability	Handling new technical issues	HIGH and EASY in the BO single purpose	HIGH and EASY with several BO purposes
	Introducing new layers of data if required	LIMITED	UNLIMITED
Completeness	Volume of data accommodated in the BO	LIMITED	UNLIMITED
	Ability at sharing tacit knowledge	HIGH and EASY	UNEASY (codif, abst)
	Reaching common / mutual understanding	HIGH (actual trial and errors), COMMON understanding	HIGH MUTUAL understanding with codif and abstr. skills

TABLE 5
Rafale boundary object's contributions to Sensing, Seizing and Reconfiguring

Boundary object	Concretely in Rafale	Sensing	Seizing	Reconfiguring
Type	INTEGRAL architecture			
	DIGITAL boundary object			
- Bridge model	Crossing boundaries between worlds	HIGH	HIGH	HIGH
	Joint (MUTUAL) understanding	HIGH	HIGH	HIGH
- Mental model	Joint problem resolution	HIGH	VERY HIGH	VERY HIGH
	Understanding gaps	HIGH	VERY HIGH	VERY HIGH
Granularity	Comprehensive + detailed information	HIGH	HIGH	VERY HIGH
	Options for disambiguation	HIGH	HIGH	VERY HIGH
Openness	Acceptation of new contributors	MEDIUM	VERY HIGH	HIGH
	Entry costs in the BO (new BO users)	MEDIUM	VERY HIGH	HIGH
	Observability of processes	MEDIUM	VERY HIGH	HIGH
	Re-appropriation by BO users	MEDIUM	VERY HIGH	HIGH
Malleability	Handling new technical issues	VERY HIGH	VERY HIGH	VERY HIGH
	Introducing new layers of data	VERY HIGH	VERY HIGH	VERY HIGH
Completeness	Volume of data accommodated in BO	HIGH	HIGH	HIGH
	Ability at sharing tacit knowledge	HIGH	HIGH	HIGH
	Reaching MUTUAL understanding	HIGH	HIGH	HIGH

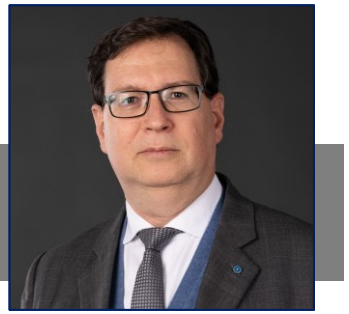
REFERENCES
CONTACT DETAILS

Valérie MERINDOL

- Dr pol sc., HDR management
- Ord. Professor, Paris School of Business
  Co-director, newPIC chair
- Founding partner, ISK Consulting SA (LUX)

- eMail vm@newpic.fr
- eMail vm@iskconsulting.net
- gsm +33-0-617 09 06 43 (Signal)
- fax +33-0-1 777 25 233
- twitter @VMerindol

David W. VERSAILLES



- Dr HDR, economics
- Ord. Professor, Paris School of Business
  Co-director, newPIC chair
- Visiting Ord. Prof., Luxembourg School of Business
- Founding partner, CEO, ISK Consulting SA (LUX)

- eMail dwv@newpic.fr
- eMail dwv@iskconsulting.net
- gsm +33-0-609 52 54 56 (Signal)
- gsm +352-0-671 01 21 58
- fax +352-0-246 11 255
- twitter @DwV13