



Collaborating within and across the organizational boundary of a Synchrotron facility: Innovation at structural folds?

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Ongoing work presented at

Graduiertenkolleg Innovationsgesellschaft heute | October 13-14, 2016



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1 Synchrotron

A particle accelerator

Picture source: Synchrotron SOLEIL

Current organizational research on particle accelerators

- Tuertscher, P., Garud, R., & Kumaraswamy, A. (2014). Justification and Interlaced Knowledge at ATLAS, CERN. Organization Science
- Avadikyan, A., Bach, L., Lambert, G., Lerch, C., & Wolff, S. (2014). Dynamique des modèles d'affaires et écosystème: le cas des synchrotrons. Revue d'économie industrielle



Synchrotron – particle accelerator 2.0 using light to look at matter

- Lifting the secret of Mona Lisa's smile or understand the nature of the atmosphere of planets light years away
- Researchers from different home organizations work here together for a restricted period of time (usually one week)
- Inviting to look at it as a site where different groups interact



1 Synchrotron

Basic research and innovation

- Looking at an organization with the single aim to produce new knowledge in basic research
- Innovation: “the scope for innovation widens to all processes that introduce something new” (Hutter & Stark, 2015:1)
- Output here: scientific publications

2 Theory

From brokerage and closure to structural folds

“Brokerage and Closure” perspective

- brokerage as source of new ideas
- closure provides trust necessary for implementation
- ongoing tension between brokerage and closure
- (Burt, 2005; Uzzi & Spiro 2005; Obstfeld 2005; Wang et al. (2010)

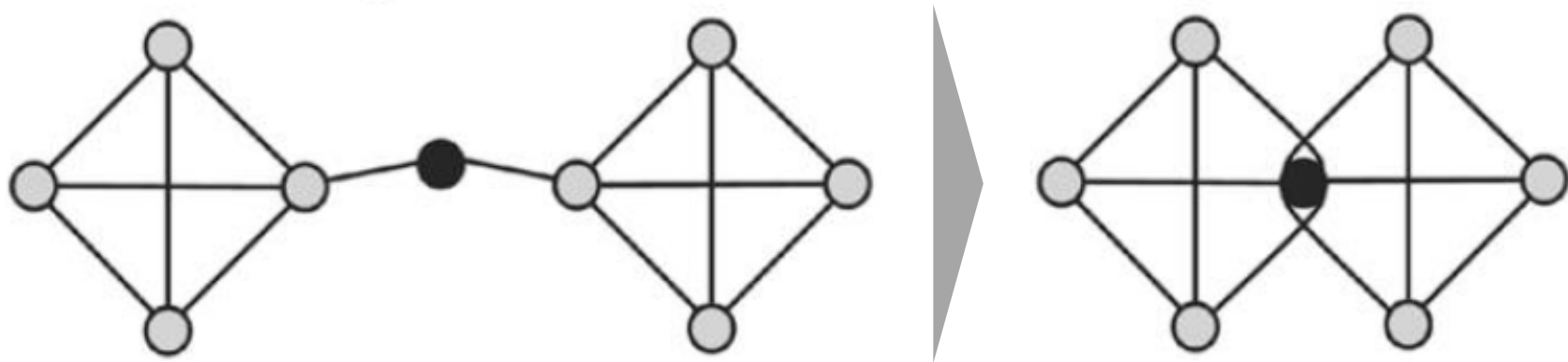
Innovation not about a broker importing ideas

- generative recombinative process (->Schumpeter)
- requiring intense interaction
- making oneself deeply familiar with the knowledge bases and productive resources of other groups

Stark (2009); Lingo & O'Mahony (2010); de Vaan et al., (2012)

2 Theory

Developing research questions from current advances in network theory



Source: Vedres & Stark, 2010

- Conceptually looking at innovation where “mutual insiders interact” (Vedres & Stark, 2010 p. 1158)
- At the overlap of cohesive groups: “structural folds”
- Gap: No one has ever seen these folds - so far quantitative concept (Vedres & Stark 2010; de Vaan et al., (2012)
- **Research question: What do quantitatively identified structural folds mean in qualitative terms?**

2 Theory

Developing research questions from current advances in network theory

- Research on teams: heterogeneity conducive to firm performance/innovation (Bantel & Jackson, 1989; Hambrick et al., 1996), later refinements: U-shaped (i.e. Richard et al. 2004)
- De Vaan et al., (2012) on *cognitively heterogeneous groups* (p. 3): “This suggests that the mechanism through which Structural Folding contributes to innovative success of teams in the video game industry is by bringing cognitively distant groups into contact” (p.26).



- We look at currently in network research much requested agency in networks, as actors can intentionally affect network structure (Borgatti et al. 2014)
- Focus on practices bringing heterogeneous groups into contact
- **Research question: Which are the practices that allow actors to fold to combine resources from cognitively heterogeneous groups to innovate?**

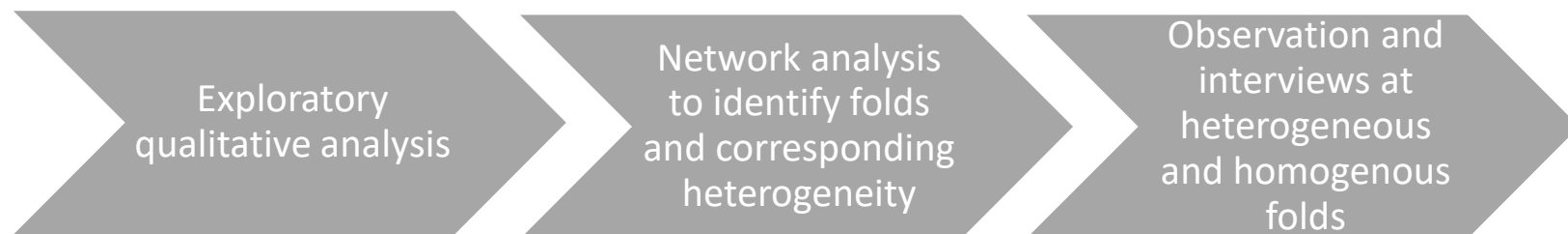


3 Design

Mixed method



- Quantitative network analysis to identify structural folds where innovation may reside
- Qualitative fieldwork to understand practices of innovation in this specific context





3 Data


Quantitative and qualitative

Quantitative data: publications at SOLEIL

- 2642 publications
- 9400 authors
- 2008 - May 2015, selected for beamline DESIRS

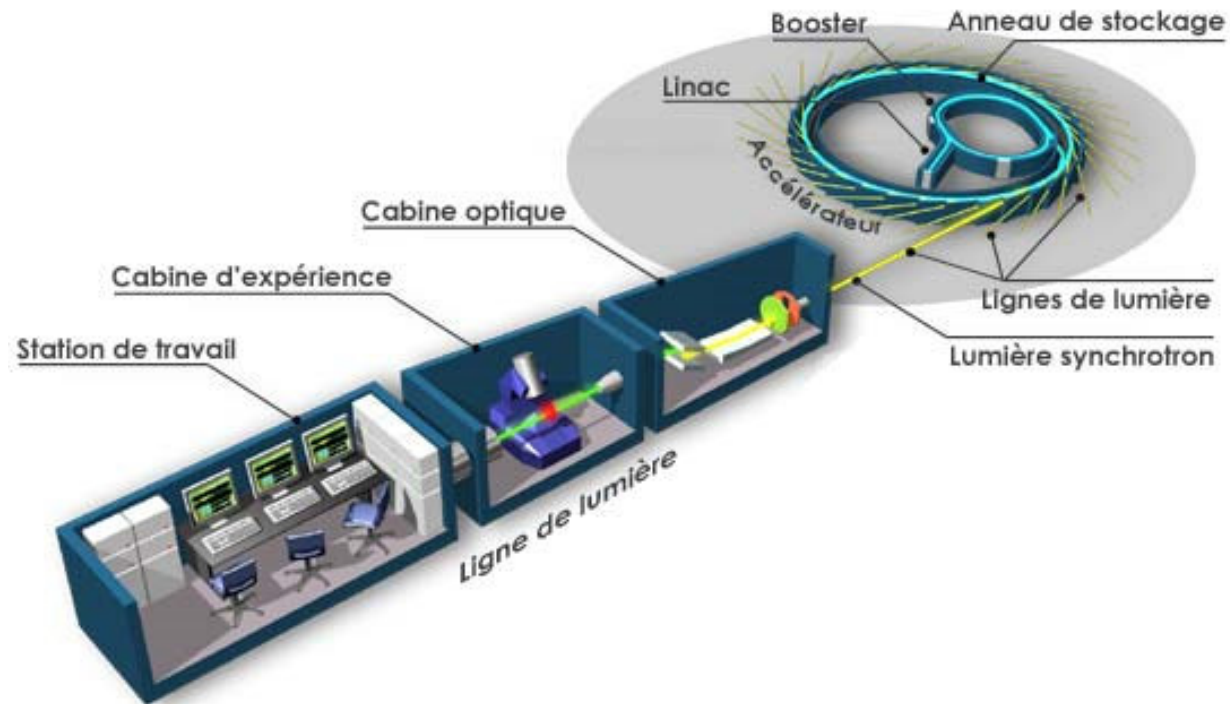
Qualitative data: fieldwork at SOLEIL

- 29 interviews
- 4 observations
- published and internal documents

Ongoing...  planned approx. 60 interviews/15 observations total

3 Method

Qualitative case DESIRS: a beamline at the overlap



Source: Synchrotron SOLEIL



nahon, l



garcia, g



4 Method

Measuring cognitive heterogeneity by *Jaccard Index*



LD	MAXyearFO	MAXyearFO	npubFOL	FNAME	SoleilSuspect	MeanFoldHomogeneity
1	2011	2011	7	7 soldi lose h h	FALSE	0,271339914
2	2014	2014	6	2 champion n n	FALSE	0,488
3	2013	2013	3	2 lagarde b b	FALSE	0,509209101
4	2015	2015	88	84 nahon l l	TRUE	0,606772711
5	2014	2014	6	2 lucchese r r	FALSE	0,61564188
6	2015	2015	15	12 alcaraz c c	TRUE	0,628423646
7	2013	2014	6	5 fillion j h	FALSE	0,692769699
8	2014	2014	9	5 gaie-levrel ff	FALSE	0,730774608
9	2014	2015	11	4 powis i i	FALSE	0,745041466
10	2013	2015	9	3 romanzin c c	FALSE	0,758241758
11	2013	2014	14	5 canon ff	FALSE	0,760560704
12	2015	2015	42	42 garcia g a	FALSE	0,766573891
13	2014	2015	22	19 giuliani a a	TRUE	0,770867115
14	2012	2013	10	2 bredehoft j h	FALSE	0,784630677
15	2013	2015	10	2 schwel m m	FALSE	0,790948276
16	2012	2013	4	2 goesmann ff meierhenrich	FALSE	0,792207792
17	2015	2015	28	24 u j	FALSE	0,827363681
18	2015	2015	10	5 poisson l l	FALSE	0,892833977
19	2012	2015	4	2 gil j f	FALSE	0,897503285
20	2013	2014	6	2 lyons j r	FALSE	0,934461792
21	2013	2015	7	2 stark g g	FALSE	0,957488606
22	2015	2015	26	20 de oliveira n n	FALSE	0,969518123
23	2015	2015	12	4 hochlaf m m	FALSE	0,976118918
24	2015	2015	21	15 joyeux d d	FALSE	0,981886005
25	2015	2015	8	5 daly s s	FALSE	0,982526616
26	2015	2015	14	2 ubachs w w	FALSE	0,98539114
27	2015	2015	8	2 heays a n	FALSE	0,99269557
28	2012	2015	18	8 meinert c c	FALSE	1
29	2012	2012	8	6 filippi j j	FALSE	1
30	2012	2014	8	5 dowek d d	FALSE	1



Field feedback: defining “external” researchers to select for 3 top heterogeneous and three top homogenous

4 Method

Field feedback quantitative/qualitative



- Choosing actor on “structural fold”
- Doing observation at the time when he is at the synchrotron, interviewing him and the people working with him
- Confronting actors with graphical representation of network analysis
- Letting them describe very openly in their own terms what they see, which sense they make of it, and how they put actors into relation with each other
- Guiding the conversation more generally towards how new ideas are generated in the community

4 Preliminary Results

The qualitative meaning of innovation in a structural fold

“Brokerage and Closure”

Information collection at
conferences



“Structural Fold”

Generating ideas in
close interaction in the
synchrotron

Example:

*“With respect to the conferences
the Synchrotron has the
advantage that you have more
time to talk” (D.).*

4 Preliminary Results

The qualitative meaning of innovation in a structural fold...zooming in...

The nature of close interaction and innovation. Example:

- *There are lots of discussions [at SOLEIL]. For instance the idea of doing this experiment that we are doing now [...] **the original ideas started [here] in a previous period in which I was doing something else.** So when we are here together we also talk about **what could we do in the future.** Or we talk about how we can interpret the data that we have from the previous year together. [...] Clearly – **being in close contact** is not only a matter of actually doing what we are here for, it is quite **important for exchanging ideas**, because we are here **24 hours a day**, a lot of time for exchanging ideas. [...]" (D.)*



4 Preliminary Results

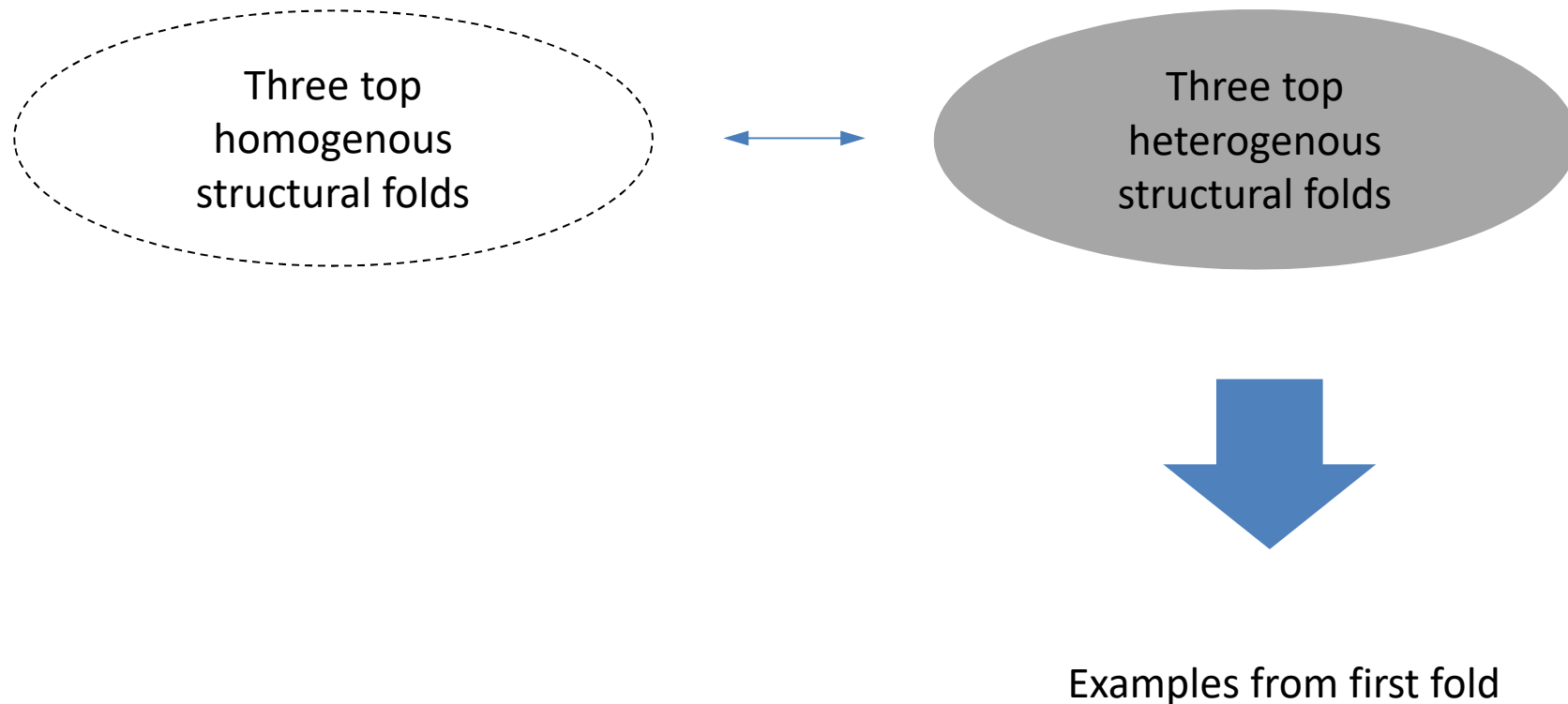
...zooming in even further

Innovations due to deep mutual knowledge. Example:

- *“D. has a project [...] on the reactions of ions which are not easy to get without getting radicals [a sort of molecule]. And just at the same time there are new developments of new radicals sources done by the colleague I work with. They can produce this molecule, I’ll be able to do photoionization to get an ion and D. will be able to use it on [my setup].” (C., translated from French)*

4 Preliminary Results

Practices of combining cognitively different groups





4 Preliminary Results

Heterogenous fold – first examples

Also external researcher enabling structural folding of heterogeneous groups:

- Bringing material resources: brings own experimental setup
 - “*crazy enough*” (C., translated from French)
- Bringing semantic resources: mutual insider through language capabilities
 - French, but switches fluently into English bringing teams together where one part does not speak English well and the other no French
- Identifying and signifying resources of connected groups:
 - Knows possibilities of synchrotron, and necessities/resources of groups working on his experimental setup

5 Outlook

Next steps

Completion:

3 most heterogeneous and 3 most homogenous (external) to understand differences
-> Understanding further practices of folding heterogeneous groups, group them,
develop a model. But...open for surprises!

Further directions:

Doors open - extension to other beamlines possible

Connection of heterogeneity with impact factor (DOI) possible

Internal database on actual collaboration received - exploitation
(who, with whom...)



Thank you.