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

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Content

1 Synchrotron

A particle accelerator

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
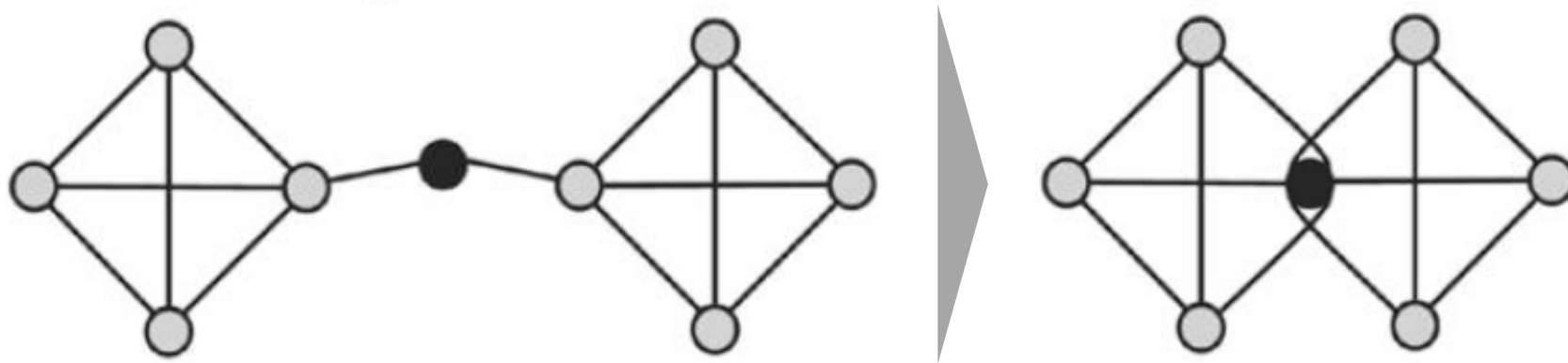
Source: Vedres & Stark, 2010

- 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).

Properties

- 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 heterogenous groups into contact

- ➤ *Research question: Which are the practices that allow actors on fold to combine resources from cognitively heterogenous groups to innovate?*
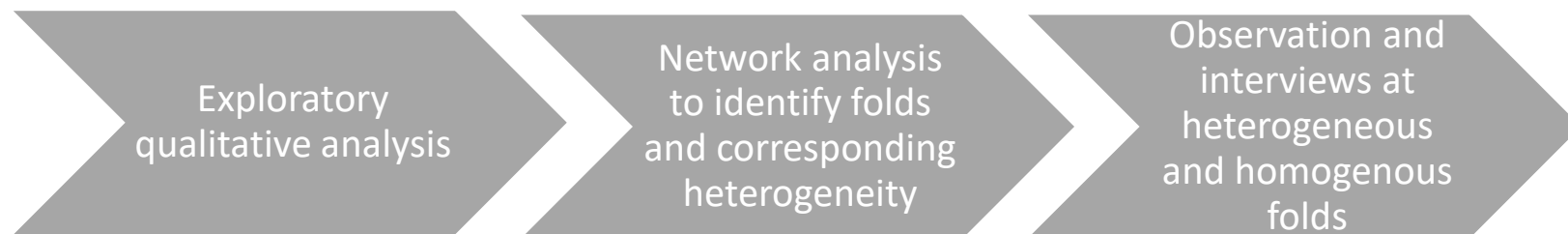
Practices

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

| Exploratory qualitative analysis | Network analysis to identify folds and corresponding heterogeneity | Observation and interviews at heterogeneous and homogenous folds |

3 Data
Quantitative and qualitative

Quantitative data: publications at SOLEIL

- 2642 publications

- 9400 authors

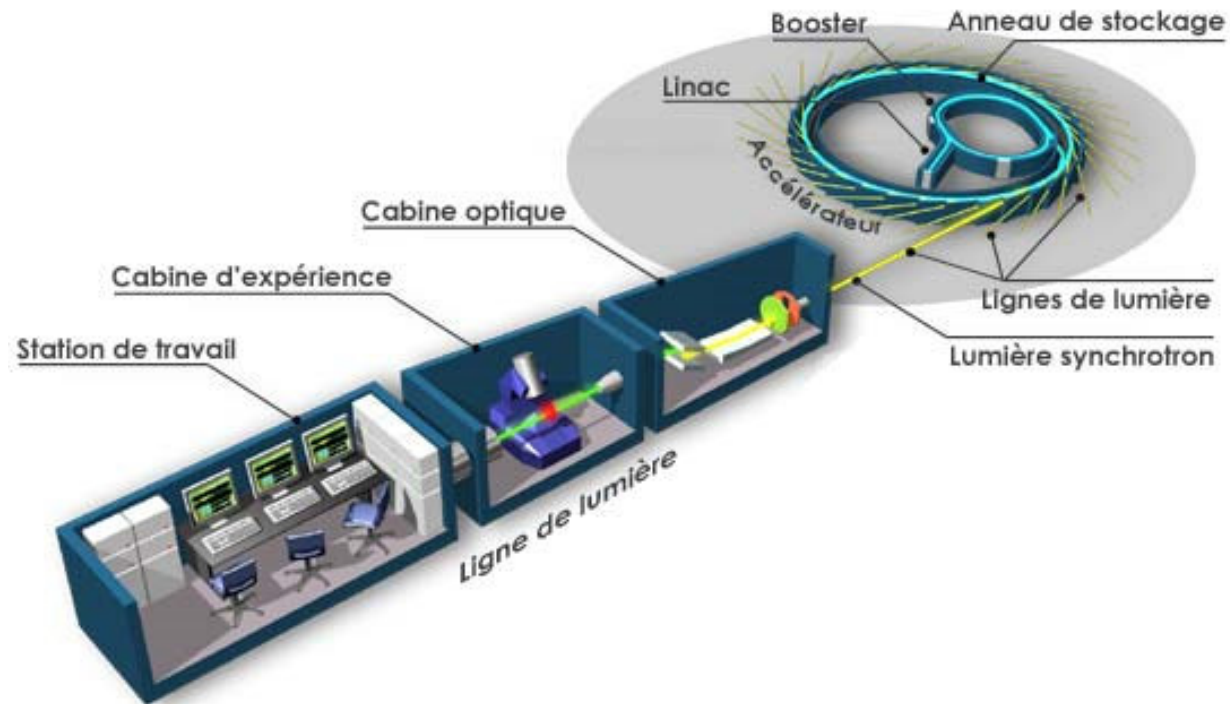- 2008 - May 2015, selected for beamline DESIRS

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

4 Method
Measuring cognitive heterogeneity by *Jaccard Index*

	MAXyearFOLD	MAXyear	npub	npubFOLD	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 f f	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 f f	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	schwell m m	FALSE	0,790948276
16	2012	2013	4	2	goesmann f f 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"

"Structural Fold"

Information collection at conferences

⟷

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.)*
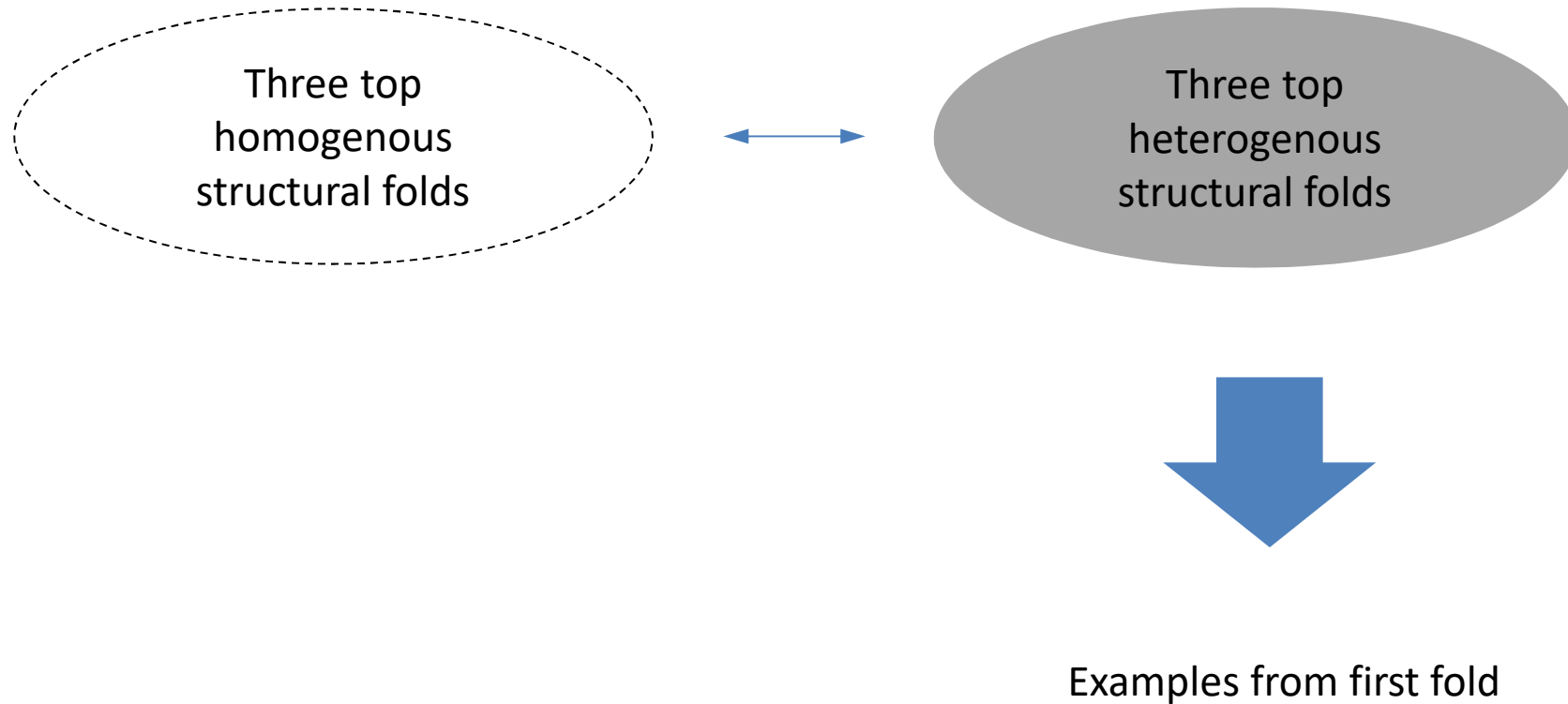
4 Preliminary Results

…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

Three top homogenous structural folds ←→ Three top heterogenous structural folds

Examples from first fold

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.