R&D and innovation in construction

Frédéric BOUGRAIN
Email : frederic.bougrain@cstb.fr

Talk Plan

1. **Definition of R&D**

2. **The impact of R&D on innovation**

3. **Construction and R&D**

4. **Innovation within contractors**

1. Definition of R&D (1)

« *Research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications.*

The term R&D covers three activities: basic research, applied research and experimental development." (Frascati Manual, 2002, p.30).

"*The basic criterion for distinguishing R&D from related activities is the presence in R&D of an appreciable element of novelty and the resolution of scientific and/or technological uncertainty i.e. when the solution to a problem is not readily apparent to someone familiar with the basic stock of common knowledge and techniques for the area concerned*" (Frascati Manual, 2002, p.34).

1. Definition of R&D (2)

« ***Investigations of proposed engineering projects****, using existing techniques to provide additional information before deciding on implementation, is not R&D…However, feasibility studies on research projects are part of R&D* » (Frascati Manual, 2002, p.30).

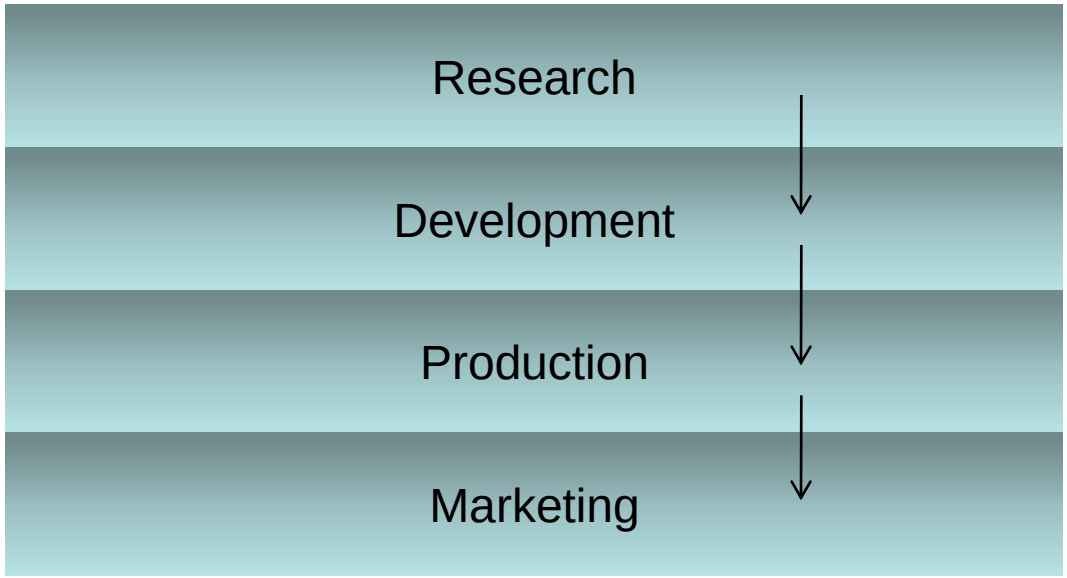
Design activities: "*the vast bulk of design work in an industrial area is geared towards production processes and as such is not classified as R&D, There are, however, some elements of design work which should be considered as R&D, These include plans and drawings aimed at defining procedures, technical specifications and operational features necessary to the conception, development and fabrication of new products and processes*." (Frascati Manual, 2002, p.44).

1. Definition of R&D (3)

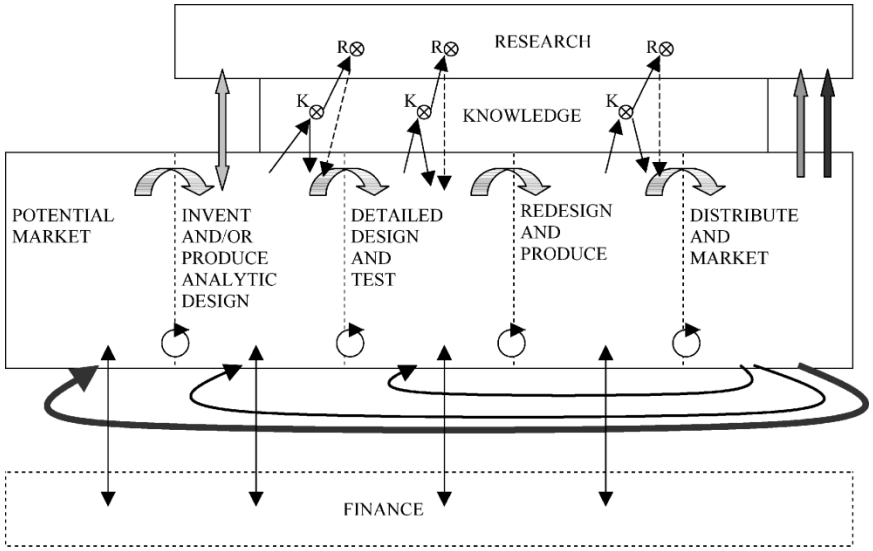
"*The development of **software** development is such as to make identifying its R&D component, if any, difficult. Software development is an integral part of many projects which in themselves have no element of R&D, The software development component of such projects, however, may be classified as R&D if it leads to an advance in the area of computer software. Such advances are generally incremental rather than revolutionary*" (Frascati Manual, 2002, p.46).

Difficulties for identifying R&D in **service activities** : "*in service companies, R&D is not always organised as formally as in manufacturing companies (ie. with a dedicated R&D department…), The concept of R&D in services is still less specific and sometimes goes unrecognised by the enterprises concerned*" (Frascati Manual, 2002, p.49).

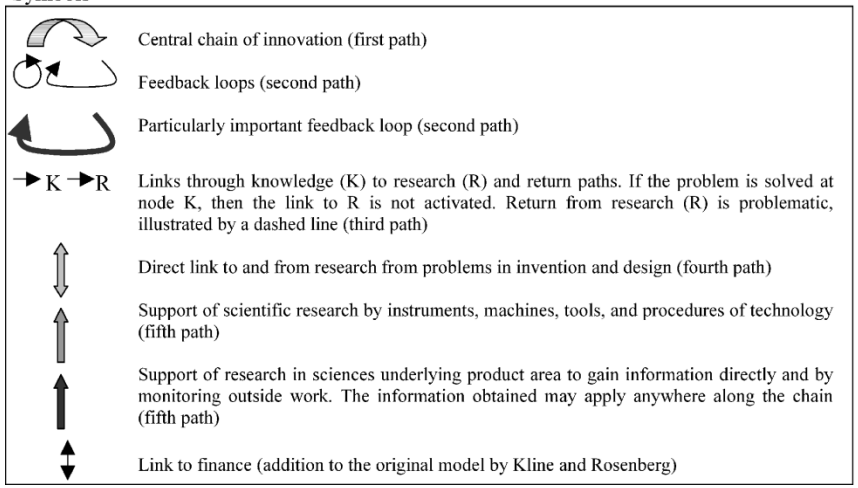
2. The impact of R&D on innovation (1) : the linear model of innovation



2. The impact of R&D on innovation (2) : the chain linked model of innovation



Symbols



Source: Kline S. and N. Rosenberg, 1986, "An overview of innovation" in The positive sum strategy : Harnessing technology for economic growth, R. Landau and N. Rosenberg (Ed.), Washington DC, National Academy Press, 275-306.

3. Construction and R&D (1) : definition of construction

Traditional definitions focus on buildings and civil engineering works and do not include :

- Upstream activities : manufacturing, mining and quarrying, architectural and technical consultancy, business services;
- Parallel activities: architectural and technical consultancy;
- Downstream activities : facility management and other real estate activities (Sexton M., Abbott C., Barrett P. and L. Ruddock, 2007).

Any analysis comparing construction with other industries has to compare the full value system (Winch, 2003).

3. Construction and R&D (2)

Activities	R&D: where and how?	Examples
Building materials and products	Large R&D centre for international companies (small research units for SMEs) Collaboration with universities, lead users (main contractors)	**Saint-Gobain** world leader on the habitat and construction markets: R&D budget 431 million euros (1.02 % of its turnover) - Six large broad-based R&D centres. - Twelve research centres and around 100 development units worldwide.
Architectural/technical consultancy	Within the firm: designers, planners, engineers Co-production of novel design solutions with suppliers, contractors, clients, **But is that R&D?**	**Arup (2012)** "*research is done in a distributed way, mainly within project teams globally, with a third of staff being research-active. We capture needs and opportunities, and coordinate global collaboration with research partners. "*
Building and civil engineering works	Almost no R&D – few R&D collaboration with suppliers – Within the firm collaboration between researchers and operational managers	**Vinci** construction: 26 million euros (0.2% of sales)

4/ Innovation within contractors (1)

Input for innovation between 2002 and 2004 (percentage)

	Internal R&D	External R&D	Acquisition of equipment	Acquisition of external knowledge	Training
10 - 49	6.7	2.5	7.9	1.7	7.1
50 - 249	12.9	4.5	15.3	6.4	18.4
250 and more	38.2	17.1	26.2	12.5	29.6
Total	**7.5**	**2.8**	**8.7**	**2.2**	**8.2**
All sectors	15.5	5.6	14.5	6.0	14.6

Source : SESSI (2006)

http://www.industrie.gouv.fr/observat/chiffres/sessi/enquetes/innov/EH.html

4/ Innovation within contractors (2)

- Innovations are *"ad hoc responses to problems encountered in the course of a construction project"* (Slaughter, 1993)
- Project level innovation: incremental innovation (hidden innovation) – (Sexton et al, 2007)
- Organisational innovations are dominant (SESSI, 2006)
- Innovation Awards Competition open to all employees (in large firms): the aim is to disseminate the innovations within the firms.

References

ARUP, 2011, *Research Review,* ARUP, London.

Kline S. and N. Rosenberg, 1986, "An overview of innovation" in *The positive sum strategy : Harnessing technology for economic growth*, R. Landau and N. Rosenberg (Ed.), Washington DC, National Academy Press, 275-306

OECD, 2002, *Frascati Manual Proposed standard practice for surveys on research and experimental development,* OECD, Paris.

SESSI, 2006, *Enquête communautaire sur l'innovation en 2004 (CIS4),* Ministère de l'Economie, des Finances et de l'Industrie, online and viewed in June 2010, http://www.industrie.gouv.fr/sessi/enquetes/innov/cis4/resultats.php?page=EH.html&nes=16

Sexton, M., Abbott C., Barrett P. and Ruddock L. , 2007, "Hidden innovation in construction", in de Ridder H.A.J. and Wamelink J.W.F. (Eds) Second International Conference *World of Construction Project Management,* TU Delft, The Netherlands.

Slaughter S., 1993, "Innovation and learning during implementation : a comparison of user and manufacturer innovations", *Research Policy,* vol.22, 81-95.

Winch G. M. , 2003, "How innovative is construction? Comparing aggregated data on construction innovation and other sectors – a case of apples and pears", *Construction Management and Economics,* vol. 21, 651-654.

Questions?

frederic.bougrain@cstb.fr

Internet : http://desh.cstb.fr