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Looking for R&D in the creative industries (*) ()**

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The creative industries¹ are frequently considered as the laboratory and the innovation models of the digital age. Indeed, in the last decades, cultural, media and content industries were among the first to undergo significant transformations of their production processes (digital recording, computerized editing of films, desktop publishing. No wonder that the

(*) The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of their institutions.

(**) This article is based on a EC JRC IPTS report ("Models of innovation and R&D or non-R&D in the Creative and Content Industries: A focus on the cinema sector"). It attempts to track the various forms of innovation, R&D or non-R&D based within an environment disrupted by digitization and characterized by fast evolving relationships between players, legacy players and new entrants.

¹ One should note that issues concerning the definition, identification and measurement of creative industries are still an open and evolving debate. As the ESSnet-Culture report stresses: "The concept is used in various documents and it is not standardized." (ESSnet-Culture, 2012: 57). The discussion of its meaning is out of the scope of this paper.

innovation and R&D function have turned out to be a key strategic asset in the culture and media sectors and a key dimension for the competition and domination of their market. The sector illustrates the tension triggered by innovations supported by content, uses and services on the one hand, and by the technology on the other hand. It is particularly enlightening at a time of hot debates on net neutrality and balance between technological infrastructure investments made by telco, OTT platforms and content providers.

However; specific studies on the very nature of R&D strategies in the creative industries are scarce. This article gives an overview of the observable R&D expenditures, then scrutinizes more specifically the case of the cinema industry. Starting from the case of culture, it is a first step to better understand where and how R&D takes place in the content and services being offered and to track the various forms of innovation to be found in these sectors.

Observable R&D expenditures in the creative industries

The scarcity of specific studies on the management of R&D in the creative industries (GREEN *et al.*, 2007) echoes the fact that creative companies lack wide investment in R&D. One of the first reasons used to explain the poor level of investments in R&D is linked to the general size of these companies. Most of the firms in the creative industries are SMEs (BOUQUILLION & LE CORF, 2010) with related difficulties in financing R&D activities.

Notwithstanding, large creative companies are also known for underinvesting in R&D projects (Foundation for Research, Science and Technology, 2003). Therefore, other explanations have to be proposed to explain this: the second explanation could be that companies in the creative industries are considering that they already take so much commercial and aesthetic risk by creating new content that they cannot cope with additional technical risks and therefore prefer to build on the R&D outcomes originating from other industrial sectors instead of investing directly in R&D ventures.

Thirdly, each creative project turns out to be an innovative and prototype project. Companies consider "R&D" as being more related to investments in projects and contents rather than directly referring to the design and innovation of processes, infrastructure and devices. The innovative activity will stay hidden within the project production budget.

Observing company-level data of the Industrial Scoreboard (2013) ², and leaving aside an (unfavourable) comparison with the data of the overall ICT sector, companies of the creative industries are allocating only a small share of their revenues to R&D: declining from around 3% (2007) to around 2% over the period 2008-2012. In fact, these expenditures were already standing below 2% over the period 2004-2008, a share most likely still overestimated as the data is biased in the *Industrial Scoreboard* towards large companies selected as top R&D investors. As stated above, this weak performance is usually explained as a result of the very structure of the sector characterized by the presence of small firms and the low propensity of firms to give importance to R&D activities.

Overall, in the Industrial Scoreboard, the low level of R&D expenditures seems to have been the standard case for media and content industries players. Comcast and Disney, the 1st two media companies listed in the Forbes 2014 Global 2000 List, are not presented in the industrial Scoreboard, for the low level of their R&D expenditures.

Still various EU companies appear in the ranking. Vivendi (France) ranks 1st (Table 1a) for its level of R&D in absolute terms ³ but displays a low 2.5% ratio of R%D expenditures to revenues. Reed Elsevier (UK), a major of the publishing sector, ranks 2nd for R&D expenditures with an R&D intensity of 4.14%. The company is technology oriented, investing US \$ 500 million every year, claiming to be the fourth largest digital content provider in the world (Annual Report, 2013: 9). The firm pioneered the use of Big Data with its High Performance Computing Cluster Systems (HPCC), "one of the most advanced, fast-performing Big Data processing technologies available today" (Annual Report 2013: 10). Technicolor (France), following-up on the bankruptcy of Thomson, invested 4.5% of its revenues from sales in 2013.

The level of expenditures of broadcasters is equally low (below 2% of the sales), notwithstanding the technological orientation of the sector with its strong industrial components and complex network of players. This remains true even for "new" companies like Sky (UK) relying on more recent channels of distribution.

² The Industrial Scoreboard is a JRC-IPTS report. <http://iri.jrc.ec.europa.eu/scoreboard13.html>

³ One may suspect that the level of R&D expenditures may be linked to the video games subsidiaries (Activision Blizzard) on the media conglomerate. As, on October 11, 2013, Vivendi deconsolidated Activision Blizzard pursuant to the sale of 88% of its interest, it may appear in the 2014 financial data. Activision Blizzard Annual report for 2013 gives a 604 million US \$ for "product development" amounting to 12% of total net revenues. Source: Annual Report 2013.

Table 1a - Top ranking global media companies by R&D expenditures (2012)

<i>Rank</i>	<i>World Rank</i>	<i>Name</i>	<i>Country</i>	<i>R&D Expenditures (€ million)</i>	<i>Sales (€ million)</i>	<i>R&D Intensity (%)</i>
1	153	Vivendi	France	718.0	28 994.0	2.5
2	296	Reed Elsevier	UK	312.2	7 523	4.14 ^(*)
3	340	Dai Nippon Printing	Japan	269.9	12 668.0	2.1
4	492	Technicolor	France	160.0	3 580.0	4.5
5	609	British Sky Broadcasting	UK	120.8	8 122.0	1.5
6	675	Dolby Lab USA	USA	106.2	702.0	15.1
7	801	Avid Technology	USA	88.3	513.1	17.2

(*) Computed by authors from two different sources: HERNANDEZ *et al.*, Scoreboard for R&D; annual report 2013 for sales.

Table 1b - Top ranking EU media companies by R&D expenditures (2012)

<i>Rank</i>	<i>EU Rank</i>	<i>Name</i>	<i>Country</i>	<i>R&D Expenditures (€ million)</i>	<i>Sales (€ million)</i>	<i>R&D Intensity (%)</i>
1	47	Vivendi	France	718.0	28 994.0	2.5
2	84	Reed Elsevier	UK	312.2	7 523	4.14
3	149	Technicolor	France	160.0	3 580.0	4.5
4	184	British Sky Broadcasting	UK	120.8	8 122.0	1.5
6	371	IPSOS France Media	France	41.8	1 789.5	2.4
7	389	Eniro ⁴	Sweden	39.3	466.0	8.4
8	431	Youview TV	UK	32.8	39.1	83.9
9	534	Euromonitor ⁵	UK	15.6	77.5	28.2
10	831	Il Sole 24 Ore	Italy	8.6	430.9	2.0
11	881	Rocksteady Studios	UK	7.4	13.3	56.0
12	898	ITV	UK	7.2	2 626.4	0.3
13	917	JC Decaux	France	6.9	2 622.8	0.3
14	992	TF 1	France	5.4	2 620.6	0.2

Source

Authors, data from the Scoreboard 2013, World - 2000 companies ranked by R&D, EU top 1000 companies ranked by R&D. Annual reports. Major R&D intensities in bold, authors' emphasis.

⁴ Eniro is a search company in the media industry, with operations in Sweden, Norway, Denmark, Finland and Poland. In 2013, 80% of the company's revenues derived from digital media (excluding directory assistance services). Source: company website.

⁵ Euromonitor International Ltd is a London-based market intelligence firm, providing market research, business intelligence reports, and data to industry. The firm was founded in 1972.

In the multimedia sub-sector two leading non-European companies show major investments in R&D: Dolby and Sony (see Table 1a) ⁶. Sony is ranking 24th in the Industrial Scoreboard (2013). Both companies show significant R&D investments,

In that context, Youview TV (UK), spotted by the Scoreboard, emerges as an exceptional case. The company is a young UK provider of digital TV which started offering services in July 2012. It introduced its own standard IPTV set-top box, and its technical orientation may account for the amazing 83.9% ratio, after one year of operation.

Another example identified in the Industrial Scoreboard because of the volume of its R&D expenditures, is Rocksteady Studios, a UK video game developer based in Highgate, London, which shows a 56% R&D ratio! Founded in 2004, the studio was acquired by Time Warner in February 2010. The developer is renowned for its games "Batman: Arkham Asylum" and "Batman: Arkham City".

R&D expenditures in the cinema industries

In the cinema industries, one could have expected its more "technical industries" ⁷ to play a major role in R&D, considering them as the "labs" of the industry. However, these industries have even been described (in the French case) as a stagnating link in an expanding value chain (Imaginove, 2014: 9). Such a statement, focusing on the French cinema industry, seems to ignore the dire situation in those technical industries as witnessed by leading players such as Laboratoires Éclair, Technicolor (formerly Thomson) or innovative camera manufacturer Aaton, all on the verge of bankruptcy.

In the EU, Thomson used to be one of the companies competing with US and Japanese firms to produce equipment and provide audio-visual services. The firm was faced with serious challenges at the turn of the century and

⁶ On these data, see also NEPELSKI & STANCIK (2011).

⁷ The segment covers: shooting (manufacturers equipment and film, shooting rentals, shooting studios/set, mobile production unit), post-production (labs photochemical/digital/video, image and sound post-production, dubbing and subtitling), diffusion (screening and broadcasting, duplications (prints/KDM), DVD), archiving, storage, and restoration. In 2012, all these activities reached 1,1 billion Euros in France according to the French Trade association FICAM (2014) for a panel of 109 companies: post-production accounted for 17%, immediately followed by dubbing/subtitling and mobile production unit with 15%, then shooting studios and shooting rentals with 13% each.

devised an ambitious plan to move into digital distribution, aiming at becoming the number one firm in the field, targeting first the US market. The plan failed. The company, now renamed Technicolor refocused on core activities, still manages an important portfolio of patents that generated 15% of its revenues in 2012. In 2013, Technicolor employed around 350 researchers and experts spread among four research centres: Rennes, Paris, Hanover, and Palo-Alto (company sites: 2014). The company invested 4.5% of its revenues from sales in 2013 (Scoreboard, 2013).

Éclair, another French company founded in 1907, active in all segments of the subsector (production/distribution/ archiving/storage and restoration) followed a similar pattern and almost went bankrupt in 2009: its revenues and workforce have been cut by two since 2009 (LUCAS, 2013). The company went through several "social plans" but seemed to re-emerge and to try taking the lead on the French market as – according to the company website – "a pioneer of digital post-production". The company from Epinay (Paris area) introduced itself as "an innovator for more than a century" (company website). The company prides itself on being the only company with an R&D programme addressing all these segments. The company was agreed and labelled within the French government project "grand emprunt numérique" (146 men/month over two years). Laboratoires Éclair Laboratoires Eclairs highlights an in-house R&D team working with a US based company, Front Park Digital, specialised in "digital asset management solutions for migrating, managing and delivering media content" (company site). For distribution of copies, Éclair "created the first European Digital Cinema Package" (DCP) in 2005 (company website) and implemented a digital distribution hub in 2011. The two companies, after some downsizing, seem to have refocused on R&D ⁸. However the company went bankrupt in 2015

Part of the reason has to do with the fact that this sub segment is treated more as a plain supplier rather than a leading technical partner. A report for the French Centre National du Cinéma (CNC), (LEPERS & PORTUGAL, 2013), commissioned to assess the economic strengths and weaknesses of this sub-sector, stressed that this technical part of the cinema industry is perceived as a "commodity" and not as the core value of the industry. The authors emphasized the negative aspects of this relationship (LEPERS & PORTUGAL, 2013: 25) and suggested some rebalancing and an improved

⁸ It is especially interesting to stress that since our report has been published, Éclair has just been acquired (July 2015) by Ymagis, the company we present below in this paper.

consideration of R&D. Besides, the report underlined that this segment also suffered from serious economic challenges.

**Potential U turns in the cinema industry:
Windows of opportunity for new (R&D) players?**

On the other hand, some technical industries are faring better than others (for instance UK post-production companies: LIVINGSTONE & HOPE, 2011). The entry of emerging new players may signal a change in the legacy relationships with these suppliers, between "creation" and technical provision of services, brought by digitization, pervasive computing and new distribution channels. Even in the case of the French industries, some start-ups managed to emerge recently.

For instance, Ymagis (France), founded in 2007 by executives from the world of cinema and high technologies, shows an amazing growth curve. The firm covers activities of the technical industries (production, post-production, storage) but focuses on digital distribution of digital copies. It claims to be an innovation company with half of its workforce being engineers and technicians, devoting 11% of its revenues to R&D in 2007 in its labs – Paris, Barcelona, Berlin (Ymagis, 2014).

Similarly, due to the growing role of software activities, some companies in the creative industries are reaching R&D intensity ratios that are much closer to those for regular technology-oriented or technology producing companies. This is also, for instance, the case of the digital content-creation solutions provider Avid spending on R&D up to 17% of its net revenues, (678 million US \$ in 2011, 513 in 2012).⁹

Many companies are likely to escape usual investigation because of their sheer size even if some of them are publicly traded like Avid. This is all the more important to analyse as it may indicate the emergence of a new digital ecosystem with companies originating from the broadly defined content sector (like the Content Delivery Networks, Akamai). They provide IT services to all kinds of media customers. For a growing number of observers, these companies are now playing the rather recent role of "new middlemen" liaising between the different layers of a transformed industrial environment described alternatively under the notion of "new ICT ecosystem" (ARLANDIS *et al.*,

⁹ Source: Annual Report 2011: 20, Scoreboard data.

2010; BCG, 2011; FRANSMAN, 2010, 2014) or "Telecom Media Technology" (TMT) according to other consultancies (A.T. Kearney, 2010; Booz&co, 2011 ¹⁰; McKinsey, 2010; PWC, 2014).

Table 2 - R&D expenditures in the cinema industry: some examples

	<i>R&D Expenditures</i>	<i>Revenues (million)</i>	<i>% of revenues</i>	<i>Size of R&D team</i>	<i>Sector</i>	<i>Country</i>
Akamai (2013)	\$ 93.9	\$ 1 580		1 017	Content distribution	USA
Avid (2011)	\$ 118.1	\$ 678	17%	NA	Cinema technical industries	USA
Aaton	NA		NA	NA	Cinema Manufacturing	France
Buf (2013)	NA	€ 10	NA	NA	Cinema technical industries	France
Dolby (2013)		\$ 807	19% ⁽¹⁾		Multimedia equipment	USA
Double Negative	NA	£14,299 (2005)		Europe's largest VFX R&D team	Cinema technical industries	UK
DreamWorks (2012)	\$ 4.9 ⁽²⁾	\$ 749	NA	310 ⁽³⁾	Cinema Motion Picture Producers and Studios	USA
Image Metrics	NA	NA	NA	The company indicates 60 man-years of research between 2000 and 2014. R&D center in the UK	Cinema technical industries and video games	UK
Eclair	NA		NA	NA	Cinema technical industries	France
Sony (2014)	4 132 (2008) multimedia	6 662 Group level	NA	NA	Multimedia equipment	Japan
Quantic Dream	NA	NA	NA	External contractors most likely	Video games	France
Technicolor (2012)	NA	€ 3 500	NA	350	Cinema technical industries	France
Vivendi (2013)	NA	€ 22 135	NA	NA	Content and telecom	France
Ymagis (2013)		€ 47.3	11%		Cinema technical industries Digital distribution	France
Zoetrope	NA	Estimated ⁽⁴⁾ \$20 to 50 million	NA		Cinema Motion Picture Producers and Studios	USA

⁽¹⁾ Generally accepted accounting principles (GAAP) R&D only. Company website.

⁽²⁾ Total for product and development as a proxy. Product development costs primarily consist of research and development costs related to technology initiatives or costs incurred pursuant to development agreements with third-party software developers (Annual Report 2012: 54).

⁽³⁾ Estimated from indication in the company's annual report.

⁽⁴⁾ Source: Manta, 2014. www.manta.com/c/mm2hh86/american-zoetrope

¹⁰ Global Telecom, Media and Technology (TMT) ecosystem.

Source: Compiled by the authors from companies' website, internet sources and annual reports

These "new middlemen" are often the output of previous R&D investments, and/or spin-off from universities. To offer here an example, Akamai, a content delivery network originated from the MIT, from research on the dynamic routing of contents. Akamai provides services to content providers bringing their contents closer to the customer.

Table 2 documents R&D expenditures in a sample of selected companies involved in the cinema industry. Taking into account the wider "Telecom Media Technology" (TMT) ecosystem, it appears that IT MNEs have much larger R&D expenditures ¹¹, and are highly R&D intensive, while even the large multinational firms of the creative industries show rather small R&D efforts.

However, some of the evidence gathered shows the existence of smaller-sized companies' efforts in technology-related content and the possible emergence of larger companies (hence able to show on the industrial scoreboard). These smaller-sized companies, specialised technology suppliers as suggested, are "new middlemen" liaising between companies and layers of the new ecosystem, bringing and building mostly on their software expertise to enable further digitization of other players.

Conclusion

The actors of creative industries invest in R&D and in technological innovations, however they do in a way that appears concealed and not in areas where one would expect: digital technologies. Cinema is quite emblematic of this view. Its economic actors significantly invest in technology, but in the traditional processes of production and distribution, rather than in the most threatening disruptive digital mutations.

These developments are reflected as such by original new models, based on particular forms of specific collaboration formalized through the decisive role of new middlemen. These new actors are building their position by organizing the dialogue between their expertise in high tech skills and the creative dimension of cultural works. More broadly, the case of cinema thus makes it possible to understand how the wide spectrum of technologies

¹¹ Even when the R&D are quickly identified in annual reports it remains difficult to see how much R&D is allocated by these IT firms to R&D for the creative industries.

mobilized in the digital age opens up strategies and allows differentiated positioning in the value chain.

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