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ARTICLE

# JOURNALISM INNOVATION:

## how media labs are shaping the future of media and journalism



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**ABSTRACT** – This paper discusses journalism innovation through experimental units known as “media labs”, addressing motivations, processes and outputs related to them. It is based on collaborative four-year research projects that mapped 123 labs within industry, civic society, and academia globally, with a focus on Latin America, North America and Europe. The data spans 45 interviews and 54 survey answers from lab leaders across 17 countries and covers 60 innovation outputs, with 30 closely related to media and journalism. The paper’s main theoretical frames incorporate open innovation and constructs from media innovation and media management. The results indicate that media labs are either within organisations or alongside them, producing projects systematically and experimentally as a reaction to digital disruption. Within an environment of scarcity, they catalyse innovation and combine technical and creative skills, unveiling solutions beyond new narratives or content-related innovations.

**Key words:** Journalism innovation. Media labs. Media innovation. Media Futures. Digital media.

## INOVAÇÃO EM JORNALISMO: como os media labs estão moldando o futuro da mídia e do jornalismo

**RESUMO** – Este artigo discute inovação em jornalismo através de laboratórios experimentais denominados *media labs*, abordando motivações, processos e resultados relacionados a eles. A investigação é baseada em quatro anos de projetos de pesquisa colaborativos que mapearam 123 laboratórios na indústria, sociedade civil e academia em âmbito global, especialmente na América Latina, América do Norte e Europa. Os dados abrangem 45 entrevistas e 54 questionários com líderes de laboratório de 17 países, assim como 60 resultados de inovação, 30 deles mais estreitamente relacionados à mídia e ao jornalismo. Os principais quadros teóricos incorporam inovação aberta e constructos da pesquisa em inovação e gerenciamento de mídia. Os resultados indicam que *media labs* estão dentro ou próximo de organizações, produzindo projetos de forma sistemática e experimental como uma reação à disrupção digital. Em um contexto de escassez, eles catalisam a inovação combinando habilidades técnicas e criativas, desenvolvendo soluções além da inovação em narrativas.

**Palavras-chave:** Inovação em jornalismo. *Media labs*. Inovação em mídia. Futuro da mídia. Mídia digital.

## INNOVACIÓN EN PERIODISMO: cómo los laboratorios de medios están dando forma al futuro de los medios y el periodismo

**RESUMEN** – Este artículo analiza la Innovación en Periodismo a través de laboratorios experimentales denominados *media labs*, abordando motivaciones, procesos y resultados relacionados con ellos. La investigación se basa en cuatro años de proyectos de investigación colaborativa que mapearon 123 laboratorios en la industria, la sociedad civil y la academia a nivel mundial, especialmente en América Latina, América del Norte y Europa. Los datos comprenden 45 entrevistas y 54 cuestionarios con líderes de laboratorio de 17 países, así como 60 resultados de innovación, con especial atención a 30 de los cuales están más estrechamente relacionados con los medios y el periodismo. Los principales marcos teóricos incorporan la innovación abierta y los constructos de investigación en innovación y gestión de medios. Los resultados indican que los *media labs* están dentro o cerca de las organizaciones, produciendo proyectos de forma sistemática y experimental como reacción a la disrupción digital. En un contexto de escasez, catalizan la innovación combinando habilidades técnicas y creativas, desarrollando soluciones más allá de la innovación narrativa.

**Palabras clave:** Innovación en periodismo. *Media labs*. Innovación mediática. Futuro de los medios. Medios digitales.

### 1 Introduction

Motivated by digital disruption and transformation, interest in media and journalism innovation has grown significantly over the last decade (García-Avilés et al., 2019). Media change spans technological content diffusion, the redefinition of the media company concept (going beyond content production and distribution), audience and consumption fragmentation, and sectoral fragmentation from the digitally native news media (Nicholls et al.,

2018). Reduced market entry barriers, changes to the economic value of content due to the proliferation of digital options, evolving revenue models, the role of content aggregators and their impact on traditional media, as well as the economic impact of digital technologies beyond the traditional media context (Mierzejewska & Shaver, 2014), are all influencing factors.

As such, a need has developed for a clear understanding of how digital technology advances and consumer adoption patterns affect the profitability of digital firms. To meet these digitally prompted challenges, innovation (of products, practice and business models) has become a central concern. Amid this, Flores (2019) highlights that journalism innovation is driven by a state of discomfort, potentially connected to this uncertain environment. Scholars have also problematised a perceived enchantment with technology within industry innovation discourses, as well as the presentation of short-term experimentation without strategic purpose (Posetti, 2018).

Hence, the visible appropriation or development of distribution, production and consumption technologies offers only the symbolic comfort that “we are not so far from innovation” or that “we are changing”, without really pursuing a long-term propositional transformational path. A paradigm shift has also been critiqued, with innovation-prompted change not always being a revolutionary force: the newspaper industry has undergone a more gradual and continuous innovation process than a radical one (Boczkowski, 2005).

Media labs, organisationally mandated spaces or processes for innovation and creation, are a key area within these debates. Issues of disruption, innovation and transformation feed directly into the expansive media lab phenomenon (Nunes, 2020). This paper combines data from two global investigations exploring the complex interrelations between technology, innovation and media labs as a strategic and organisational response to long-term digital disruption. It identifies an interdisciplinary organisational environment – spanning editorial, technical, design and sometimes academic and business expertise – that stands apart (but sometimes alongside) the time-pressured environment of media and news production.

It finds that labs are a safe space for experimentation. A space where collaborators can develop a singular vision (Clarke, 2019) and where there is institutional openness to absorbing technologies and

ideas (Chesbrough, 2006) via collaboration. Belair-Gagnon et al. (2020) highlight that a major limitation of journalism innovation research is one country samples, often European or American ones, which are used to generalize journalism innovation. This research proposes a wider look over news innovation via the media lab construct.

This paper investigates the role of media labs in creating journalistic and media futures around products, innovation, and people with three foci: motivations, processes and outputs. It suggests that media labs, focussing on journalism, constitute an organisational or process innovation and positions labs as an incarnation of open innovation principles, absorbing new knowledge in the form of novel and emerging technologies, practices, and people into organisations. Media labs have the potential to catalyse or develop innovation in a systematic way in an experimental context, prioritizing the functional side of innovation, going against the tendency of journalistic innovation to focus on soft innovation, exclusively in the form of new narratives and content.

## **2 Media innovation, open innovation and media management research**

This study locates itself within Media Innovation research, an area that interconnects Media Economics, Media Change, Digital Humanities and Media Management. It aligns with Storsul and Krumsvik (2013), Dogruel (2013, 2015) and Küng's (2008, 2013) argument that an interdisciplinary approach contributes to media and journalism research. The Media Innovation approach links innovation theory and the particularities/challenges of the media industry, especially journalism. As such, the paper leverages Chesbrough's (2006) notion of open innovation – which envisages a firm having permeable boundaries where ideas and technologies are absorbed and new organisations and products spin out – and applies it to media labs as an organisational construct. Dogruel (2013, p. 30) comments that media innovation research is traditionally addressed by two foci:

- new information technologies and the survival of communication from fragmentation, new digital business models and the restructuring of media organizations;
- new media products, both in terms of new formats and content, and new technologies for and from the media.

The study of media labs, then, is informed by and informs these notions. There is a macro-oriented approach focused on technologies and business models that coexists with a micro-oriented bias, targeting media products that emerge as a response, resistance, or consequence of the context of fragmentation and restructuring in the media industry. Both perspectives are addressed to achieve a wider understanding of experimental innovation via the media lab construct.

### **3 Innovating the creative industries, content, and journalism**

Unlike other media sectors, where items of media are created as discreet products or projects over time – such as film – journalism is characterized by the continuous creation of updated content (Picard, 2005) in a system or format that concentrates this delivery or availability. Due to the different nature of each media product, companies focused on continuous creation media products usually have “(...) strongly structured and coordinated processes that tend to be time constrained and require that managers cope with process management issues” (Picard, 2005, p. 62). This is the case in the journalism industry. Innovation activities usually emerge from daily operations and do not have the same business risks and failures (Picard, 2005). In this way, media labs potentially provide a space away from this daily routine of content production, where innovation can materialise beyond newsroom conditions.

Innovation also maps across novel forms of content as well as publication technologies, content creation processes and revenue streams. In media, it is interconnected with creative and authorial work, described as soft innovation “that primarily impacts upon aesthetic or intellectual appeal rather than functional performance” (Stoneman, 2010, p. 22). The media industry has always had a relationship with innovation as a core way to understand change, particularly around content. Their outputs carry some degree of creativity and novelty, with a particular non-functional way of being innovative. Media labs, on the other hand, are spaces that offer new understandings for these forms of innovation.

#### 4 Media Labs: form and function

Media labs are a response to changes in technology, communication and economy, reacting to the increased external and internal complexity and uncertainty promoted by digital disruption. Wilczek (2019) highlights that this scenario is a driver to news organisation managers to specialize and invest, a fact that could corroborate media labs' recent popularisation.

With a revival in the 2000s (Plohman, 2010) and a recent emergence of experimental labs within companies (Salaverría, 2015), media labs' focus and purpose shift from a purely technological bias to a societal one (Tanaka, 2011). Globally, media labs exist within news publishers such as the Wall Street Journal, Deutsche Welle, the BBC, Agence France Presse (AFP), Austria Press Agency and national digital venues as OjoPúblico, within universities such as Universidade Nova de Lisboa (iNOVA), Texas State University (Media Innovation Lab), University of Surrey (Digital World Research Centre), Universidad EAFIT (MediaLab EAFIT) and Universidade Federal do Maranhão (Laboratório de Convergência de Mídias – LABCOM), as standalone units such as Media Lab Bayern, Chicas Poderosas – New Ventures Lab and ÉNóis - Laboratório Aberto de Jornalismo or as consortium, as the NYC Media Lab and Media City Bergen Media Lab. The diversity of labs' structure shows how they are fluid and live concepts, experiencing changes and adapting over the years.

During the last decade, the term media lab has also risen in popularity (Nunes & Mills, 2019) and covers a broad swathe of structures and activities. These span advertising agencies, branded content institutions, student university newsrooms, community centres, media literacy programmes and innovation 'events'. This is in addition to a physical space focused on processes, technologies, products and other kinds of media innovation, such as fostering relationships between multiple actors (Mills & Wagemans, 2021).

Previous research focuses on self-identified media labs (Mills & Wagemans, 2021), educational labs (Capoano & Ranieri, 2016), media labs within media businesses (Salaverría, 2015), and a processes-oriented approach focusing on R&D (Dekker, 2011; Ito & Howe, 2016; Clarke, 2019; Wershler et al., n.d.; Nunes, 2020). It is difficult, therefore, to offer a precise definition of a lab. Media labs can be in-house within publishers, technology creators or universities. They can be independent or hosted,

infrequent collaborative events or distinct operations with space, budgets and staff.

This paper focuses on media labs as organisational constructs that accelerate media and news industry involvement in experimental and functional innovation. Zaragoza-Fuster and García-Avilés (2020), for example, identify two distinct roles of public television media labs based on BBC and RTVE case studies<sup>1</sup>: the first, focuses on global innovation strategy using new technologies to create tools and content, and the second has a small, limited influence on a variety of innovative storytelling formats.

Some labs centre on research, development, and innovation through experimental approaches (Salaverría, 2015). These innovation institutions pride themselves on being “antidisciplinary” (Ito & Howe, 2016), addressing a variety of problems and creating learning opportunities (Hogh-Janovsky & Meier, 2021). Media labs also pursue innovation with actors beyond the journalist, the journalistic organization, the sources of information and the public, including research centres, universities and media companies.

As envisioned by Franciscato (2014), digital disruption has opened up new spaces and reinforced the importance of non-institutional actors in the development of innovative processes. Here rises the main line of inquiry for this paper: to focus on how journalistic labs are motivated, what processes they use to innovate – rather than in tracing a fluid and transient technological focus – and what do they output. To help answer these questions, the media lab is seen as an organisational method to create journalistic futures, and in doing so, offers valuable data in understanding publishers’ organisational strategy and the operational vehicles at hand to realise these futures. We seek to expand on pre-existing case studies of labs and combine two global studies to create a broad base of labs, with data spanning both qualitative and quantitative material, the analysis of which provides new insights into the media lab as an organisational and innovation phenomenon.

## 5 Methodology

This paper locates media labs within Storsul and Krumsvik’s (2013) product, process, position, paradigm and social innovation framework. It frames labs through Chesbrough’s model of open



innovation and sees them as a response to industrial, social and technological challenges that their hosts/creators identify against a background of digital disruption. Our core research question is:

RQ: what is the role of the media lab in creating journalistic futures around products, (innovation) processes and people?

To help answer this, three sub-questions are explored:

SRQ1: what are the motivations and core goals of media labs?

SRQ2: what are the processes and practices of innovation that are deployed within them?

SRQ3: what are the characteristics of media and journalism innovations (outputs) developed by media labs especially those related to the media and news industry?

The results are based on combining two distinct research projects that contributed to a four-year international collaborative investigation in partnership with the World Association of News Publishers' (WAN-IFRA) Global Alliance for Media Innovation (GAMI).

## 5.1 Study one

Desk-based research was undertaken between 2016 and 2018 to identify the scope and manifestation of labs as no worldwide media lab database existed. Sources included:

1. Segmented databases and bibliography sources: Salaverría's (2015) European corporate media lab list (31 institutions); Media Innovation Mapping Project, led by GAMI (41 initiatives by July 2018); Ubilab's<sup>2</sup> media lab mapping (20 media labs); and, in Latin America, innovation examples from Mioli and Nafria (2018).

2. Google search term "media lab launch" in English, Portuguese and Spanish: the first 100 results were analysed.

3. Crowdsourcing in Brazil: Facebook sharing on groups of media professors and media innovation community as well as mail lists.

The data were analysed to verify if the labs were still operating, generating a global media lab database of 123 active labs<sup>3</sup>.

From 2018 to 2019, 54 lab leaders from Europe, Latin America and North America answered a survey<sup>4</sup> varying from 16 to 36 questions (depending on their relationship to media and journalism innovation). Labs focusing on developing or catalysing media innovation could answer all questions, while those undertaking other activities, such as media literacy education activities or non-innovation projects, answered 16 questions. The questionnaire was divided into four thematic sections:

- a. Identification of the media lab and context of the respondent
- b. Characteristics of the lab: objectives and focus of innovation (Storsul & Krumsvik, 2013; Lindmark et al., 2013; Salaverría, 2015).
- c. Innovation processes and challenges: based on the interviews already conducted on processes and strategies.
- d. Lab's main results: characteristics listed by Küng (2008), types of media innovation (Storsul & Krumsvik, 2013; Dogruel, 2013, 2014)

This survey was validated in mid-2018 via a pilot phase with 10 participants, then sent to the whole media lab database (123 labs). Furthermore, the survey generated a list of 60 projects<sup>5</sup> considered to be “most successful” or “most replicable”. These outputs were analysed based on the documents available online and against two axes formed from a preliminary analysis:

- Materialization of innovation, which aimed to understand how the innovation took form within the following subcategories:

- digital tools (replicable solutions that automatized or facilitate an operational task);
- media, technology & arts (projects in the intersection of these areas);
- new narrative forms;
- new business (initiatives that stand out especially for finding a market opportunity),
- platforms & channels (new forms of content distribution);
- broad and contextual solutions (solutions that respond to specific contextual problems and that do not fit into the other categories).

- Type of media and journalistic innovation characterised the innovation beyond soft-innovation and functional innovation through the following subcategories: 2014)

- Creative Innovation (creative-intellectual strategies, exclusively impacting journalistic content/narrative and consumption);
- Reflective innovation (organizational or process innovation without technological mediation);
- Exploratory innovation (appropriation of technologies for production, distribution, and/or consumption);
- Generative innovation (development and implementation of functional innovation for production, distribution and/or consumption).

## 5.2 Study two

Researchers explored media lab activities and identities, drawing upon 45 qualitative interviews with structures that identified as media labs to explore definitions, actions, positionings, and conceptualisations of labs in multiple contexts such as academia, news media, innovation clusters, incubators, and start-ups (Mills & Wagemans, 2021). Respondents innovated product, process, revenue model, pedagogical approaches skills or generated new knowledge for exploitation by the media/journalism.

Some focused directly on journalism, some had broader interests in media, and some had passing interests in journalism, but had delivered R&D projects that were directly related to journalistic interest areas, applications or practice. Interviews were conducted with a semi-structured script to ensure a degree of consistency around the inquiries, but with the flexibility to pursue interesting themes or topics. Labs were primarily located in Europe (28) and North America (12). As the transcripts were created (phase 2, 35 transcripts), an inductive open coding approach was deployed to identify core themes (Glaser & Strauss, 1967; Taylor et al., 2015). These themes informed a meta-level analysis of the media lab phenomenon represented in our findings and discussion section below.

## 5.3 Combining data and data condensation

This paper offers a meta-level analysis of these studies' findings; combining data and validating it against each other. The approach generated new conclusions through a further round of data analysis and "condensation" (Miles et al., 2020), where insights are generated through ongoing reflection and analysis.

## 6 Findings and discussion

Our mixed approach seeks to further existing knowledge discussed in the literature review above, beyond case studies and comprising different types of media labs. By addressing motivations, processes, and outputs of media labs, we open room to discuss the role of media labs in creating journalistic and media futures around products, processes and people.

### 6.1 Motivations and purpose

Our data analysis reveals a range of motivations. Labs had a central interest in journalism, with 74% indicating this as one of their media axes. They also spanned industry, academia and individual units that ran alongside traditional industrial settings and academic hosts. Motivations ranged across business, learning and change management concerns, and, to a large extent, were rooted in the notion of openness and collaboration as a way to navigate digital disruption.

A selection of (sometimes) interconnected sub-themes was identified during the coding process. These included:

Manage or catalyse digital transformation: whether the labs were located in a publisher, academic institution or an independent unit, the core motivation was to manage or be part of the management strategy, for digital transformation. This function can be seen as a meta-level requirement that cascades into lower sub-themes revolving around personal and professional goals.

For publishing houses, labs allow new digital technologies to be measured against and utilised around the core goals of the organisation (journalism, journalism education or the creation of new products and services). New skills developed in the lab could also be utilised within an organisation that focused on emerging digital opportunities or requirements. Some organisations saw the role of the lab as being an early exemplar of how working processes could be in the future. For example, the lab was a model for how the organisation could work and operate beyond the current norm. Some leaders saw the lab as intentionally separate.

It wasn't the goal of the lab to evolve the host, but it rather performed a quarantine function to explore new opportunities and

possibilities and then translate/transfer them into the organisation more broadly. Others explicitly stated that prototypes should move beyond invention and make it into the market – ‘otherwise you stay in the invention phase’ and don’t innovate.

Further elements of digital transformation mapped against organisational culture markers. Interviewees spoke of labs helping to change a mindset, create new ways of working (see below) and a physical and mental space within an organisation to do things differently and to develop people. One North American leader explained “it’s about giving and receiving, it’s a feedback loop, and it’s sharing, you know, everything along the way. So that’s, that, it’s not formalised, but it’s ingrained in people’s way of working. Which I think is powerful”.

Labs also met the demands of digital transformation in broader ways. These included theoretical, applied and experimental research and discussions (15 labs); development and launch of digital applications and technologies (13 labs); exploration of new multimedia narratives and databases, or data journalism (13 labs) promotion and development of start-ups and/or new companies (8 labs); training activities for media professionals and/or media literacy programs for the audience<sup>6</sup> (5 labs). Table 1 demonstrates that lab leaders articulated fundamental motivations as being geared around culture with (57%) and learning (also 57%).

**Table 1** - Reason for the success of the most successful innovation indicated by lab leaders (n=51<sup>7</sup>)

For what reason(s) is/are this/these innovation(s) a success sample for your lab?	Surveyed	%
Culture change: the innovation proposes a change of culture in the media and journalism whether it is for journalists or the audience.	29	57%
Team learning: the innovation has enabled the team to learn more about the question at hand, advancing towards a solution.	29	57%
Positioning in front of the audience: the innovation allows the company or lab to position itself in a specific market or for audiences as innovative.	22	43%
Differentiation and competition: the innovation helps differentiate in the context of the media today and generates competitive advantage over other companies.	18	35%
Others	7	14%

**Business and resilience:** several media labs were explicitly created to, at least in part, enable new business models and revenue streams, and their outputs were tied to explicit business and commercial requirements. For example, factors such as exploring new business models, improving time-to-market rates, exploring how innovation processes could be sustainable within their organisations and evaluate external products and services concerning their own organisation's requirements were identified. Incubation and academic settings also coalesced around business development, sustainability and resilience. Some were created to support start-ups or SMEs, and therefore provided economic impetus beyond a single organisation.

**Collaboration:** strongly connected to business and resilience factors, a core lab driver was to absorb new information into the organisation and is evidenced in both the qualitative and quantitative data (table 2). Collaboration was a key driver for this, both between multiple skills located within the media labs themselves<sup>8</sup>, but particularly with external engagement with other actors. For example, one lab leader described their networked position:

I think in general just the way that we work nowadays spans organisations and communities ... what we know from research is that, innovation, the new ideas and insights come from the edges, they don't come from the people who have been working on that thing forever so that means that creating fluid and dynamic and networked communities to work on different challenges and opportunities is key. (European lab leader).

An underpinning requirement of this approach was to access and absorb new information within the permeable boundaries (Chesbrough, 2006) of the organisational structure or the lab's external ecosystem. For example, the qualitative data shows collaboration within the host organisation broadly and technology providers, journalists, start-ups, students, other media companies, other external companies more broadly and members of the local community or indeed community of practice (table 2).

**Table 2** - What is the inception of this innovation? (n=51)

What is the inception of this innovation?	Respondents	%
Opportunity from engaging with communities and or approaching user contexts.	18	35%
The emergence of new technology which can be used to the media and/or journalism that may be related to a market need/opportunity.	15	29%
A new market opportunity or need.	11	22%
A new use for something that already exists arose from the team's creativity or observation.	7	14%
Demand or internal need of a media and/or journalism company.	3	6%
Not sure / I cannot identify.	1	2%

Overall, media labs were therefore not a separate and detached unit but rather an essential element to create, explore and maximise internal and external relationships to the benefit of the host organisation and/or wider community.

But if you can bind ... technology expertise, with journalism expertise, you create something really interesting. (North American Lab leader).

Journalism as a driver, emergent technology as a vehicle: as may be expected from a media “lab”, many were explicitly created to explore and exploit emerging technologies. Examples of technological foci include blockchain, video verification, drones, internet of things, wearables, mobile media verification, virtual reality, mixed reality, augmented media, AI and web or mobile digital platforms and products. However, although labs were mandated to explore these areas, this wasn’t necessarily an end-goal in and of itself. Often, the exploration of these technologies mapped across overarching concerns of media and journalism – i.e. to enable publishers to meet Journalism’s social and democratic motivations and business concerns. For example, our survey data revealed that most media labs tend to be tech agnostic: 30 laboratories (59%) disagreed (partially or totally) with the statement “My lab is based on a new specific technology (drones, personal assistants, internet of things, etc.) to address its projects”, while 76% totally or partially agreed with the statement: “My lab process starts from diverse problems of the information age and then thinks about the appropriate technologies to solve it”.

Purposeful Creativity: a sense of creativity permeated multiple labs. Whether this was the open collaborations run through hacks, new product development, a design thinking and human-centred approach, combining multiple academic disciplines or connecting journalism students to different ways of thinking and doing, new ideas and concepts were created. However, they were underpinned by business, pedagogic or journalistic function and production.

## 6.2 Processes

Whether they be industry, academic or independent labs, the processes of innovation within the labs primarily centred around speed, people and openness. For example, media labs (both industry and academic) often heralded a user-centred approach using multiple skills and expertise (sometimes professional, sometimes student). One interviewee suggested that the term “lab” itself was too sterile for this activity:

[...] a Lab implies something you walk into, that is very sterile and where you have some experts sitting together looking for the grand solution. Instead, the Maker Space is looking for user-driven innovation, by embracing user-experience and co-creation. (European lab leader).

Design thinking, which involves putting users and their requirements at the centre of an innovation process, and deviations of it, were identifiable in academic and professional contexts. For example, Austria Press Agency (APA) lab utilised a Sprint (Knapp, 2016) methodology which builds from a user-centred approach but also wraps fundamental business and organisational strategy concerns into the innovation and decision-making process. These methodologies can be deployed quickly. A pointed example of this need for speed is the use of hacks over one or two days that focus innovation on a central problem or challenge to create a low-fidelity output. Equally, innovation took the form of discreet project development, sometimes through giving employees money and time to pursue their ideas via methods such as Adobe Kickbox. Agile and lean approaches were also identified. Processes were iterative and designed to take place at pace and without excessive resource demands. One leader described a practical approach based on project management tools



So we're very agile, it's the key method that we use so we're very big on Trello boards and breaking projects down in their components, so we're not completely sprint-based, but we have our fortnightly team meetings [...] So that's the sort of primary method we use, along with [...] software, engineering, plan development... (European lab leader).

Our quantitative data shows teams are mostly lean (with up to 15 members in 80% of cases). These approaches elevate the importance of speed, place users and their requirements in a central position when innovation is pursued and are open to those with a diverse range of experience and skills. "The whole point of labs is that we succeed fast and we fail fast", said one European leader. Labs also incorporate multiple skills and look outwards to external organizations such as start-ups and individuals that offer different skills and perspectives.

Our survey data also indicates a range of more traditional research methods – face-to-face interviews (34 out of 51 labs) and focus groups (22) were used, as were ethnographic studies (13) and observation in user testing and real-world conditions (19). Nevertheless, participatory or collaborative design strategies involving users (workshops or other interactions with the target community) were among the top methods used (25).

### 6.3 Outputs

Analysis of the most successful and most replicable projects demonstrates the openness and broadness of media and journalism innovation: eight surveyed leaders have indicated the lab itself; three others, development programmes, along with 49 specific projects (narratives, digital tools, new processes) nominated by other participants. "To propose innovation" is, indeed, a wide term that can both mean to catalyse innovation or develop it, and media labs can do both. Projects were divided into two segments: 30 projects from media labs self-identified as connected to the media and/or journalism industry and 19 projects coming from those who stated being beyond the media industry segmentation, understanding public spaces, arts and other topics as media also.

Media, technology & art was the most common theme (6) around those from the latter group. These projects usually involved public spaces such as promoting interaction between people and

urban spaces through technology. Broad and contextual solutions were present in five projects. Examples include a do-it-yourself bag to help the carrier use their smartphone more consciously and a data visualization to understand the complex processes that govern the city of Katowice, Poland. As shown in table 3, projects materialized as a range of initiatives, including digital tools (as an open-source solution to automate the creation of interactive timelines), media narratives (as the reinterpretation of the Frankenstein story as an AI or an immersive dystopian narrative with 3D audio and 360° video), or, even, as a new platform or channel that used augmented reality and electronics to connect paper to the internet.

**Table 3** - Materialization of innovation (n=19): broad media concept labs

Materialization of innovation	Projects	%
Media, technology & art	6	32%
Broad & contextual solutions	5	26%
Digital Tools	4	21%
Narratives	3	16%
Platforms or channels	1	5%

Media labs of this kind understand media as connected to spaces, people, stories and to life in general in a way not encapsulated by industry markets. In doing that, they show the ubiquitous nature of media an area that, after digital transformation, has become as connected to the creative industry as it is to the tech industry.

Media lab outputs confirm a constant tension between action and reaction to digital context(s). Among the 30 media and journalism initiatives, 11 (37%) were digital tools, the majority (nine) sought to improve processes such as: converting text and video to audio, automatic language translation and using algorithms to automate content. This connects with the driver of scarcity, accelerated by the digital disruption, whether that is people, time, or money. Automation and new ways to display information were also detected, with projects including interactive tutorials for new digital products and a Facebook Messenger quiz bot.

**Table 4** - Materialization of innovation (n=30): labs connected to the media and/or journalism industry

Materialization of innovation	Projects	%
Digital tools	11	37%
Platforms or channels	6	20%
Business or revenue opportunities	6	20%
Narratives	4	13%
Broad & contextual solutions	3	10%

Platform or channels had the second-highest number of projects (table 4), with initiatives such as an electrophoretic screen for displaying hyperlocal news in public spaces, a project to disseminate information and local news in regions with limited internet and a VR immersive news environment project.

Reacting is part of the media industry, one (especially the news industry) that has historically had a defensive culture (Boczkowski, 2005). However, this reaction has changed its nature with media labs: it has gone from a purely creative and journalistic approach to interdisciplinary solutions. From a topic-based, short-term innovation system embedded in a media cycle, to systematic experimentation away from continuous media production.

Besides developing innovation, catalysing change also meant helping new digital native initiatives. These were related to new business or revenue opportunities such as human-perspective multimedia stories, a data-driven agency for the media sector and an independent data agency specialising in the Information Access Law (Brazil). Finding new revenue streams or exploring new niches also connect to digital disruption challenges.

In this way, broad and conceptual solutions, even if less common in labs connected to the industry, seem to be acting/proposing a new ecosystem and/or anticipating needs. In turn, this may drive a wide range of experimentations from a multimedia website reporting eyewitness sources on the prevalence of transphobic violence to a media ecosystem mapping to guide systemic thoughts.

Moreover, output analysis reveals labs connect media and journalism to the core economic definition of innovation, along with intellectual and creative output. Nunes' (2020) media innovation

classification reveals a major presence of “Generative” initiatives (table 5), i.e. projects demanding a combination of technical and creative skills, going beyond the exploration of tools from other industries. One example is an experimental system for using data as currency for news.

**Table 5** - Type of media and journalistic innovation (n=30): labs connected to the media and/or journalism industry

Type of media and journalistic innovation	Projects	%
Generative	18	60%
Creative	7	23%
Reflective	3	10%
Exploratory	2	7%

Previous research (Evans, 2018) shows media and journalism innovation tends to be related to new narrative forms. Contrary to this, media labs appear to be connected to a more holistic view of innovation, prioritizing projects that demand development and implementation of functional innovation for production, distribution and/or consumption. Interdisciplinary opportunities may open a door for journalists and media professionals to deal with hidden affordances (Gaver, 1991) to produce outputs that integrate creativity and functionality that are enabled by technology. This can also be grounded on the small number of projects focused on new narrative forms (table 4).

Narrative experimentation tends to respond to a short-term strategy, possibly with a desire to maintain the status quo, something akin to the pragmatism of the culture of innovation in print journalism (Boczkowski, 2005). Even though responding to the challenge drivers of digital disruption, media lab outputs reimagine the scope and extent of media innovation in practice.

## 7 Conclusion

Media labs, as they have emerged globally as a structural, practice-based and content focused entity, are interpreted here as an open and ongoing response to ongoing digital disruption, shifting audience requirements, changing media ecosystems and the need to

innovate revenue streams. Through exploring motivations, processes and outputs, this paper demonstrates how they are being used to leverage people, technologies, ecosystems and networks to help build potential future ways of working, storytelling, publishing and monetizing journalism.

Media labs can be rendered as an organisational construct geared towards catalysing, absorbing, learning, creating and iterating media, and specifically journalism, innovations. They have expanded rapidly over the last decade and expand organisational frontiers towards a perception of interdisciplinary and replicable innovation, with the potential to impact the industry from multiple perspectives. They relate to the media and journalism industry or a broad media concept, with some academic labs, alongside or as part of teaching, establish journalism innovation projects as part of a much wider suite of research and development initiatives, and catalyse innovation across product, process, practice and business sustainability and resilience.

They are reactive to market, audience, and editorial conditions but generally do not engage in longer-term formative research and development to create “new” technologies. Instead, they are at the frontend of innovation: charged with short and medium-term exploitation of emergent technologies that they absorb into their organisation to test, assess and validate, even if developing new technological affordances. However, they are not usually faithful to technology as a core or dominant motivational driver (although there are some exceptions to this). They work, for the most part, with an innovation process(es) that privileges problems and then diagnoses technologies to solve them. In some cases, they test emergent technologies if they have potential journalistic function and value. Often, amid an environment of scarcity, they explicitly or implicitly revolve around removing labour for journalism publishers. Although removed from daily new cycles, they are guided by limited deadlines and resources, where, with lean teams, 31% of the labs deliver more than six projects per year and 24% more than 12.

Our outputs analysis identifies that media labs work within the realm of implicit innovation affordances: developing and implementing functional innovation for production, distribution and/or consumption for media and news. This generative innovation (Nunes, 2020) deals with coding and

technical skills but is removed from new (disrupting) hardware. In fact, it might not be the goal, as team learning and cultural change lead in terms of success metrics. Generative innovation, however, goes beyond the idea of soft innovation and locates journalists (along with an interdisciplinary team) as part of an innovation process that goes beyond content. These innovations tend to be within the scope of digital tools, platforms or access channels and new business or revenue opportunities. They won't radically change the ecosystem nor "invent" hardware or formative technologies, but herald interdisciplinary innovation related to media and journalism.

Lab activities can integrate the arts, technologies, and urban spaces, in initiatives that are located on the borders of different areas without a single defined disciplinary territory, blurring the boundaries between a functional and creative innovation dichotomy.

Labs are explicitly "other". They present a physical or conceptual space in which the media and journalism can experience a systematic innovation strategy outside the established product cycle, resulting in functional solutions produced by interdisciplinary teams that include journalists. This may mean the emergence of a new professional field of "journalism innovators", which may be consolidated in the coming years. In some ways, media labs demonstrate networked innovation, unveiling how journalists connect with others to create value – an emergent interest in journalism innovation research from 2015 on (Belair-Gagnon et al., 2020). However, media labs position journalists in a more central role in the creation and use of new digital tools and services.

Multiple labs regard themselves as innovative and disruptive, but when activities are viewed over a longer time frame, it could be argued that their outputs are configured to be generated and assessed over the short term as incremental. On the other hand, the labs are a medium to long-term measure to manage external disruption and internal change amid a background of digital transformation. Although they develop technologies, their main contribution is through catalysing cultural change.

This leads to recommendations for future work. This paper spans a four-year snapshot of media lab activities and environments. It does not offer a deep dive over extended periods to better understand the nuance of media lab operations and

how they connect, or not, with other parts of their organisations and wider communities, and what impact they have within wider contexts over long time frames. Questions remain over both the extent of this impact and how it can be/is measured. Also, our data is limited to leaders' perceptions of innovation, being most of the indicated projects not on the adoption stage yet, giving room for future studies on a broader range of projects developed within these structures.

Finally, our paper demonstrates that media labs are a process, cultural and technological response to external and internal conditions that are mandated to look outwards to new practices and knowledge in response to digital disruption and transformation. They translate their role to offer innovation and apply it within and beyond journalistic contexts for the perceived benefit of individuals, organisations and ultimately the communities they serve. They are one of the building blocks in creating the future of journalism: an environment that positions users as a focal point and seeks to create profitable, effective, and impactful organisations and journalism.

## NOTES

- 1 Case study methodologies are often used to explore media labs, for example: Hassan, 2003; Capoano and Ranieri, 2016; Canavilhas et al., 2018; García-Avilés, 2018; Finger and Fontoura, 2018; Hogh-Janovsky and Meier, 2021
- 2 Ubilab is a media lab part of GAMI/WAN-IFRA.
- 3 A full list of labs is available via the BJR open access database: <https://osf.io/gdzan/>
- 4 All quantitative data are based on Nunes's PhD thesis.
- 5 The list had 63 projects, but three had to be excluded due to insufficient information (no project name, website or description).
- 6 Labs focussing on media literacy programs were not the main target this research, which had prioritized labs catalysing or developing innovation.

- 7 Three labs didn't state promoting innovation as a main goal and haven't answered this question.
- 8 However, these skills did revolve around information technology professionals and journalists (with both present in 69% of the labs surveyed).

## REFERENCES

Belair-Gagnon, V., & Steinke, A. J. (2020). Capturing Digital News Innovation Research in Organizations, 1990–2018. *Journalism Studies*, 21(12), 1724–1743. DOI: 10.1080/1461670X.2020.1789496

Boczkowski, P. J. (2005). *Digitizing the News: Innovation in Online Newspapers*. Cambridge: MIT Press.

Capoano, E., & Ranieri, P. (2016). From Laboratories to Media Labs: Proposal for Actualization in Journalism Learning. *Journalism Research and Education Online*, 1(1), 40–56. Retrieved from <http://jre.sbpjor.org.br/index.php/revista1/article/view/22/21>

Canavilhas, J., Pellanda, E., & Nunes, A. C. B. (2018). Laboratórios de inovação: o papel dos media labs nas redações ubíquas. In J. Colussi, F. Gomes-Franco e Silva & P. Melani Rocha (Eds.), *Periodismo ubicuo: convergencia e innovación en las nuevas redacciones* (pp. 171–191). Bogotá: Editorial Universidad del Rosario.

Chesbrough, H. (2006). Open Innovation: A New Paradigm for Understanding Industrial Innovation. In H. Chesbrough, W. Vanhaverbeke & J. West (Eds.), *Open innovation: Researching a new paradigm* (pp. 1–12). Oxford: Oxford University Press.

Clarke, J. (2019). *Media Labs: What You Need to Know*. Twickenham: Aurora Metro Publications Ltd.

Dekker, A. (2011). The End of the Media Lab as we Know it. In: A. Plohman. (Ed.), *A Blueprint for a Lab of the Future* (pp. 276–285). Eindhoven: Baltan Laboratories. Recuperado de <http://aaaan.net/wp-content/uploads/2015/05/the-end-of-the-media-lab.pdf>

Dogrueel, L. (2013). Opening the Black Box. The Conceptualising of Media Innovation. In T. Storsul & A. H. Krumsvik (Eds.), *Media innovations: A multidisciplinary study of change* (29–43). Göteborg: Nordicom.

Dogrueel, L. (2014). What is so Special about Media Innovations? A Characterization of the Field. *The Journal of Media Innovations*, 1(1), 52–69. DOI: 10.5617/jmi.v1i1.665



Dogrue, L. (2015). Innovation Research in Media Management and Economics: an Integrative Framework. *Journal of Media Business Studies*, 12(3), 153–167. DOI: 10.1080/16522354.2015.1069478

Finger, C., & Fontoura, M. (2018). Reconfiguração da mídia pública: um estudo de caso do BBC News Labs. *Verso e Reverso*, 32(80), 121–132. DOI: 10.4013/ver.2018.32.80.03

Flores, A. M. M (2019). *Jornalismo de inovação: os Estudos de Tendências como ferramenta de pesquisa* [doctoral dissertation, Universidade Federal de Santa Catarina]. Repositório Institucional da UFSC.

Franciscato, C. E. (2014). Inovações tecnológicas e transformações no jornalismo com as redes digitais. *Revista GEINTEC – Gestão, Inovação e Tecnologias*, 4(4), 1329–1339. Retrieved from <https://ri.ufs.br/jspui/handle/riufs/1844>

Evans, S. K. (2018). Making Sense of Innovation: Process, Product, and Storytelling Innovation in Public Service Broadcasting Organizations. *Journalism Studies*, 19(1), 4–24. DOI: 10.1080/1461670X.2016.1154446

García-Avilés, J. A., Carvajal-Prieto, M., Arias, F., & De Lara-González, A. (2019). How Journalists Innovate in the Newsroom. Proposing a Model of the Diffusion of Innovations in Media Outlets. *The Journal of Media Innovations*, 5(1), 1–16. DOI: 10.5617/jomi.v5i1.3968

García-Avilés, J. A. (2018). Resultados de la innovación en los laboratorios de medios: el caso de El confidencial LAB. *Profesional de la Información*, 27(2), 359-466. DOI: 10.3145/epi.2018.mar.14

Gaver, W. W. (1991). Technology affordances. *Proceedings of the SIGCHI conference on Human factors in computing systems*. Retrieved from <https://dl.acm.org/doi/pdf/10.1145/108844.108856>

Glaser, B., & Strauss, A. (1967). *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Mill Valley, CA: Sociology Press.

Hassan, R. (2003). The MIT Media Lab: Techno Dream Factory or Alienation as a Way of Life? *Media, Culture & Society*, 25(1), 87–106. DOI: 10.1177/016344370302500106

Hogh-Janovsky, I., & Meier, K. (2021). Journalism Innovation Labs 2.0 in Media Organisations: A Motor for Transformation and Constant Learning. *Journalism and Media*, 2(3), 361-378. DOI: 10.3390/journalmedia2030022

Ito, J., & Howe, J. (2016). *Whiplash: How to Survive our Faster Future*. Hachette: Grand Central Publishing.

Knapp, J., Zeratsky, J., & Kowitz, B. (2016). *Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days*. New York: Simon and Schuster.

Küng, L. (2008). Media Management. *The International Encyclopedia of Communication*. New Jersey: John Wiley & Sons. DOI: 10.1002/9781405186407.wbiecm041

Küng, L. (2013). Innovation, Technology and Organisational Change: Legacy Media's Big Challenges. In T. Storsul & A. H. Krumsvik (Eds.), *Media Innovations: A Multidisciplinary Study of Change* (pp. 9 - 12). Göteborg: Nordicom.

Lindmark, S., Ranaivoson, H., Donders, K., & Ballon, P. (2013). Innovation in Small Regions' Media Sectors. In T. Storsul & A. H. Krumsvik (Eds.), *Media Innovations: A Multidisciplinary Study of Change* (pp. 127-144). Göteborg: Nordicom.

Mierzejewska, B., & Shaver, D. (2014). Key Changes Impacting Media Management Research, *International Journal on Media Management*, 16(2), 47-54, DOI: 10.1080/14241277.2014.954439

Miles, M. B., Huberman, A. M., & Saldana, J. (2020). *Qualitative Data Analysis: A Methods Sourcebook*. CA: SAGE Publications Ltd.

Mills, J., & Wagemans, A. (2021). Constructing Laboratories, Innovating the Future: How Journalism is Catalysing its Future Processes, Products and People Through Media Labs. *The International Journal of Research into New Media Technologies*, online first, 1 - 26. DOI: 10.1177/1354856521994453

Mioli, T., & Nafria, I. (2018). *Inovadores no Jornalismo Latino-Americano*. Austin: Knight Center.

Nicholls, T., Shabbir, N., Graves, D., & Nielsen, R. (2018). *Coming of Age: Developments In Digital-Born News Media in Europe*. Oxford: Reuters Institute for the Study of Journalism. Retrieved from [https://reutersinstitute.politics.ox.ac.uk/sites/default/files/2018-12/Nicholls\\_Developments\\_of\\_Digital\\_News\\_Media\\_FINAL\\_0.pdf](https://reutersinstitute.politics.ox.ac.uk/sites/default/files/2018-12/Nicholls_Developments_of_Digital_News_Media_FINAL_0.pdf)

Nunes, A. C. B. (2020). *O que é inovação em mídia e jornalismo? Uma análise de media labs e seus projetos* [doctoral dissertation, Pontifícia Universidade Católica do Rio Grande do Sul]. Repositório Institucional PUCRS.

Nunes, A. C. B., & Mills, J. (2019). *Media Labs*. Paris: WAN-IFRA. Retrieved from [https://wan-ifra.org/wp-content/uploads/2020/09/WAN-IFRA\\_TIN\\_MediaLabs.pdf](https://wan-ifra.org/wp-content/uploads/2020/09/WAN-IFRA_TIN_MediaLabs.pdf)

Picard, R. G. (2005). Unique Characteristics and Business Dynamics of

Media Products. *Journal of Media Business Studies*, 2(2), 61–69. DOI: 10.1080/16522354.2005.11073433

Plohman, A. (2010). Introduction. In A. Plohman & C. Butcher (Eds.), *The Future of the Lab* (pp. 9 – 16). Eindhoven: Baltan Laboratories.

Posetti, J. (2018). *Time to Step Away from the 'Bright, Shiny Things'? Towards a Sustainable Model of Journalism Innovation in an Era of Perpetual Change*. Reuters Institute for the Study of Journalism. Retrieved from [https://reutersinstitute.politics.ox.ac.uk/sites/default/files/2018-11/Posetti\\_Towards\\_a\\_Sustainable\\_model\\_of\\_Journalism\\_FINAL.pdf](https://reutersinstitute.politics.ox.ac.uk/sites/default/files/2018-11/Posetti_Towards_a_Sustainable_model_of_Journalism_FINAL.pdf)

Salaverría, R. (2015). Los labs como fórmula de innovación en los medios. *Profesional de la información*, 24(4), 397–404. DOI: 10.3145/epi.2015.jul.06

Stoneman, P. (2010). *Soft innovation: economics, product aesthetics, and the creative industries*. Oxford: Oxford University Press.

Storsul, T., & Krumsvik, A. H. (2013). What is Media Innovation? In T. Storsul & A. H. Krumsvik (Eds.), *Media innovations: a multidisciplinary study of change* (pp. 13–26). Göteborg: Nordicom.

Taylor, S. J., Bogdan, R., & DeVault, M. (2015). *Introduction to Qualitative Research Methods: a Guidebook and Resource*. New Jersey: John Wiley & Sons.

Tanaka, A. (2011). Situating within Society: Blueprints and Strategies for Media Labs. In A. Plohman (Ed.), *A Blueprint for a Lab of the Future* (pp. 12–20). Eindhoven: Baltan Laboratories.

Wershler, D., Parikka, J., & Emerson, L. (n.d.). *What is a Media Lab? Situated Practices in Media Studies*. Retrieved from <https://whatisamedialab.com>

Wilczek, B. (2019). Complexity, Uncertainty and Change in News Organizations. *International Journal on Media Management*, 21(2), 88–129. DOI: 10.1080/14241277.2019.1590839

Zaragoza-Fuster, M. T., & García-Avilés, J. A. (2020). The Role of Innovation Labs in Advancing the Relevance of Public Service Media: The Cases of BBC News Labs and RTVE Lab. *Communication & Society*, 33(1), 45–61. DOI: 10.15581/003.33.1.45-61

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