Convergent Digital Media in Journalistic Newsrooms: an Ecosystem Perspective

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ABSTRACT

A model for digital newsrooms' ecosystem is proposed. It is structured in layers and adapts the semantic sphere approach. The model assumes that the cooperative and distributed news generation routines can be managed from various media and especially through a convergent digital media inside the newsrooms of the informative industry. In so doing, we enable workers to make effective use of technologies to engage in meaningful cooperative work and social practices.

Categories and Subject Descriptors

C.0 [**Computer System Organization**] System Architecture; I.7.1 [**Document & Text Processing**]: Document & Text Editing - *Document management*

General Terms

Documentation, Design, Human Factors, Languages.

Keywords

newsroom ecosystems; production news management; collective intelligence; semantic journalism.

1. INTRODUCTION

Traditional journalism loses readers every day. It is impacted by new habits of the post-digital generations that are required to participate in the news production process and do not accept the hegemonic distribution of information [1] Simply displaying information in sites and portals does not satisfy anymore the exigencies of new consumers. Particularly in the newspaper industry, mobile devices allow the spread of instant news, with features that complement and contribute to add veracity and credibility to reports: videos, animated graphics, photo galleries, music, in addition to public participation [3]

Thus, it is useful to monitor the news development process in digital newsrooms in order to map the late demands of the public and to know how news can be consumed by users on different platforms, including mobile devices such as smartphones and tablets. News is graphically and visually supported by these devices, so this brings yet more requirements and challenges to the newsrooms, with the growing possibility of connection, the uninterrupted use of geolocation features, and innovative forms of visual, tactile and responsive presentation.

This paper describes an integrated, ecosystem-based approach to study the ongoing process of adapting printed newspaper offices to the novel requirements of multiplatform information distribution. In so doing, we model how the news production routines in newspaper companies are moving to absorb the new mobile devices; and intend to show how all this information ecosystem can be understood under the logic of the systems that organize and provide its management with users being the ultimate recipients. Our challenge is to transform all the data into knowledge, by engaging in what is being called participatory digital memory, and transforming "the digital medium in a reflective observatory of our collective intelligence" [16].

2. NEWS PRODUCTION

We understand journalism as an intellectual activity of knowledge production, whose objective is to provide updated information to society in the form of news. We consider journalism as an "owner" or representative of a discourse type, expressed through narratives. The concept of "news" can be taken as a model or basic unit for the construction of significance, and it is based on the reporting and writing under a format that is adapted to platforms such as radio, newspapers, TV and digital media. In a broader sense, news represent the "journalism metonymy" [17], that is, when one reads news, one reads journalism.

The Theory of Newsmaking is used to study this subject, starting with the preparation of the news reports and newsworthiness criteria, as well as the research of conditions to develop these tasks.. The results are news products made available to the public on the specific characteristics of the periodical press [24] We then enter on the specific issue of the content that is produced and, in

particular, the thousands of lines coming out every day from news organizations. Three areas of investigation compose this study field: (a) the journalistic routines; b) the content of information and the impact of information products; and c) the news as a construction of reality [23][25].

So, the theory of newsmaking - part of which has been called the Journalism Theory - can join the "two binary" of professional culture: i) the working organization of the journalists and ii) the news production processes [25]. Via the newsmaking process, it is possible to make a sociological analysis of news production and to verify how the construction of mass media messages takes place. In this context, one of the contemporary challenges that newsrooms face is that of digital media convergence, which shall now be elaborated upon in more detail.

2.1 Towards Digital Convergence

News media organizations in the world have been adapting their corporate strategies to the specific demands of the evolving communicative environment. Digitization and convergence reached the newsrooms in the eighties, when great hopes and expectations still covered the eyes of the media owners, who – at that time – overestimated the potential of the Internet to deal with the uncertainties of the future.

Therefore, online news production became part of the business of the newspaper industry, because it was being forced to adopt practices that promote synergies between media of the same group: a phenomenon called digital convergence. We now recognize that convergence affects many aspects of media companies—technological, cultural, economic and management —and challenges the media industry to review its strategies at least in two dimensions: professional and organizational.

The current context is evidenced by a recent survey of 13 countries [2], which highlighted that Brazil is a country with a growing consumption of media content through tablets and smartphones, with average reading rates on such devices being double those associated with of other platforms. Moreover, the number of people connected to the Internet in Brazil is growing rapidly, with annual population growth above 10%. Once the use of new technologies has grown rapidly worldwide, studies show that by 2025 most of the global population, estimated at 8 billion people, may as well be online [21].

Furthermore, we now face the wearable technology phenomenon, in addition to the by now traditional ubiquitous informational paradigm. These recent trends are also novel for the newspaper industry, which is trying to adapt itself to the plethora of novel devices. There is no doubt that the news production involves long and concerted collective effort of the media industry. A challenging outcome of this field is created by the dissemination of information and communication technologies: a certain familiarity, especially within the younger generations, with the devices and electronic resources, and thus creating a generation of readers who had not been previously included among the components in the traditional modus operandi of the news production process.

Nonetheless, the media industry enters the news convergent market with the same recipes of the past, and therefore tends to make the same mistakes, when, two decades ago, the Internet could only be imagined as a kind of "digital arm of its operations" [4]. In principle, new and emerging media mimics or is sustained by old existing media (TV copied the radio, the printed newspaper had the style of the previous newsletters). The news content in tablets and smartphones tende to reproduce the same situation, with very little real innovation in its products or in the journalistic services. However, everyone is looking for a way to realize integrated and converged communications.

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3. NEWS AS A CONVERGENT PRODUCT

Convergence, integration, cross-media, multimedia, multiplatform: many of these are the associated concepts, according to Salaverría and Negredo [20] a phenomenon that usually generates divergence with respect to the media. In a generic sense, media convergence is the merging of communication markets (print, television, radio, internet) with portable and interactive technologies through digital platform presentation [11][12].

Convergence can be viewed from various angles and may have different facets [8]. According to Kawamoto [13], convergence would be "the merging or joining technologies and services historically separated." The media convergence movement took shape from recent technological developments, especially the emergence of the Internet and the digitization of information, which resulted, in the eyes of journalism, in the use of digital technologies to investigate, produce and make available news "to an audience increasingly more familiar with the computer."

In this paper, we deal with the concept of informative turbine: a convergence model that aims to help companies to structure themselves, in the process of news reengineering, and enable them to offer products and services for various media, from an input: the facts. The concept of informative turbine (Fig. 1) is that the journalistic work should flow as an industry of online information production: multimedia, multiplatform and multi-channel. According to Soria [22], "The newspaper has to be planned as multiplatform once everyone is multimedia and multiplatform-based". The migration to a such new environment has generated anxiety and confusion in newsrooms, leading to a crossroad in the communication services being offered, not hitherto seen since the beginning of the Internet.

The media company should, according to this idea, function as a plant, organizing the production in connected circles: on one
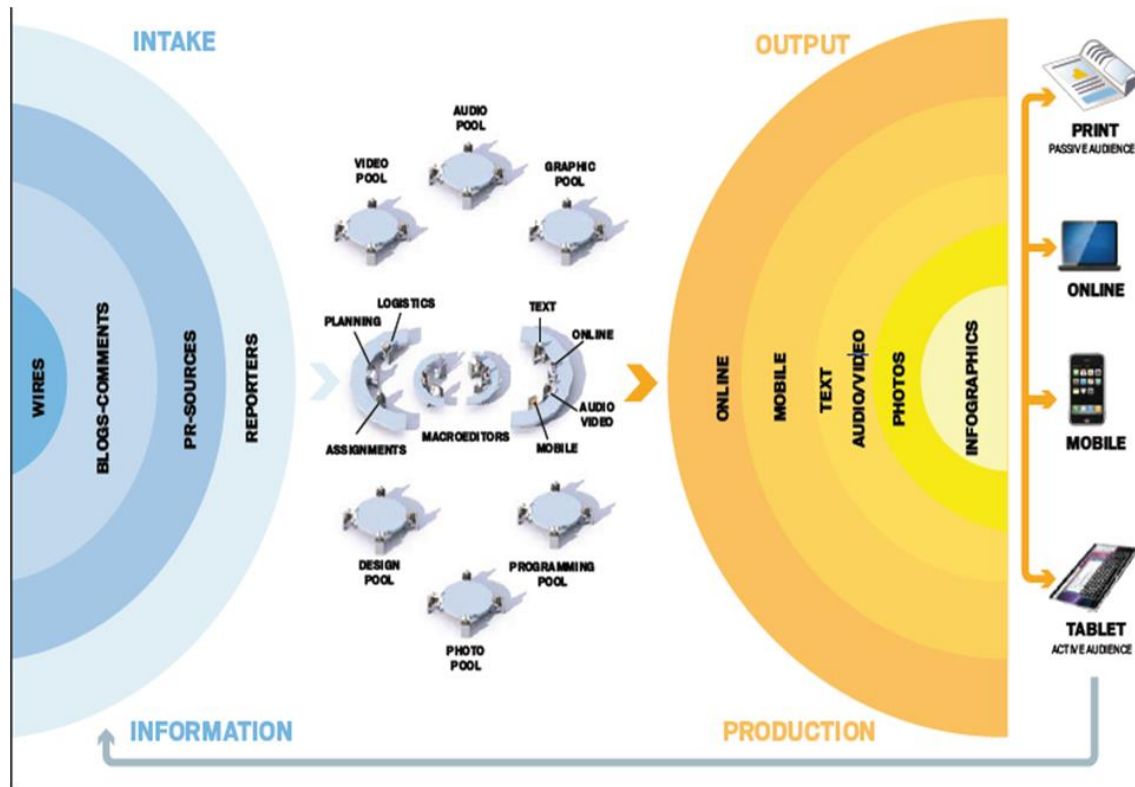
Figure 1. Informative Turbine (adapted from [26])

hand, enters the raw product; it is refined (for the various uses to which it can be done); and then distributed by a network of channels. The most efficient networks operate in continuous flow, changing and adapting to the innovations required by the reader. Thus, the new narratives of the 21th century require a reinvention of workspaces to accommodate the multimedia editorial team, connected through platforms 24/7 to its potential audience.

To disseminate news on mobile devices firstly means the end of the sense of deadline for closure of issues, as rooted by traditional paper newsrooms. Due to the fact that it is intended specifically to the virtual environment, the informative in the digital environment ignores problems of the past, such as the cost of paper or the distribution logistics of printed material. Moreover, these cases are currently augmented with the power of social networks and instant messaging systems accessed by mobile phones.

In turn, a newspaper presented on a mobile device, using multimedia channels and multi-modal access, lay the premises for a different mind-set, not only in the productive mode, but also in the relationship with the reader. Furthermore, the product is always online and the reader will always access it at any time of day or night. If the idea is to fill the gaps of an always-on/always-on-you society [4], which is focused on the consumer and their demands, the communication vehicles have kick started the race to update and adapt content on multiple devices. This will result in a complete restructuring of the news content systems provision on multiple platforms.

The model of turbo-convergent newsroom, is governed by strict journalistic deadlines, as noted by Soria [22], who highlighted that knowing the habits of readers is of crucial importance so that

information can be returned to users in forms of symbolic and diffused knowledge. We could thus summarize the converged digital process in five phases: 1) essay digitization; 2) implementation of the peculiar writing structures for online journalism; 3) physical integration of traditional and online newsrooms; 4) development of novel languages according to the public interest; 5) fusion of structures, making them indistinguishable.

4. A DIGITALLY CONVERGENT SEMANTIC JOURNAL ECOSYSTEM MODEL

The proposed model in this paper is focused on the need for interaction of professionals working with increasing information volumes, with text, image, video and diversified digital media, by using new information technologies (IT), and by taking advantage of ubiquitous computing and distributed processing, besides the Semantic Web facilities for building creative dialogues, supported by convergent and hybrid multimodal technologies

4.1 Information Economy Meta Language IEML

A scientific approach in the study of human cognition has been proposed [15][16] via a semantic sphere model: the specification of an Information Economy Meta Language (IEML). This model is used to represent concepts by a set of points in a coordinated system which allows the observation and representation of human cognitive processes according to time and space, actual and virtual, also enabling the interdependent co-emergence of the virtual and actual spheres [16].

The Semantic Sphere model [16] constitutes the mathematical-linguistic structure of a digital hiper-cortex, which allows to observe and simulate human cognitive processes according to time and space, actual and virtual, also allowing the interdependent co-emergence of the virtual and actual spheres. One may say that the symbolic dimensions of the human condition occurs via the dialectic interaction between three types of manipulations: a) symbol manipulation, or signifiers, which corresponds to the syntactic function; b) concept manipulation, or significance, that corresponds to the semantic function and c) the manipulations of data or referents, which corresponds to the pragmatic function.

In the **syntactic function** one represents the general categories by using systems of symbols (languages, writing systems, icons, etc.), or the symbolic cognitions, to decompose, organize and reorganize significant and complex structures, according to an automatic generation and specification model of generative grammars [7]

The **semantic** (or **dialectic**) **function** is not limited to the logical reasoning, but also comprehends opposition games, complementarity, analogy, linguistic derivation and composition between meanings, including all refinements of dialog and narrative, by explaining human´s capacity to produce and to understand conceptual architectures that can be indefinitely complex. The dialectic ability of semantic function commands the cut, the synthesis, the transformation and the ordering of meanings in relevant structures [16]

The **pragmatic function** considers the notions of pertinence of conceptual architectures, which implies a real or fictitious situation within which meanings are referred to. The concepts categorize sensorial data according to a practical intention, by using both effectively perceived, remembered or imagined data. Concepts are used to manipulate data, or percepts. The pragmatic function follows the immersion of a thinking subject in the temporality of memory and action.

From the memory side, data is sensitive and organized in its conceptual meaning and in its affective value. In action, the pragmatic function categorizes the percepts in functions of the subject´s proposals, and maintains compatibility between emotive and conceptual memory. The pragmatic function aims the effective action, above all, by being subordinated to the fineness and pertinence of conceptual and affective interpretation of data.

After attaining an affective value to the categorized percepts, the pragmatic function produced connected ideas via semantic relations of its concepts and via sensitive relationships of its precepts. The ideas exchange their affects and get organized in ecosystems, due to its rhetorical ability towards both the speaker and the public. In this network dialogical relationship, both transmitters and receivers constantly exchange their roles, by configuring specific dynamics in the semantic space.

4.2 Semantic and Integration Challenges in Newsroom Production

The professional journalist has to deal with an increasing amount of news sources, in the form of video, text, messages, graphics, photographs, interviews and user-generated content. Some of them can be transformed in breaking news stories, but this is processed manually and individually. Sometimes journalists use search engines or online tools to sort some of that volume of information but no machine can verify the nature or the veracity of information except by the journalist him/herself.

Semantic Journalism proposes a semantic-based solution that can formalize and link unstructured content for the integration of activities in a convergent newsroom, as well as fact-checking purposes and decision-making across multiple platforms. We could say that Semantic Journalism is the convergence of technological and cultural trends [10] within a news ambiance, using ontologies to provide a formal and semantically enriched description of concepts that can benefit shared understanding. In short, Semantic Journalism's main objective is to facilitate sharing, or the coordination of mental processes and reuse of news in digital journalism, by applying linked data principles to publication and archival for better interoperability [8].

The emergence of the Semantic Web and its associated technical and technological artefacts has thus impacted on the journalist's role as a communicator in his/her own field of communication. Accordingly, in this new context., increased audience participation in news production, coupled with the increased multi-skilling and simultaneous de-skilling of journalists [12], as well as the excess of available data on the Internet, all constitute novel challenges [19]. Whilst some of these can be met through the use of Semantic Web technologies, their impact on the journalistic ecosystem has to be examined across strategic, organizational and technological levels [5]

Whilst investment in digital facilities has set the basis for a more integrated operation amongst the different news media outlets, finding a workable template to implement professional cross-media practices has been more complex than expected. This enables the radio, television and online newsrooms together in the same physical space, even if this model has different outcomes in terms of cooperation across media and journalists' involvement [14]. Moreover, the information systems for convergent newsrooms must support different recommendation models for single and multiple users that address several recommender systems - and they use semantic technologies [6].

In this context, multimedia such as text, video and image, becomes available on the Social Web, and almost at the same time, semantic web, metadata, natural language processing (NLP) and other technologies will provide the framework for Social Semantic Journalism [18].

4.3 Proposed Model

The model proposed is based on an architecture comprising four successive, concentric, layers centered on a digital core: Data; Semantics; Collaborative and News, (Fig. 2). The interfaces and the services of the proposed architectural model represent the actions and functions relevant for the mapping of the abstraction corresponding to each layer of the real and virtual worlds, implemented via ubiquitous multimedia tools and devices.

Given the considerable amount of data available to and produced by the news industry the proposed model represents an opportunity to address this challenge. Thus, the innermost layer – the Data layer – concerns itself with the treatment, transport and storage of data. Whilst analog scanning has enabled the conversion of legacy data into digital formats, its storage in cloud-based repositories is efficient in the long-term and facilitates a steady expansion of digital artifacts. This process also eases the standardization of data and metadata as well as multimodal access to these resources and media.
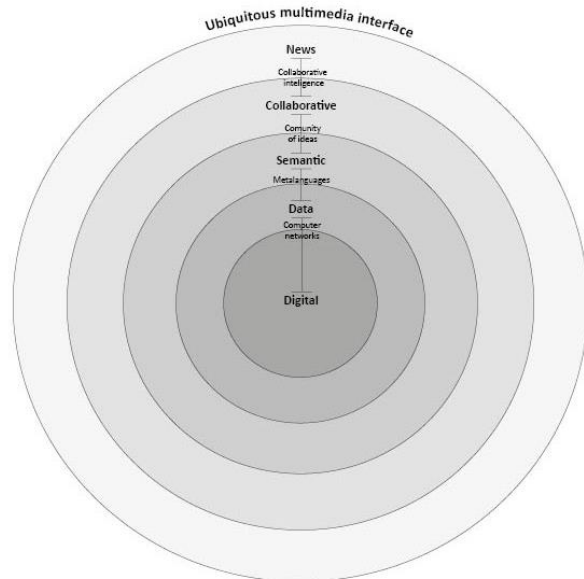
Figure 2: Ecosystem of Digitally Convergent Newsrooms

The second concentric layer – the Semantic layer –comprises the various meta-languages developed, based on metadata and ontology, connecting URLs to the corresponding concept or text - USLs (Uniform Semantic Locators) - thereby allowing semantically computable addressing. The mappings of concepts are structured in networks and semantic relationships which give meaning to the information management process, achieved through collaborative processes of production and creation of media on various platforms.

The third layer – the Collaborative Layer - incorporates the collaborative aspects of newsrooms; here the social networks hosted by the various platforms play a supporting role in collaborative work between people whilst producing news content.

The last and outermost layer – the News Layer – encompasses the collective intelligence, now in a dynamic and continuous process of convergence in the newsroom ecosystem. This layer is a direct result of the newsroom ecosystem in context, historically constituted by data storage via semantic interpretation of dialogical co-operation processes, supported by semantic data models and information flows permeating the ubiquitous multimodal platforms in the real and virtual worlds. Lastly, the interface with the real and virtual worlds is then achieved through multimedia content on mobile devices.

5. CONCLUSIONS

Whilst journalism – in general – and news production – in particular – have tentatively adopted Semantic Web technologies, the phenomenon of digital convergence has brought new challenges to newsroom production. Accordingly, in this paper, we have presented a semantically-underpinned model for ecosystems characteristic of digitally convergent newsrooms.

This model will be subsequently refined and validated in the newsrooms of four leading newspapers: The New York Times (USA), the Guardian (UK), O Globo (Brazil), and La Nación (Costa Rica). In so doing, we also expect to develop theoretical and experimental research about digital registers, information structure, and disclosure to formal user networks of intelligent devices and their impact in the computing, communication and education areas. Moreover, as future work, we will also evaluate the impact of semantic models on the collaborative working process, as well as undertake usability analysis of news software on mobile devices.

6. ACKNOWLEDGMENT

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