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An approach to the taxonomy of data visualisation

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Abstract

Introduction: In the new visual media there is a tendency to use enormous data sets to build documents that are useful in different ways. To this end, graphic representations of data sets are created to highlight the most immediate, meaningful and educational data and make the information more easy to understand for readers. **Method**: This article aims to bring some order to the polysemy and synonymy of the terms that are often used in the production of graphic representations and to develop a prototypical analysis of the various types of documents presented in the so-called data visualisations. **Results and conclusions**: The taxonomic classification is a contribution to visual communication studies and highlights the interest of the media companies on using data visualisations that are easy-to-interpret, rapid-to-produce and low-cost (when their programming can be used to visualise other types of content).

Keywords

Visualisation; infographics; visuality; visual narrative; data.

Contents: 1. Introduction. 1.2. Data visualisation. 2. Method. 3. Data visualisation types. 4. Conclusions. 5. Notes. 6. List of references. 6.1. Related references.

Translation by **CA Martínez Arcos**, Ph.D. (Universidad Autónoma de Tamaulipas).

1. Introduction

Long time ago humans discovered the ocular portal to knowledge. This has been so important in the past, that the approach of multimedia models in the age of the cyber-media has given priority to the

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use of visual languages. In most cases, what cannot be touched, smelled, heard or tasted, can be represented visually.

Neuropsychiatrists, like Xaro Sánchez (2007), consider that the sense of sight and art works can allow any website to communicate knowledge. This visual communication is also artistic and that is why some scholars claim that art should be used primarily to transmit knowledge, even more so than for the aesthetic purposes that are inherent to art.

But there are two opposing types of art: the so-called facts graphics, also known as graphics information, and the flavour graphics, which is understood as a decorative type of graphic art. In other words, the visual properties of the content and the visual properties of the art of representation co-exist in the same document (see Cairo, 2011: 19).

Some types of graphism resemble others but the contents are different and so is the representation of the signifiers. A medical development and a meteorological development are not the same: the first thrives on scientific progress or principles and the latter on data continuously provided by the natural environment; sometimes they reflect the significant key issues with figurative forms that reflect nature more or less. Sometimes what dominates is the content and some other times the dominant element is art. However, currently there is a great interest in discovering and visualising the knowledge contained in databases, based on unsupervised neural network technology (see Sotolongo, Guzmán and Carrillo, 2002: 477).

The term “visual” possesses some polysemy and synonymy. Certain confusion on these concepts is quite extended since the same concept refers to ocular properties, modern processes and the necessary visual literacy of the audience.

Visuality and visualise refer to different things. According to important dictionaries: the concept of visuality is used to describe a pleasant effect when creating eye-catching objects, while the verb visualise is used to refer to the optical representation of a variety of phenomena.

The first the concept refers to the artistic product created to produce connotative aesthetic feelings (flavour graphics, fine art, etc.) while the second refers to the generation of a product that reproduces some ideas that are comprehensible with denotative knowledge. Both properties merge in a representation.

The so-called visualisation is one of the most important characteristics of visual representations; no communicative property is more important and powerful than that designed to be understood by the interpreters. Human beings have always used visualisations based on visually-decoded languages in order to make messages last in time.

Thus, when art is mentally visualised, hunting or the form adopted by an animal in its assault, for example, can be imagined by people who have not experienced this event; people just have to close their eyes and, thanks to their experience and the morphological simulation and of their movements, they can reproduce the sequence of the hunting and understand it.

This is how Albrecht Dürer drew his famous rhinoceros, an animal which he had never seen before: explorers described the animal to him, he visualised it and drew it afterwards. How else could he draw the animal if he had not visualised it mentally? Julio Verne did the same thing when he described voyages he had not experienced. Visualisation is therefore a property of human beings capable of generating mental and visual images by transforming the former into the latter.

Visualisation differs depending on the platform and the representation of the interpretant. Visualisation is created with capture or synthetic systems, and has spatial-temporal limitations that prevent its optimisation because it does not reflect all the times and key moments of nature and reality, and its limited to the visible elements. However photography and videotaping can also transform nature and reality synthetically.

Graphic synthesis, also called synthetic visualisation, consists of a set of properties that seek to represent reality completely and to develop the (descriptive, narrative or interpretative) story of an event, not just the visible elements of nature. Fonts and typefaces are replaced by iconic languages, infographic visualisations and visuality systems. As discussed in previous works (see Valero, 2012b, 2008), we can create graphic synthesis of events and their fortuitous acts, the actions of living beings, documents, stored data or data generated in the present, and material or intangible objects of diverse origins, in many ways.

On the other hand, in the real world there are natural, infrastructural and intangible manifestations with referential properties, which can often be measured to provide data that allow the identification of trends, predictions, and the establishment of relational patterns. "Interactive graphic interfaces in general and the application of interactive visualisation in particular, bring new techniques to manipulate data" (Manovich, 2011: 148).

1.2. Data visualisation

Data-based visualisations aim to build a graphic, synthetic or complementary set that highlights the most significant elements or key issues, in order to enable understanding, establish groups, relations, or statistical trends, in order to minimise entropy and facilitate the drawing of conclusions for its interpretation. The so-called data mining used within the field of technical or scientific observatories can provide many tools of general usefulness (Sotolongo, Guzmán, Carrillo, 2002: 482).

Data are representations of quantified variables or attributes, originated from sampling and its subsequent alphanumeric or visual transformation (which provide points, and not numbers or letters) about a more or less significant subject matter, event, action or thing.

Its significance often arises from the feelings that are unmasked when they get accumulated or when statistical trends are associated with such data. They are often the documentary and informative basis, with reduced uncertainties, necessary to make decisions about very varied contents, from journalism to science. However, in general terms, some inherent aspects must be taken into account:

1. Data are coded records of observations of reality, are conventional annotations about what is detected in the study of the phenomena that occur in the real world.
2. In the study of real-world phenomena, actions and things can appear either as static data or active data that are undergoing constant transformation or changes. The first type of data can be historical the second ones are subjected to variations caused by their challenging nature or reality.
3. The way to obtain data is not uniform; they are not always obtained by phenomena-measuring devices, although sometimes they are directly measurable or estimated.
4. The devices used to measure variables are not flaw free and may contain errors in their readings and errors attributable to the users.
5. Often, data are obtained in attributive ways and are not based on measurable variables, so they cannot be considered to have the precision of other types of data.

6. Data can be the result of the analysis of selected and limited samples and not of entire populations, phenomena or objects, as it happens in statistics and polls.
7. Data can originate from measurements or result from processes that modify their magnitude, such as the logarithmic values that transform geometric quantities into arithmetic quantities, or all kinds of translations/adaptations, so that they can be understood in the context in which they are presented.

Graphic representations of data or data visualisations are built with basic graphic units, lines, points, areas (surfaces and volumes) with flat colours or with complex graphic units like iconic images (see Bertín, 1967) and monochromatic or polychromatic drawings. With the expansion of computer technology in the late 1980s, the written press began to create comparative visualisations to accompany, replace or implement information and, thus, allow the written contents to focus on other issues, or simply to be more effective in improving the understanding of the information, with a supplementary purpose in the news and feature articles. With the arrival of computer graphics and programming online newspapers began to present new models that emulated those often used in the field of physics and statistics. Although these representations were not new, all the new technological advances of the time were exploited to build certain classifications based on semiotics (see Córdoba, Alatriste, 2012).

The so-called data visualisation (DV) deals with this type of processes, based on the principle that data representations generate descriptions and even narratives in some cases. DV can simplify, measure, compare, explore, discover, and partially explain things in order to transform data into key knowledge. Infographic documents can be understood as expressive products whose main source is diverse and reliable data. They are created to compare and visualise ideas through data-based graphism.

Some moments in the history of visualisation are worth remembering:

- 1637: René Descartes, in his book *Geometrie*, presented the Cartesian coordinates that have been so used in science and technology.
- 1644: Michael F. Van Langren uncovered inaccuracies in the terrestrial longitudinal measurements through the observation and mapping of the moon.
- 1765: Joseph Priestley used the timeline charts for the first time.
- William Playfair(1759-1823) designed pie, bars, and time charts.
- 1858: Florence Nightingale developed graphics comparing the causes of mortality in field hospitals during the Crimean War and in England hospitals.
- 1869: C. J. Minard drew up the well-known chart about the loss of soldiers in the invasion and withdrawal of Napoleon’s army in and from Russia from 1812 to 1813.
- 1911: Henry l. Gantt planned industrial working times in a systematic way through the so-called Gantt chart.
- 1913: Hertzsprung-Russell presented his diagram for the study of stars’ luminosities and colour temperature.
- 1924: Sociologist Otto Neurath created ISOTYPE, which is a symbolic way of representing quantitative information through interpretable icons in order to complement texts.
- 1991: Tim Berners-Lee invented the World Wide Web.

Over the past two decades there have been important transformations in the fields of visualisation, infographics, information organisation, cognitive psychology, linguistics, and other previously unrelated fields of science. The emergence of computer technologies and particularly the Internet have transformed the landscape.

Some models of DV began to be used in various fields with different names like mapping, treemapping, *impactopias*, *jardines*, sparklines, digital cities, etc. (See Dürsteler, 2003) **[1]**.

Currently, there are some out-standing proposals made by authors such as Shneiderman, who created the "treemaps" for dynamic query analysis in temporal and multidimensional series of data, even data extracted from social networks; MacKinlay, who used the concept of "information visualization" in his designs in 1999; and Munzner, who studied the fundamentals of graphics at the end of the first decade of the 21st century (see Card, S. K.; Mackinlay, J. Shneiderman, B., 1999).

Visualisation is a resource widely used not only in the media but also in public and private institutions that use these representations to explain important information to very heterogeneous citizens. "The important information from more than a million measurements is immediately available. Visualisation allows the perception of emergent properties that were not anticipated" (Ware, 2004: 3).

In the world of journalism there are some professionals who have implemented partial data representations, such as the veterans Alejandro Malofiej and Peter Sullivan and the contemporaries Amanda Cox, Mario Tascón, Jordi Català, Jeff Goertzen, Rafael Hörh, Chiqui Esteban, Tomás Alhambra, Xaquín González, Juan Pablo Noriega, Jaume Serra (see Serra, 2010) and Alberto Cairo, among others. All of these journalists, some with more than thirty years of experience, have made good visualisation proposals in their respective media, with and without computer support.

2. Method

Taxonomy is a practice and science that allows us to determine the status of a subject and to propose useful models for specific communicative situations. There have been attempts to classify DV, but not from the field of journalism, which does not offer any updated classification. For this reason we have decided to review the characterisation of the different categories that have been configured so far, with the collaboration of some of the journalists mentioned above.

Diverse models with very different solutions to present content have been developed. Traditionally, different types of infographic formulas have been created without the use of new software, like the representations of Bertin in *Semiologie grafique* and previous works, but other formulas to present data by taxonomy have also been created (Shneiderman, Plaisant, 2009: Chapter 14).

However, DV production has changed as a consequence of technological developments, and the types and levels of information derived from the recent computer organisation of infrastructures and superstructures, which has resulted in progress, as a consequence of a change of approach in the field of public relations of the associations and institutions that feed the newsrooms with data sets that are not easy to represent and do not have clear communicative usefulness.

The analysis of more than 500 DV published in recent years (200 of them in printed media) was aimed to identify new and different types of DV. However, we only found a few really different DV models, although these models showed variations when they were applied to different data sets, were given different functionalities, or were based on a different production technology.

Our classification covers from the classic presentations adapted from what was printed in the journalistic media, to the most modern proposals made by newspaper websites. We distinguished between the traditional models with specific variations motivated by the type of content they represent, like the models 1, 2, 3 and 4, and the clearly distinct models that use very modern instruments, like the models 5, 6 and 7. On the other hand, we distinguished the first seven models, which are understood as basic visualisations and often combine (Manovich, 2013: 215) different basic graphics with mixtures of any of the other seven types, from those generally termed miscellaneous, as model 8, which are understood as several visualisations presented together in a single, comprehensive model.

Given the great versatility of the presentations in terms of content, it does not make sense to aim to identify pure models in terms of communication. As often suggested by the various professional infographic artists, it may be advisable not to incorporate large amounts of information in the DV.

The typological study does not focus on the movement, the large multimedia techno-graphics in three or four dimensions, the very original documents, the visualisations resulting from large research studies, the big data visualisations, or the most complex algorithms, because they are elemental qualities that all types of DV can contain.

The central objective was the systematic study of the parameters in order to know the valid prototypes to predict their use in new documents. The study covers all kinds of cyber-journalistic spaces, but focuses on identifying those spaces that mostly include journalistic data visualisations, including several models of this type, and dismisses those media that mostly include persuasive, techno-graphic, fictional or artistic types of data visualisations.

We selected a subsample of the 100 most representative digital data visualisations, from the observation of a multitude of publications made since 1990, including the first studies presented since the emergence of cyber-journalism. This subsample provided differential details, with the identification of a total of 8 different types of DV, which are repeated depending on the proposals of the media that use them the most, and means that they are the most-used types during these times in cyber-journalism. This study should be considered as the analysis of a sample of evidence that is open to new possibilities, as technology and other branches involved develop.

All the samples were located and reviewed in advance, but they were retrieved from the Internet on the same day: 10 April 2014 from 10 a.m. onwards. We reviewed what may be understood as data visualisation, limited to the context of recent years and the prototypes generated during this time in the models presented in the recognised journalistic websites, "knowing that there is a technical-communicative convergence and an integration of the traditional media with the Internet natives" (Cebrián, 2009: 21).

3. Data visualisation types

The general taxonomy that we have developed from the review of a sample of data visualisations is based on the repetition of models. Based on the analysis of one hundred visualisations, we have developed the following categories:

1. Spatial visualisation: Is the data-based comparison of spaces, confluence of points, lines, or coloured areas. The records and fields (continuous or in intervals) of a database can be presented visually represented through bars, pies, circles, "thematic streams", accumulated layers, "spider webs", point clouds, icons, drawings, words, etc."

The digital system separates texts in information pieces by incorporating other languages but sometimes it complements them with typographic languages.

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This type of DV is the most-used and can be constructed in many different ways based on variable records and data or their representations (rates, percentages, logarithmic values, etc.). This type of DV was the most common in the sample (38%) and also the least original in most cases (see Figure 1).

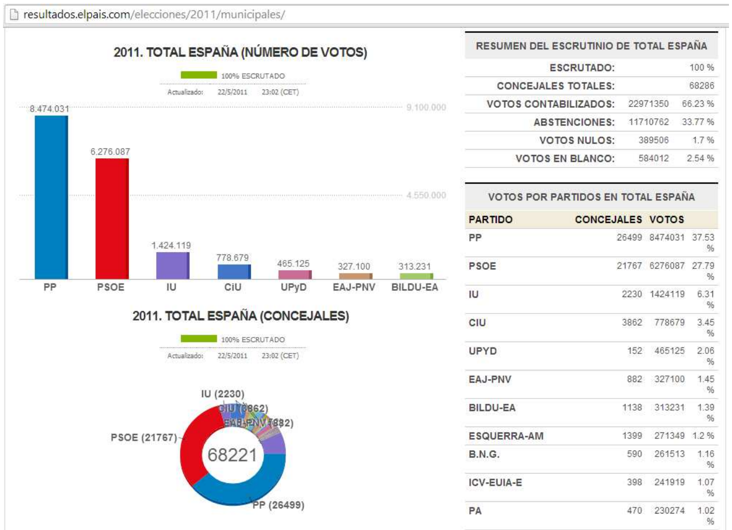

Figure 1. Source: http://resultados.elpais.com/elecciones/2011/municipales/.

The crossed results of different variables, like age, gender and cast votes, can be used to configure point clouds, lines, circles, spots, or colour changes that allow us to denote influences in a particular sector in comparison to other sectors, forming variables sets of density or colour related to the data frequency, etc. (see Figure 2).

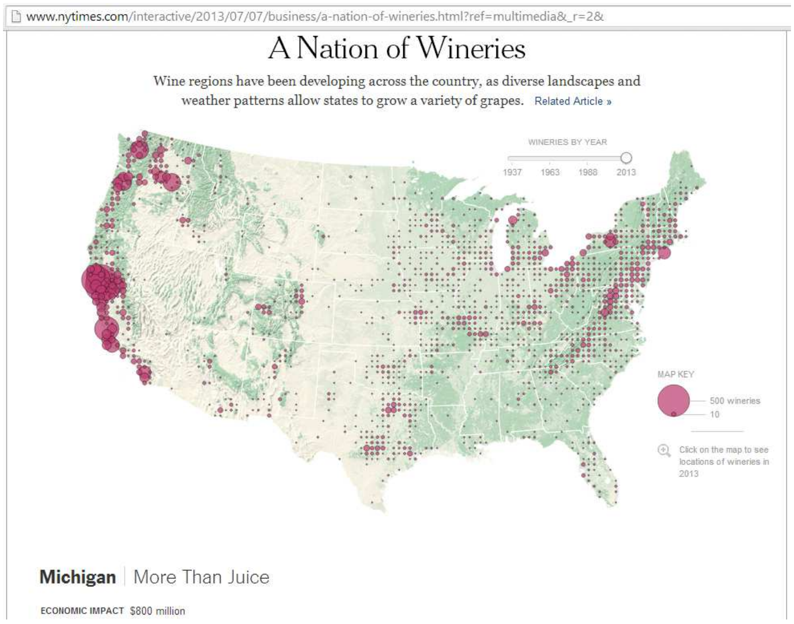

Figure 2. Source: http://www.nytimes.com/interactive/2013/07/07/business/a-nation-of-wineries.html?ref=multimedia&_r=0

In field of sports, DV include 4D effects and bird's-eye views of the objects (see Figure 3). Also common is the use of coloured zones of influence explained with captions related to the activity of teams or players in matches (see Figure 4).

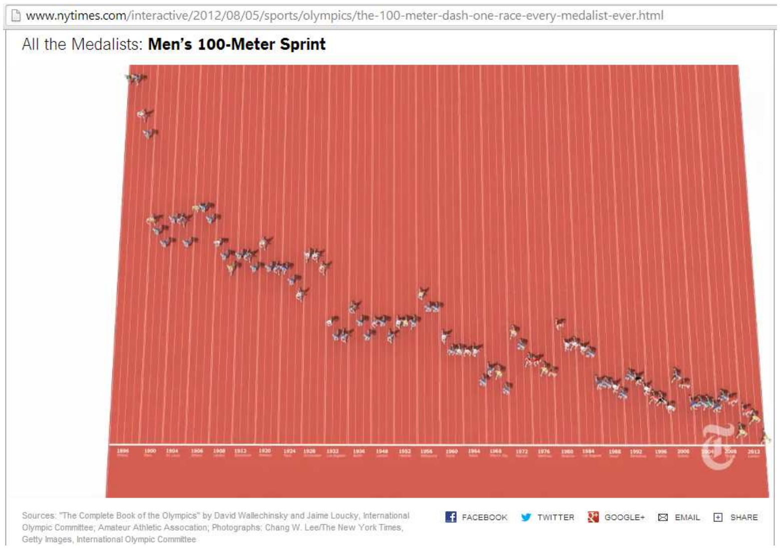

Figure 3. Source: http://www.nytimes.com/interactive/2012/08/05/sports/olympics/the-100-meter-dash-one-race-every-medalist-ever.html

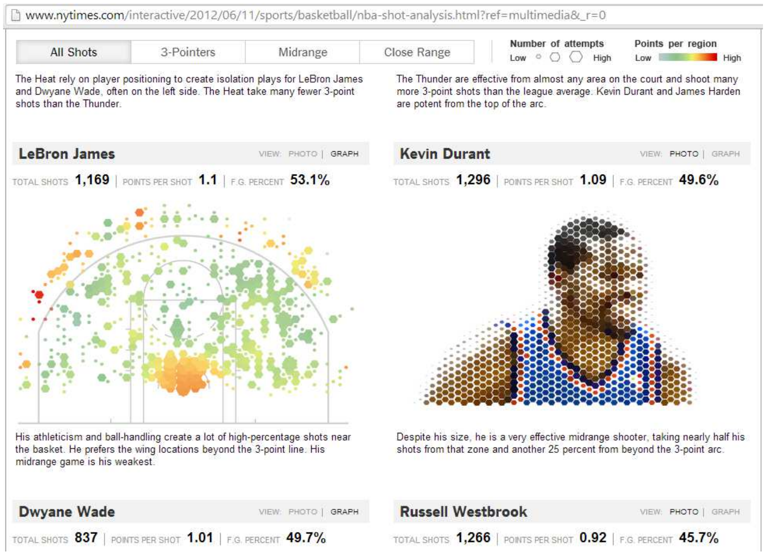

Figure 4. Source: http://www.nytimes.com/interactive/2012/06/11/sports/basketball/nba-shot-analysis.html?ref=multimedia&_r=0

2. Tabular visualisation: These are studies of recorded properties, compared interrelations, relations between records or fields, etc. "Tables are absorbed through our verbal system, while graphics come to us through our sight" (Few: 2012: 155). Elements of the same or different species are compared and related in tables by means of tabs, lines of relation and data, among others (see Figure 5).

The comparison of features technique is very used to represent sports, electoral and economic opponents. They usually compare different types of data such as age, titles, significant aspects and positions in the game. This type of DV constituted 15% of the sample. They often complement the information or documentation with typographic forms.

Tables, of records or content units, organised with or without interactivity, present a multitude of objects and compared their features (see Figure 5).

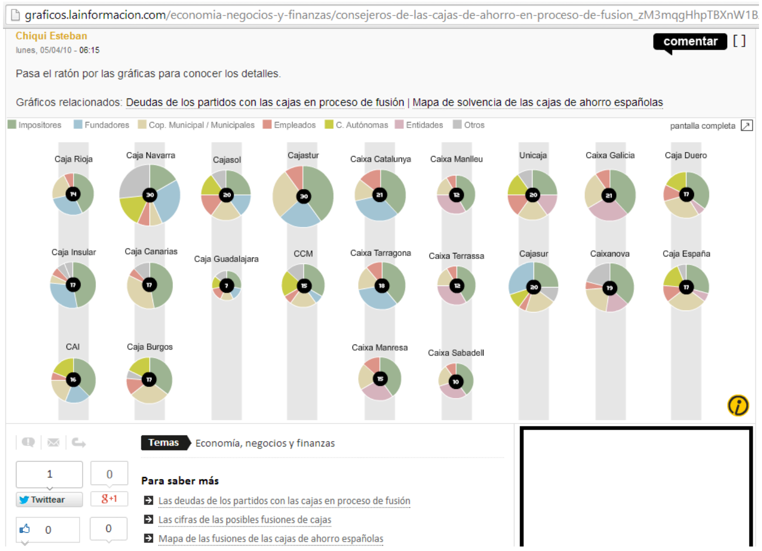

Figure 5. Source: http://graficos.lainformacion.com/economia-negocios-y-finanzas/consejeros-de-las-cajas-de-ahorro-en-proceso-de-fusion_zM3mqgHhpTBXnW1BJhttG2

Examples of this type of DV are the visualisations of motor racing circuits, lengths, curves, difficulty levels, etc. **[2]**. In the field of sports news, DV tables present irregular distribution of teams and important players on the field of play, car circuits, etc.

3. Positional visualisation: The position in space and the type of language used depend on the importance and denote significance or influence relations. Any individual or accumulated variable can be zoomed in or out from the centres of significance, to obtain a reference individual within the whole data set. This type of visualisation is used for example in family trees, representations of opponents, positions of politicians or players, business and operation charts, sports precincts, artefacts of any kind, flow charts, danger zones, etc. This type of visualisation constituted 15% of the sample (see Figure 6).

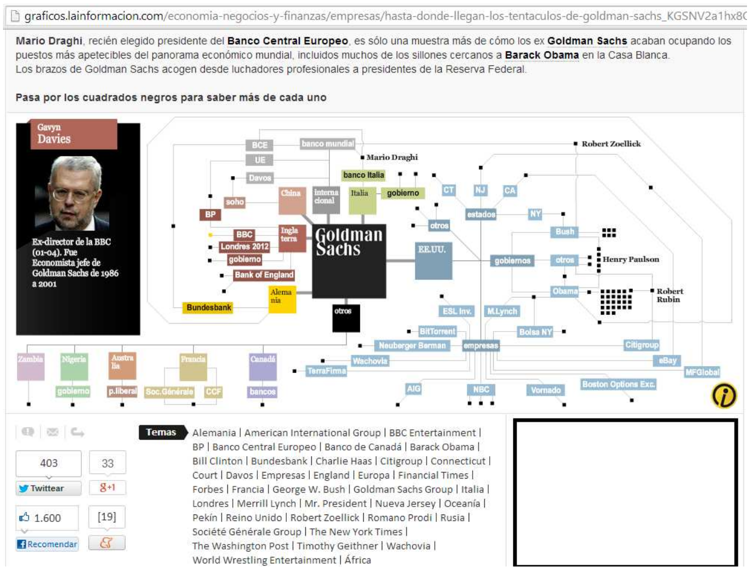

Figure 6. Source: http://graficos.lainformacion.com/economia-negocios-y-finanzas/empresas/hasta-donde-llegan-los-tentaculos-de-goldman-sachs_KGSNV2a1hx8QoC9qaKWzN2/

There are many variations of this type of visualisation, which can present tactics, relations of influence between entries, people, phenomena, components, as shown in figures 7, 8 and 9.

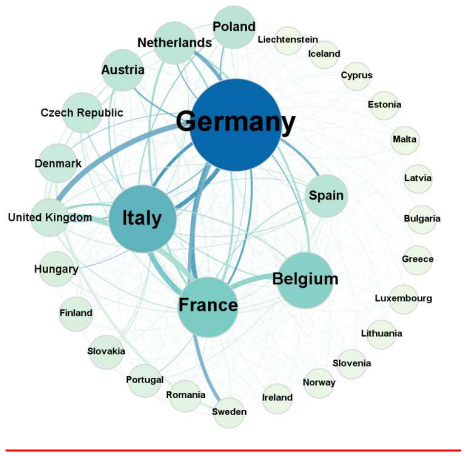

Figure 7. Source: http://alessandrozonin.wordpress.com/2013/05/03/open-data-e-network-analysis-esposizione-del-debito-sovrano-eu/

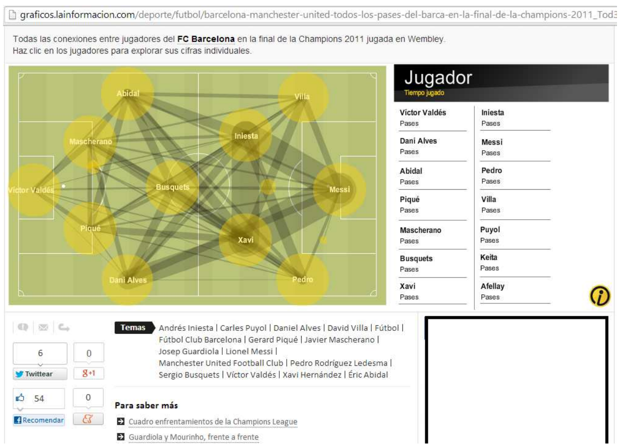

Figure 8. Source: http://graficos.lainformacion.com/deporte/futbol/barcelona-manchester-united-todos-los-pases-del-barca-en-la-final-de-la-champions-2011_Tod3yCiFT7dh4XywImpKo

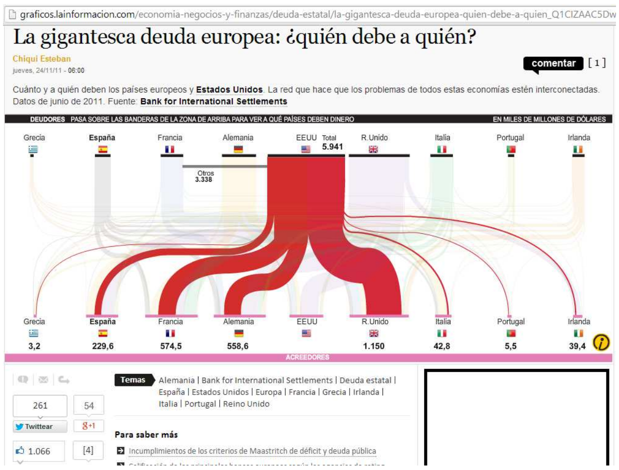

Figure 9. Source: http://graficos.lainformacion.com/economia-negocios-y-finanzas/deuda-estatal/la-gigantesca-deuda-europea-quien-debe-a-quien_Q1CIZAAC5DwVgGiHvTl6H4

Other sub-types of this model of DV relate documents with temporal positions, timelines or a dial:

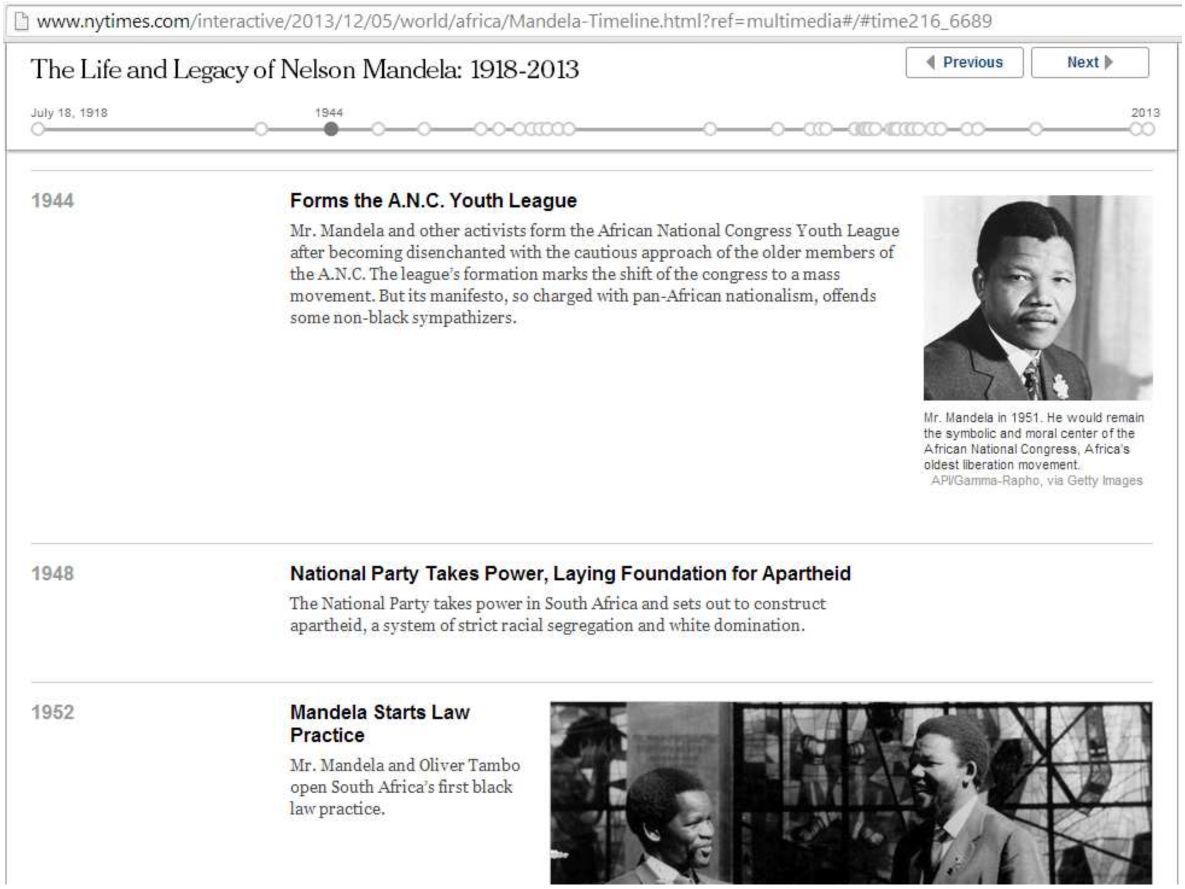

Figure 10. Source: http://www.nytimes.com/interactive/2013/12/05/world/africa/Mandela-Timeline.html?ref=multimedia#/#time216_6669

These types of visualisations tend to complement the information or documentation with typographic forms, except in interactive presentations which integrate schemes with active buttons/areas that users can click to obtain more information. In these cases the scheme is presented as a table of contents.

4. Topographic visualisation: The representation of territories (maps, plans, sports precincts or mini-plans) may or may not have geographic-positioning objectives and may be a support for the distribution of data or figures, with various types of properties (multi-scale, anamorphic, multicolour, interactive, etc.). The degree of prominence of the territory makes the difference since territories often appear as graphics units in other visualisation models. This type of visualisation constituted 12% of the sample. Is also common for this type of visualisation to include a map or plan of the area under analysis.

The most classic topographic visualisation is the weather map which shows isomorphic or isotropic lines over the terrain to indicate weather variations. This type of visualisation is common in printed and online media since it appeared for the first time in *The Times* on 1 April, 1875 (see figure 11).

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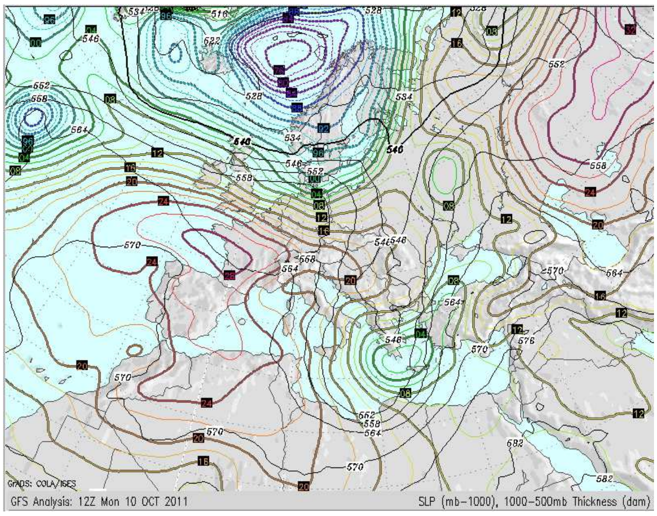

Figure 11. Source: http://blogs.20minutos.es/emilio-rey-capturando-temperie/files/2011/10/pres.jpg

In the 1980s, with the advent of Macintosh computers, *The Washington Post*, *Usa Today* and other newspapers began to use new weather maps that still serve as reference for various printed and online newspapers.

Scale is very important in the representation of territories and thus there are maps, plans, sports precincts and mini-plans with their own peculiarities of representation and multi-scale properties (through zooms or overlaps). Although they were missing from the sample, it is important to highlight the topographic importance of the vertical spaces such as the kilometre points associated with terrain slopes, the road elevation routes (cycling maps), floor levels of a building, etc.

The so-called anamorphic maps aim to simulate distances, but the measurement unit is not necessarily the metric one (see Figure 12).

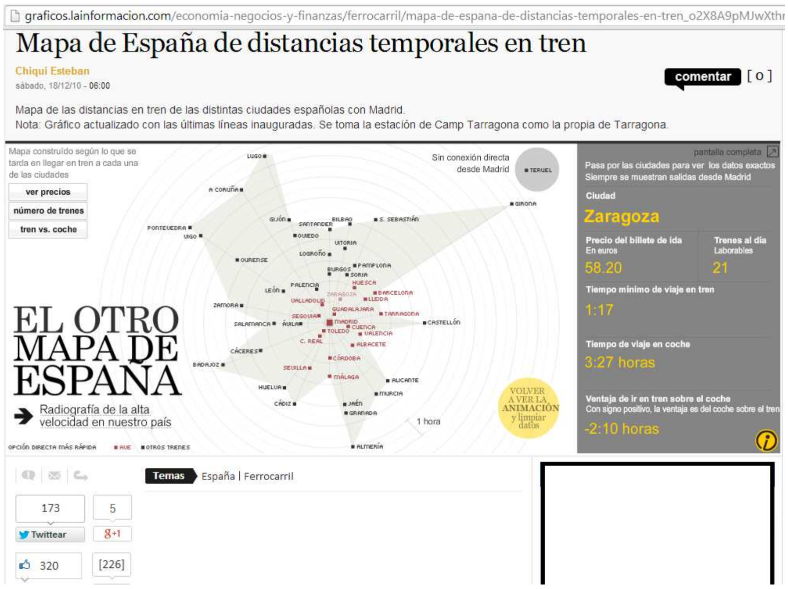

Figure 12. Source: http://graficos.lainformacion.com/economia-negocios-y-finanzas/ferrocarril/mapa-de-espana-de-distancias-temporales-en-tren_o2X8A9pMJwXthmWBb9PKp7

Visualisations of territories almost always have geographic-positioning objectives and that is why we considered the typological option in the study of DV. It is very common to associate any territory to routes, boundary lines, distributions or connections, like when it is used to represent summarised distributions of content through active points, side-by-side comparison of features, etc. (see figures 13 and 14) **[3]**. Interactive maps are also often used as support since they integrate active button/areas which are used to distribute information documents.

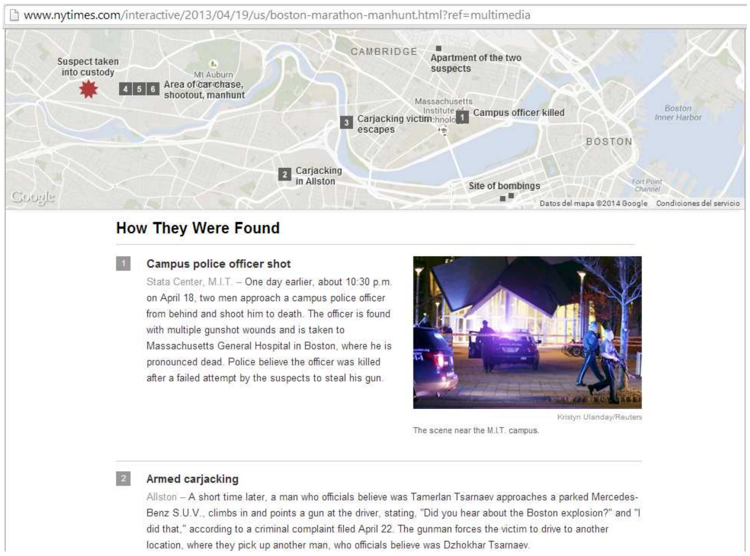

Figure 13. Source: http://www.nytimes.com/interactive/2013/04/19/us/boston-marathon-manhunt.html?ref=multimedia

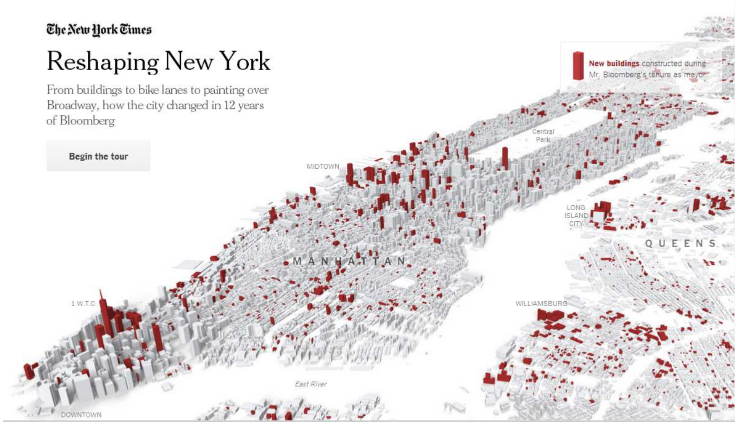

Figure 14. Source: http://www.nytimes.com/newsgraphics/2013/08/18/reshaping-new-york/

5. Tele-dynamic visualisation: Based on its importance we have distinguished between changing dynamic presentations and automatic processes. They can be of several types: dynamic representations that change based on spatial coordinates, like those associated to transportation vehicles in inter-oceanic or inter-territorial competitions; those that use goals or sports results; and those drawn based on the data provided by election campaigns data centres. We have found 7 examples of this type of representation in the sample.

The transference of XML data to Flash or html 5 formats allows the updating of programmed graphics, as in the case of the DV of vote results at the end of political elections, which are presented in real time, as votes are counted, on the homepage of many general-interest online newspapers. In

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this case the map does not have a geographic-positioning objective but a distributive objective. Spatial presentations have the all-important quality to reflect visually events as they take place (see figures 15 and 16).

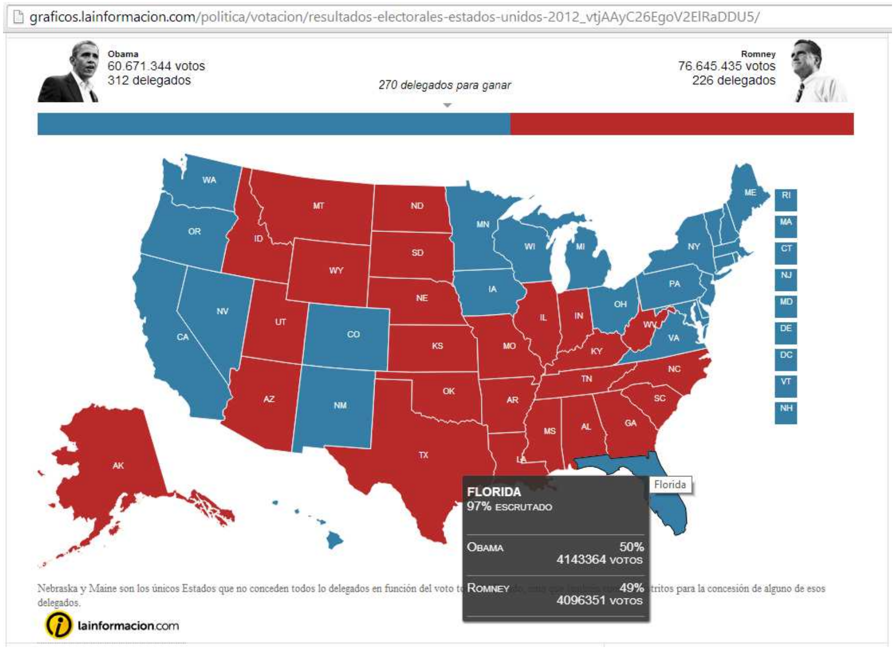

Figure 15. Source: http://graficos.lainformacion.com/politica/votacion/resultados-electorales-estados-unidos-2012_vtjAAyC26EgoV2ElRaDDU5

Figure 16. Source: http://internacional.elpais.com/internacional/2010/05/30/actualidad/1275170402_850215.html

Tele-dynamic visualisations can be documentary supplements or pieces that are isolated and separated from the informational or documentary contexts. It is of great interest to follow-up an event, like a competition, in real time by geolocation, as shown in the multimedia visualisations of the 2010-2011 *Barcelona Word Race* ocean sailing races, which are visible only while the competition is taking place (see Valero 2012: 108).

6. Interactive drag-and-drop visualisation: This can be considered to be the most interactive type in general. In offers drag-and-drop and choice functions to the users to activate areas, make calculations, or make propositions in conflict resolution diagrams, etc. Activation, algorithms and data entries are required to make calculations; and abacuses are offered for the resolution of critical paths and to compare calculated data, etc. Four examples of this type of DV were found in the sample.

There are many variations and their use is complex. An example is the following interactive graphic that calculates the value of a football team based on the user's selections (see Figure 17).

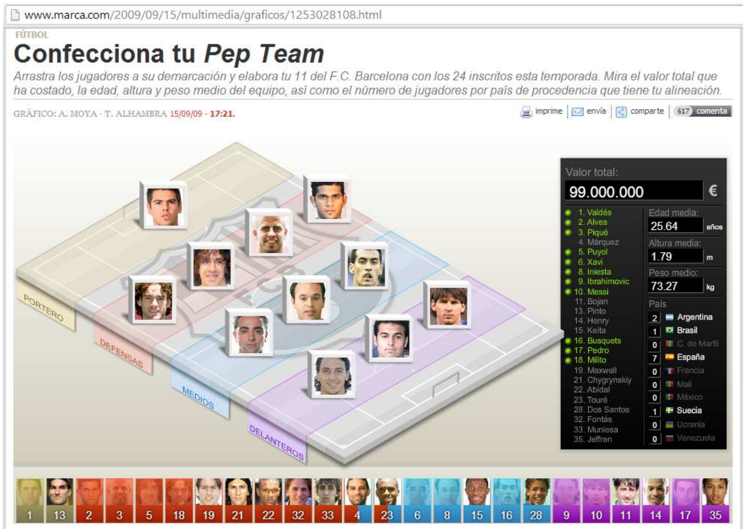

Figure 17. Source: http://www.marca.com/2009/09/15/multimedia/graficos/1253028108.html

In other cases interaction occurs through the comparison of two similar artefacts, like in the following figure which shows a graphic that allows users to see a more detailed view of a section of the planet earth in a second screen (see Figure 18).

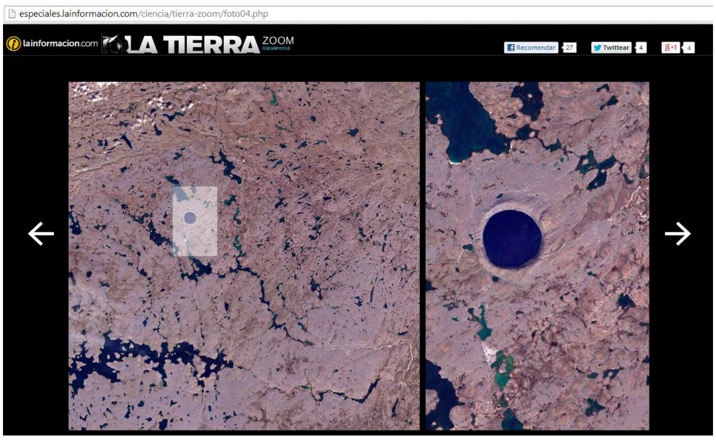

Figure 18. Source: http://especiales.lainformacion.com/ciencia/tierra-zoom/

Depending on the content, these types of visualisations can or cannot be used to accompany the information or documentation with typographic forms and act as supplementary documents.

7. Augmented-identification visualisation: They are graphical evolutions based on high resolution photographic images and associated data that appear when the user requests them. Three examples of this type of DV were found in the sample.

Reality can be captured in iconic forms and can be augmented with associated data **[4]**. It can be a visualisation of normal or high resolution pictures of groups of people with information bubbles and labels over the most relevant people so that users can click them to obtain the identifying information (see Figure 19).

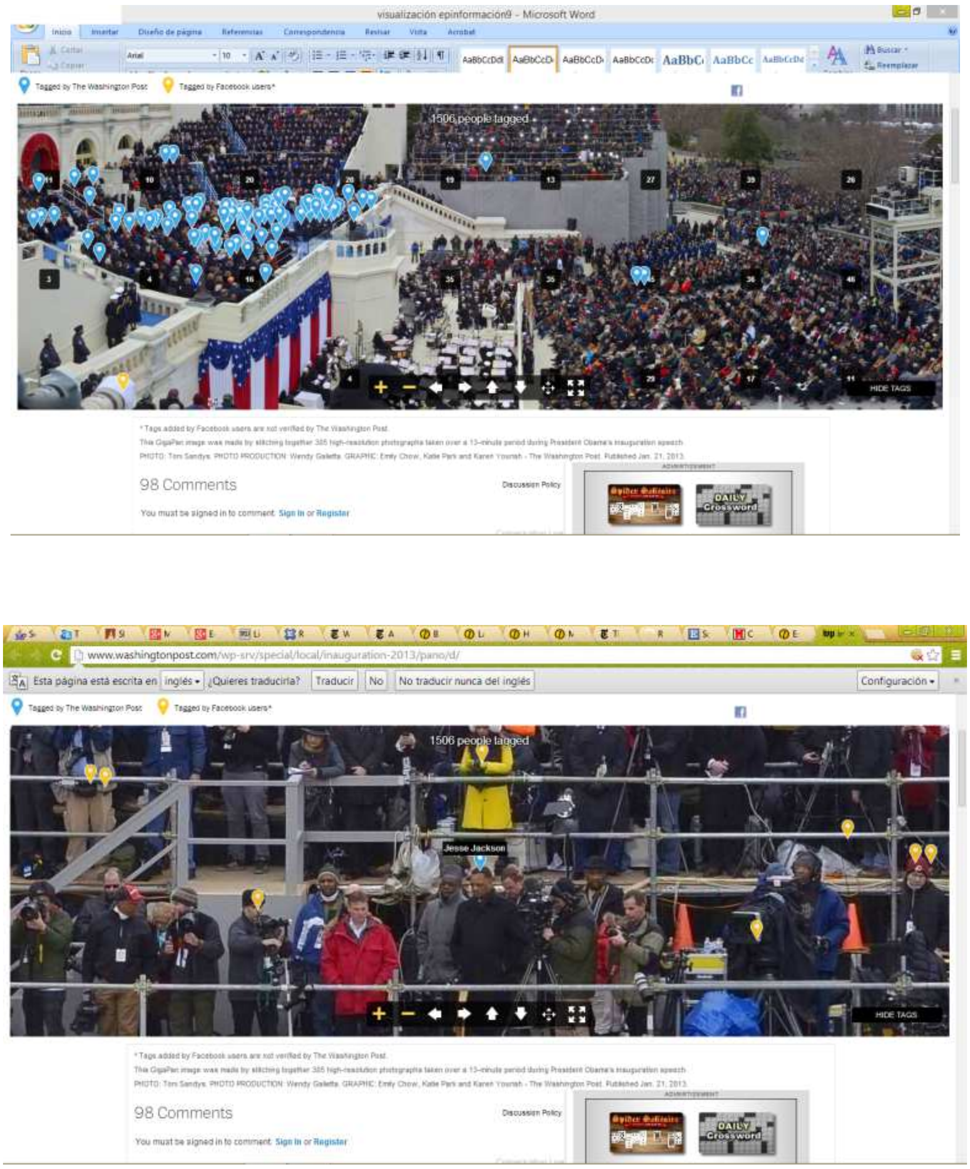

Figure 19. Source: http://www.washingtonpost.com/wp-srv/special/local/inauguration-2013/pano/d/

Sometimes augmented identification is achieved through sounds or others resources instead of iconic or alphanumeric forms (see Figure 20).

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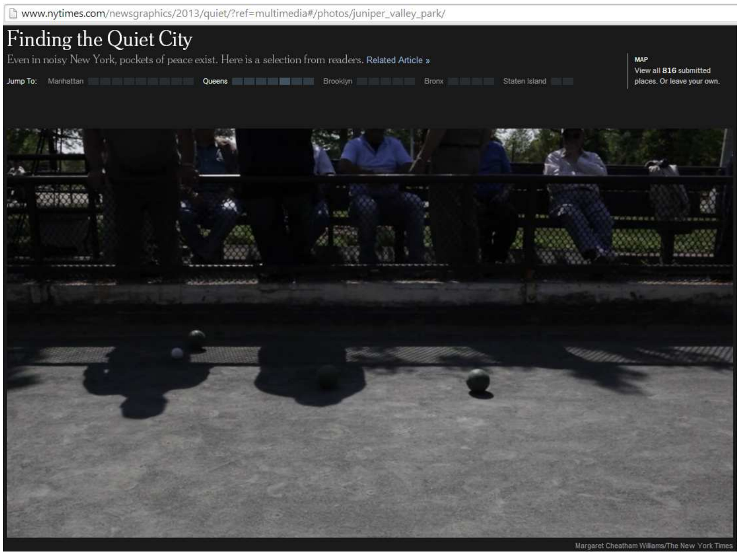

Figure 20. Source: http://www.nytimes.com/newsgraphics/2013/quiet/?ref=multimedia#/photos/inwood_hill/

Depending on their degree of depth, thematic variety or specific functions and initiatives augmented-identification visualisations may or not accompany the information or documentation pieces with typographic forms.

8. Miscellany of various types of visualisations: This category includes a multitude of possible joint, simultaneous or successive, representations of graphs that can be presented as complements and be mixed, multi-morphic and multi-function, etc. **[5]**.

One example, although not journalistic, is provided by the website of the non-profit association Gapminder.org. Its main document titled “Wealth and Health of Nations”, based on very large sets of data organised primarily by countries and years (see Figure 21).

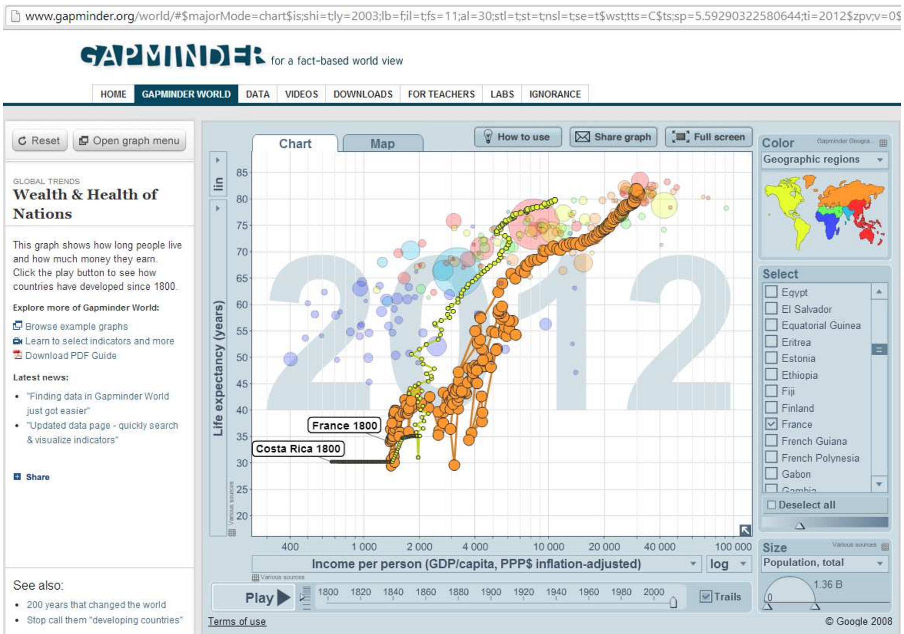

Figure 21. Source: http://www.gapminder.org/world/

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The sample included six miscellaneous models, which can **contain more or less presentations depending on the depth and variety of data they contain**. All models may contain different mixtures to some extent. Sometimes data are presented with representation of territories and some other times with a variety of graphics (see Figure 22).

Figure 22. Source: http://www.marca.com/2013/12/12/multimedia/graficos/1386877579.html

These types of visualisations do not usually accompany the information or documentation in typographic forms.

In summary, the sample of 100 DV contained the following types:

Types	Quantity
Spatial	38
Tabular	15
Positional	15
Topographic	12
Tele-dynamic	7
Miscellany	6
Drag and drop	4
Augmented identification	3
Total	100

4. Conclusions

In cyber-journalism, news stories and feature articles often include infographics that integrate DV. The visual story of certain content can use multimedia languages that can replace the classical typographic texts with more visual texts. The literature review and the comments of our panel of experts indicate that the term infographics is used since the beginning of digital media and that, despite its polysemy and the existence of various synonymous, the terms has been also used to refer to models configured to present data.

Data are very important, but have many limitations as documentary sources in the construction of visual stories as they do not usually present all the documents necessary to tell the whole story of a journalistic event. Data can generate new knowledge, but they are not always processed in the right way to make useful visual synthesis that can facilitate interpretation and understanding and can be used to generate prototypes, as it occurs with the weather maps. However, with basic data we can study issues of greater relevance and represent them with metaphorical, abstract and statistics forms.

Some of these representations are very old and others are still undergoing developing. Their use is not widespread in the media or the Internet due to serious unresolved problems such as the misunderstanding of their utility, the sequence of time necessary for their development, which collides with the immediacy and the need for numerous and expensive, highly specialised professionals, which raises the cost of production. Therefore only few media use DV produced by skill and specialised staff, within the computer graphics department.

DV have their own features, they highlight key and specific issues; reinforce the information and documents, provide striking visual results; collaborate in the description and interpretation of the context; they are not structurally limited to classic journalistic narratives; they are usually presented as discontinuous pieces about specific themes or services, with direct content. They are used to provide answers to various specific needs, which complement the information or documents, although they are often separated.

Most of the DV in the sample have varied comparative purposes: different compared frequencies such as spatial representations of distances, vote results, times, influences, interrelations, features, positions, locations, time/space changes of variables, calculations based on interaction, positional identification of features, statistics, precision algorithmic results that denote significant values of variable interest, etc.

DV provide lots of social utility, depth and reality when they rely on data correctly taken from any kind of phenomenon or infrastructure. In this context, visualisations of closed sets of data are usually presented in sports, political, economic and service contents, which are paid-for sections in the media.

It is very normal for DV to include very iconic figures although in some cases they include photos, videos and even sounds. The most common visualisations are in two-dimensions, they are usually not drawn freehand and may contain overlapping layers, mixtures or hybridisations of graphics.

DV are not necessarily digital, interactive, telematic, 3-D, 4-D, have movement or have large formulas. Interactivity has been implemented in a limited manner to allow users to decide between several options, to see a part of a picture in greater detail or to select different variables, fields or approaches. They tend to present general and then particular information or vice-versa, offering users new inquiry options.

There is certain interest in this type of presentations when they are easy to read. Media companies take advantage of DV because they can be produced fast and at a low cost when their programming allows modification to represent different contents. DV models have an initial fixed cost but can be used to represent different contents and offer many possibilities of repetition when the content allows it.

In short, technology incorporates new representations that society adopts and understands, as it happened with the predictive visualisations of weather maps. Increasingly, there are more proposals to program complex but very effective DV that include shapes and navigations of rapid implementation and adaptable to different contents.

* This research study had no funding.

5. Notes

[1] Data taken partially from Dürsteler's website http://infovis.net/ (accessed on 24 April 2014) which complements his 2003 book, included in the list of references.

[2] There are many different tabular proposals: iconic, alphanumeric or mixed.

[3] Maps with distribution by regions, of monuments, football stadiums, graphics, information cards, etc., can be understood as geographic-positioning tables or visualisations, depending on the intention of the user and the importance of what is distributed.

[4] This is often understood as augmented reality or virtual reality, but we consider that reality may be intangible, difficult to capture and not understood as a representation.

[5] For general mathematics, level of curiosity in relation to Combinatorics without repetition, deduce that the possible sundries are 21 when we have 7 simple models taken from 2 on 2, 3 on 3 35, 35 4 4, 21 taken 5 in 5 types, etc. which is a very comprehensive set of proposals involving two or more models in this study.

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