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**MULTI CONFERENCE ON COMPUTER SCIENCE AND
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INFOVIS FOR THE SOCIAL: A WAY TO EXPLORE CONTENTS AND DATA IN SOCIAL TOPICS

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ABSTRACT

Information Communication Technology (ICT) has radically changed everyday life, and also changed fields like business, production and distribution, services and social relationships. The first result of this phenomenon is the changing role of the technological network is now central in the relationship creation. In a world where everything is connected, it is essential to understand and make use of the data produced. On one hand we are dealing with a quantitative aspect, on the other hand it is important to find and bring out the qualitative aspect of these data and their possible social impacts. The ability to understand, convey, and give sense to the data is rapidly becoming a potential value. This context includes the field of information visualization (infovis), that we see as a complex multidisciplinary field. In this paper, we present a way for visualizing online discussions related to social and civil values and we show how infovis can be not only a communication tool but also an information tool, turning itself into a functional interface enabling insights and research.

KEYWORDS

Information visualization, social topics, design methodology, ICT, systemic design

1. INTRODUCTION

The development and dissemination of new technologies radically changed everyday life, work organization, production and distribution of goods, services, culture and above all in social relationships. Acquiring always more strategic importance are tools to generate information, knowledge, and contents. In technological innovation we have passed from a 'learning by using', to an acquisition of technology by 'learning by doing' (Castells, 2002). The diffusion of ICT increases power of the technology itself and of those who have the ability to exploit it. Therefore, new technologies are not just new tools to apply, but they are new processes to develop.

In this paper we show how information visualization (infovis) can be a valuable support to the contents broadcasting with a specific case study. We show how infovis enables people to get more information and fosters the participation of users less involved. Our approach entices users to reason about data in a way that increases their awareness and competency. This changes their behavior, which is the hallmark of effective innovation (Tamborrini, 2012).

2. ICT AND INFORMATION VISUALIZATION

ICT fosters and strengthens the participation, thanks to the recent developments that have made technology more powerful and easier to use. This technology plays an important role in particular for disadvantaged social groups that are excluded from the information flows and the public debate.

Participation built in computer network takes on the characteristics of this network: it binds to the individual and his interests, but it is also able to move and expand itself to global and collective levels.

Today, individuals may have access to valuable informative and communicative resources that impact their social, political and economic growth. Access to information, knowledge, communication, and the ability to enjoy them individually and collectively, have become essential factors for the strengthening of

individual opportunities. They are especially useful for minority groups in order to really take part in decision-making and democratic processes.

At every level and every field, access to ICT is an essential condition for this new participation. Computer networks assume a central role in the information society as they can be used to create social relations beyond traditional notions of space and time. This is thanks to the network's features, including the pervasive and continuous information flow, the increasing ease of access to culture, and the changing the way in which it is used.

The recent boom in social media and social networking systems, has made it easier to create communities based around sharing and discussion. It has also radically changed how people communicate. Cyberspace provides the basis for the development of social situations diversified by culture, purpose and use of the interaction tools, allowing the creation of relations in the network that can change depending on the goals and preferences of each one.

The growing interconnection due to the digitalization of information and relations, as well as the exponential spread of data generated by things, people and organizations, represent a challenge and an opportunity to design new tools suitable to complex and changing environment in which we live. Therefore, it is essential to understand how it is possible to extract the most value from information, emphasizing the communicative potential contained in them (Cukier, 2013).

Data are not only a prerogative of the economic and statistical sector, they are everywhere. Thus, it is increasing the request and the consequent importance of infovis, which adapts and models itself each time in new ways, that can be attractive and suited to the context and the contents.

Infovis provides tools to extract value from data. For instance, infovis tools are a valuable support to tell and describe events, phenomena and stories in newspaper articles and magazines, up to achieve educational publishing and the narrative field (Colin, 2014). These tools also allow us to explore data in order to answer questions as well as generate and confirm hypotheses. Recently, such tools have become increasingly common and usable. Thus, infovis is used to clarify and simplify information. It enables exploration of complex data, and can be used as a tool to persuade and convince observers of an idea by making information visible, highlighting the causes and effects of specific choices, comparing the different values and situations, showing the flow of a system and how it changes, analyzing the relations, distributing chaotic data into an ordered structure (Cairo, 2013; Shneiderman, 1996).

In fact, infovis cannot be merely defined as the graphical representation of information. Instead, it is a complex multidisciplinary field involving data collection, visual arts, perceptual psychology, and computer graphics (Card, 1999). Today infovis is an entry point for the consultation and in-depth analysis of contents, turning itself into a functional interface enabling insights and research.

3. CASE STUDY: AGENDA DELL'IMPEGNO

The *Agenda dell'impegno* project was created to offer offering an innovative, informative and educational instrument for displaying and broadcasting social values. It starts with tweets obtained from the Agenda dell'impegno, which is an initiative born from the collaboration between the Telecom Italia and Libera NGO. The initiative proposed the launch of a monthly topic of discussion around which users could actively participate, sharing their opinions and thoughts in reference to the subject suggested, using social networks and in particular the Twitter micro-blogging system.

We analyzed the data from this initiative, and designed guidelines for the development of the visualization design and its subsequent implementation. Our guidelines take into account the user's different needs and interests, such as the level of detail that each user is interested in. Based on our guidelines, we created an instrument that offers an overview of the data which displays general patterns. This is augmented with a highly detailed view that satisfies users more involved and interested.

3.1 Methodology

This work originates from a collaboration between Telecom Italia, the Department of Architecture and Design from Polytechnic of Turin (DAD) and the Department of Computer Science from University of Turin. Each collaborator brought a unique skillset to the project (Gaiardo, 2013). Although these disciplines

are not commonly grouped together, we found their skills to be complementary. In order to create a viable product, the final outcome had to demonstrate originality, appeal and user engagement. This required a 'designer driven approach' (Bigelow, 2014). The designers involved in the project used the methodology of *systemic design* as it pays attention to the organization, optimization and understanding of every single factor at play. It focuses at first on user requirements, then highlights the best conditions and the most interesting facets to work on, while keeping an eye on their mutual relationships (Bistagnino, 2011).

We consider data as components that interact with each other in countless possible ways, and where the overall behavior is not given by the simple sum of the behaviors of their constituent elements, but depends strongly on their interactions (Bistagnino, 2008; De Toni, 2005).

Because of the cross-disciplinary approach, we focused on frequent consultation with all involved collaborators. This assured assure the feasibility of our designs to fully exploit the available technologies.

At the base of the design, it was necessary to have a complete scenario analysis on topics as ICT, bigdata, social media and infovis, and in particular an analysis of the users involve and of their needs to satisfy.

3.2 Project Description and Data Analysis

The organizations behind the initiative chose each month a specific hashtag related to the topic to be explored (#temadelmese) that allowed to aggregate share in the conversation flow on the website, in addition to the general initiative hashtag (#agendaimpegno). There were a total of twelve topics used for discussion. They ranged from the Italian Constituting to women and territory respect, as well as worker's rights.

We focus on the visualization of tweets collected during the project. We performed an accurate analysis in order to identify what were the elements that could be expressed qualitatively in subsequent discussions.

Data produced by the initiative have been extracted and cleaned in order to allow a report initial data exploration. During this exploration, we examined the tweets frequency, temporal distribution, attachments, and use of hashtags. We discovered that the total number of tweets provides information about the level of participation which we interpret qualitatively as the community's interest in our initiative. We also examined the temporal distribution of tweets during the year understanding trends in the use of the platform related to the various themes. From this, we identified topics that aroused greater involvement. We also examined attachments of the tweets, such as images, videos, and articles. This content provided information about how users decide to discuss topics. Analyzing the hashtags allowed us to understand the moods evoked by some topics.

We also thought it was essential to bring out the concept of the potential of a tweet, starting from the number of followers of each user. This number allowed us to understand the likelihood that the content is shared. Finally, by examining the audience and its contribution to the initiative, we identified the influential figures and on what topics they are particularly linked. We also highlight what topics have more or less involvement with the entire group of participants.

3.3 Project's Guidelines

After the analysis of the initiative and the data obtained from it, and after the identification of the users' needs, it was possible to draw some useful guidelines for the project.

The investigation of the infovis concept showed us that it was crucial to structure the project in a way to give the possibility to users of choosing their own level of depth, for the purpose of better readability; in this regard the graphical representation most suitable appeared to be the interactive one, which allows users to browse the contents offered, facilitating the exploration of its. Thanks to the interaction, to the simple visualization is added the possibility to interact with what one sees: it is possible to change representations (passing from an overview to a deepening on desired topics), filter things that are not of interest, select some information to obtain more details, highlight the relations between elements. In addition to the main ways of active interaction (that between person and graphical computer interface can only happens through the mouse cursor), the spontaneous interactions are also interesting; in these the mere presence of the cursor in a point of the interface creates an unexpected reply, arousing surprise and interest in those who benefit from it.

The project had to be understood by everyone, both children and adults, both experts and not; therefore, the visualization had to be clear, simple and intuitive, in order to the contents to be broadcasted.

The ‘Agenda’ should had the objective to expand its catchment area, developing more interest and knowledge about the project, and paying particular attention to how the topics are debated; for this reason it was important to develop a proposal that was adaptable, easily consulted and accessible from any device, whether computer or mobile.

Finally, the leitmotiv of the whole system was to inform pleasantly, giving users the opportunity to create a true path of reading and browsing according to their own interests or proximity to the speeches touched upon.

The color was another key element to deal. In fact, the color is a tool that can be both as organizational tool and as an instrument to express a personality: bold or contrasting colors on a particular element will require attention, while when it is used as an instrument of personality color may extend to more sophisticated types of hierarchy; using specific colors it is possible, for example, to bring an emotional appeal to a page. The color may also affects everything, coming to connote a brand, up to transmitting symbolic concepts. Advanced use of colors can also be helpful to classify information, giving a specific hierarchy. We can not deny that there is a relations between colors and emotions, and each designer aims to take full advantage of this concept, looking for shades that reflect what they want to communicate, but also shades that help users to easily relate the sector.

In this case, by the analysis of different platforms which debate social topics we have identified in bright colors a faster and simpler reference to topics of interest. In addition to these colors, the background plays an important role too: the choice fell on the use of a light color in order to allow greater readability of contents, putting it more in evidence.

3.4 Project’s Development

All these premises help to explain the project we developed, that is a proposal for the visualization of the tweets obtained from the initiative ‘Agenda dell’impegno’. The proposal is structured in two additional projects: a PC version and a version for mobile devices. Different will be the degree of interaction that everyone can have and the possibility of deepening. But, given the speed of the shares through the Twitter platform, their brevity, the great possibilities of interaction offered by smartphones and the need for some categories of users to see ‘anytime anywhere’, led us to think that a project for the only interface of the personal computer resulted wrong.

3.4.1 The Visualization

Due to the yearly lifespan of the initiative, the graphical representation chosen was the circle, suited to convey the notion of a cycle and offering a global glance of contributions. Every ray departing from its border represents a day, a colored dot represents an original tweet and a black dot a retweet; the choice to highlight to difference between the shares was determined by the difference in quantity between tweets and retweets, the second ones more present.

Given that there is a one to one correspondence between months, topics and hashtags, a palette of twelve different colors has been selected; the choice was made taking into account first the aesthetics most, and then the need for the user to spot out each topic, hashtag or month immediately. This feature has been further enriched by making the legend responsive to interaction, with the function of sector selection. Analyzing the tweets it was apparent that for the most part they contained more hashtags than those required to take part to the initiative; this richness led to the creation of a ‘top ten’ section, containing the most frequently used. The use of strings connecting the hashtags with the related tweets reveals at a glance how different subjects are connected, how they cross influence, and the emerging topics. With the same approach, we highlight the external mentions, that is the authors that have been mentioned by others but still haven’t participated to the initiative; this definition, applied to the concept of reach and potential of a post, widens it not just numerically, but also geographically and in terms of reachable communities: if a tweet containing a mention to @Pontifex_it or @HillaryClinton is re-tweeted by the owners of those accounts, it will literally be spread all over the world.

A circular crown around each tweet, proportionally sized, that appears only when the tweet is selected, represented the reach of the tweet; this apparently raw figure can lead to some important qualitative observations: for example, finding users with a high potential could be of help to launch important messages worth to be spread.

Every shape in the visualization is interactive, so the user can choose a content (images, videos or articles), read a tweet and even follow the links it contains, and he can also select a single author and visualize all his messages, to better understand his activity based on time, or subject. The contents view shows the distribution of contents, and again which ones are the most shared and the media considered most suitable for the communication of a topic among others. The structure of the visualization has been thought to leave freedom to the user to choose her personal path, based on her own interests and needs; this is also enabled by the 'search' function, that highlights all the tweets containing the searched text. The text counters were added to the geometric elements to juxtapose the graphical/qualitative with the statistical/quantitative aspect: they are refreshed every time a new selection is made.

The resulting visualization (Fig.1) was later implemented by Telecom Italia and it is available at <http://infowiz.ddns.net/agendaimpegno/>

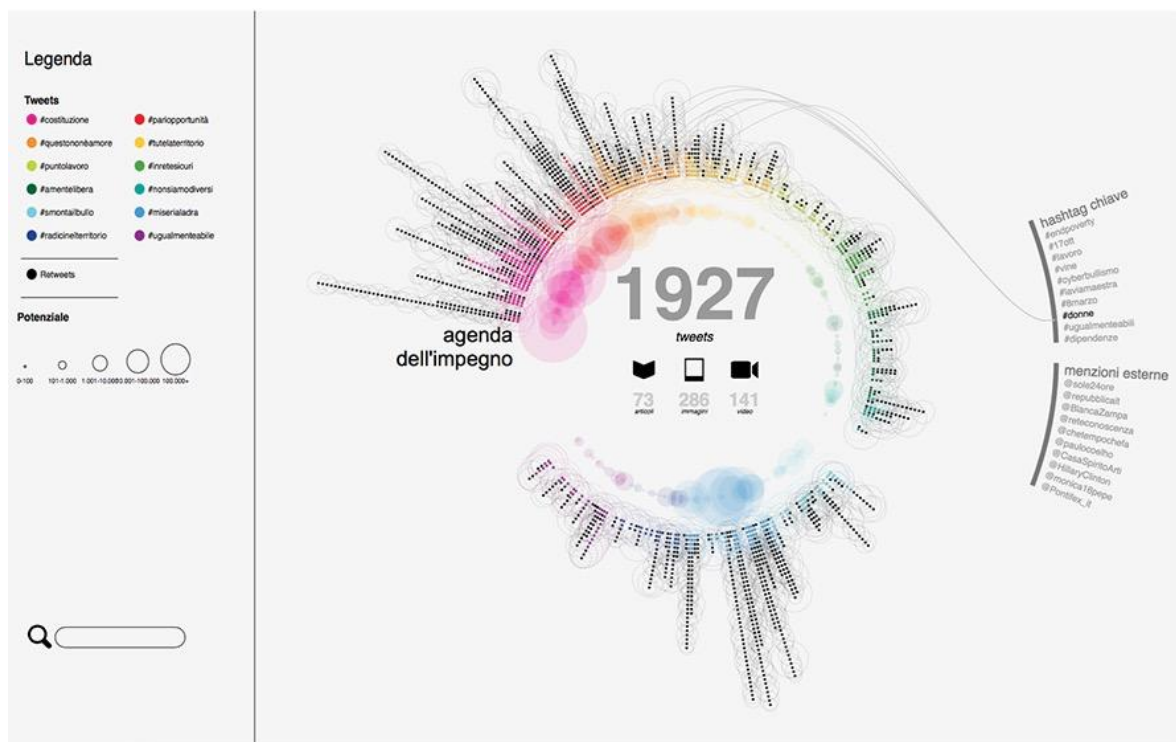


Figure 1. Visualization, main view

3.4.2 The Web Page

As explained previously in the guidelines, the web page project is born because we wanted to offer a way more evocative and emotional to broadcast the contents developed in the initiative, bringing the contents in the foreground and the quantitative data in the background.

However, the latter continue to be accessible, offering a greater level of depth the most interested users. Moreover, it is conceivable that this web page will become the entry point to the visualization above described; in this way it could be possible to bring those users less close to the topics covered, focusing on a transmission of the contents more qualitative than quantitative and statistical.

The path created becomes personal and customizable for each user; in fact anyone can choose the most suitable way for browsing, from the content to the data, but vice versa too.

Going into the specifics structure of the web page, the starting point was the analysis of the typology of shared contents; these were divided in images, videos, and articles, based on an analysis of the links extracted from the texts of individual tweets. We wanted to allow immediately the choice of these three channels of exploration, thinking to a user interested in the depth reading and watching videos, involved and attracted to strong and evocative images.

The web page (Fig.2) offers users the ability to browse through all images, all videos and all articles, showing the latest tweet on the homepage. From the beginning, they can access to the visualization above mentioned, but this communication channel is present during all the exploration, allowing access at any time. The counter of the total tweets, updated in real time, and the partial counters of contents, are always shown. In addition, the hashtag of the topic of the month is highlighted, enabling anyone to make a share directly from the visualization, pre-filled with the two hashtags #agendaimpegno and #temadelmese, in order to facilitate writing.

When the channel of interest is selected, the page does not vary at the left column with the hashtag, the counters and the access to the visualization described above; but in the second part of the space is now possible to see the last shared content in a higher dimension, with the reference tweet and with the number of retweets made, the more re-tweeted content and a gallery chronologically ordered. Each contents is thought to be re-shared through direct interaction with the number of retweets.

Because of its structure, the web page can be explored by everyone; in fact, communication is simple and the exploration focuses on the suggestions. Users can create their own path guided by well-considered decisions, but can too be guided by emotions and by what some pictures or descriptions can broadcast.

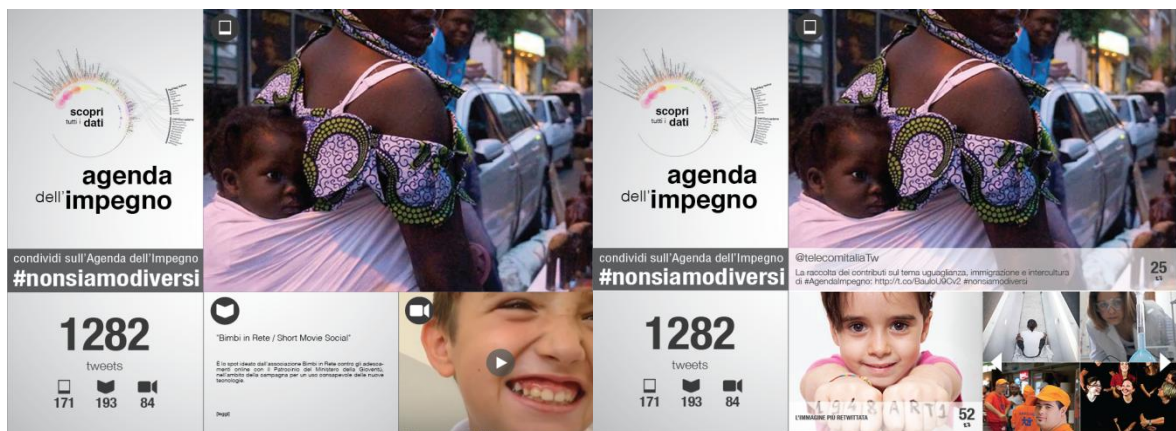


Figure 2. Web page, main view and image view

3.4.3 The App

In order to make the project flexible, we thought a version for consulting the contents even by mobile devices; this version has some limitations and the data visualization is not consulted to small displays, however the needs of a consultation by mobile device results to be different: it is in fact requested information and a general update, subsequently deepened by the user only if concerned, but above all it is required an easy consultation, as well as a pleasantness in it.

As regards access, the application browsing is designed very similar to the web page; on the top, it remains visible the direct link to a possible sharing, pre-filled with the hashtags reference (#agendaimpegno and #temadelmese). The lower part of the display is divided into four parts, one affected by quantitative data, represented by a total counter of the tweets and the three partial counters of the contents; the remaining three areas act as entry points for images, videos and articles galleries.

By clicking on the counter, it is possible to have more information about the initiative, in particular a short description of it and its founders, but even some important data that characterize the platform, that is the total number of tweets, the partial contents and the twelve topics covered during the year.

The user can browse through the selected contributions arranged in reverse chronological order, just like flipping through a daily diary. In the specific, he can view the content at the top of the screen, and the tweet linked at the bottom.

Regarding the graphics choice, it differs from the data visualization and the web page, which use bright colors on a light background in order to emphasize the contents exposed. The analysis of some social applications showed us how applications rely upon dark colors so that the tone of the images may stand out better; in fact apps report a smaller quantity of contents, but they focus mainly on exciting and impressing the user. In our case the choice fell on a black background, except for the screen which show the articles, just to allow a clear and easy reading of its.

3.5 Evaluation

In order to evaluate how much the project was really suitable and useful to informate and communicate social topics, but especially to allow people to make some new reasonings, we have conducted an anonymous survey among the initiative promoters. This kind of evaluation allows us to estimate if the designer's contribution was reached, specifically we investigated the characteristics of originality, innovation, engagement (that is how much the visualization fosters user interaction) and pleasantness. Beside these parameters, we evaluated others like clarity and usability, that are fundamental for the right exploration of the contents.

For the evaluation, we used a scale between 1 and 7 point, where 1 was the minor value and 7 was the higher. The survey involved twelve people and obtained generally a positive result, with a medium to high average value for every parameter. In particular, the parameters of originality, innovation and pleasantness have been rewarded, and the majority of the participants considered the visualization a valuable instrument for the exploration of the social topics and not only these, helpful for inspiring deductions and qualitative reasoning.

The result of the survey confirms that infovis can be used not only to show simple information in a graphical way more attractive, but it can contain a large amount of information, properly related, thus turning the visualization into a access point for contents more detailed, enabling more complex reasoning starting from the simple picture offered.

4. CONCLUSION

In conclusion, it can be seen that today technological innovation offers products and features unique that can help to convey civic and social values, for the purpose of communication based on increasingly strong interaction between people (Caulier Grice, 2011).

The postmodern personality is fluid, complex and dynamic, and the needs of the people are always new; the different identities have different approaches to technology, communication and information. For these reasons, it becomes highly interesting to give the possibility of obtaining results by ensuring the personalization experience, with the aim of satisfying the different needs and driving the user to repeat his behavior.

In this context, infovis can be a valuable tool to improve communication, to offer a higher level of information, but even to allow users a personalized path. All this can be applied to different contexts coming to assume the role of cultural analysis tool for discovering and understanding data, decoding the complexity of contemporary society.

The case study shows how it is possible to use infovis to broadcast contents at different levels, but it is fundamental the analysis of the data to visualize in order to highlight the relations between them; the discipline could take advantage from the 'systemic design approach', for the purpose of exploring any topic in a more complete way, understanding complex data with the apply even of creative and interaction design.

After the encouraging evaluations obtained and the positive interest aroused by the visualization, we are now working on the standardization of its form, favoring its extension to different sectors and kind of data, and shaping it into an informative, formative and expressive tool, useful to investigate and explore data for statistical, marketing or business purposes.

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