DC(S)
DESIGN CULTURE(S) | CUMULUS ROMA 2020
JUNE 16.17.18.19, SAPIENZA UNIVERSITY OF ROME

EXPERIMENTS ON COMPLEX SYSTEMS MAPPING AROUND MATERIALS.

Flavia Papile*[a], Romina Santi[a], Beatrice Gobbo[a], Tommaso Elli[a], Barbara Del Curto[b]

[a] Department of Design, Politecnico Di Milano, Italy
[b] Department of Materials, Chemistry and Chemical Engineer "Giulio Natta", Politecnico di Milano, Italy
*flavia.papile@polimi.it

Abstract | Nowadays, information about almost every topic are connected, accessible and not only bounded into the academic, "disciplinary" field. The need of keeping trace of the collection and elaboration of those information has been manifested through the years by the development of a plethora of different tools, methods and strategies. The proposed RTD experiments have been built upon a common design tool (the mind/concept map), but with a different, lateral approach to the mapping activity itself. By mixing common design tools (maps) directly with "extraneous" platforms to the research practice (social networks), the authors propose an experimentation to keep the mapping activity an iterative, context-dependant and updated tool. Three different experimentations on mapping material related frameworks are presented and discussed, trying to identify a new disruptive approach where people can easily participate into the debate.

KEYWORDS | RTD EXPERIMENTS, GIGA-MAPPING TOOL, SOCIAL MEDIA, COMPLEX SYSTEMS, ITERATIVE MAPPING

1. Introduction

Nowadays, information about almost every topic are connected, accessible and not only bounded into the academic, "disciplinary" field (e.g. the incremental push from European commission in spreading the knowledge towards Open Innovation, Open Access and Open Science pillars[1]). In order to pursuit a *design task* [2] (of every nature: project, research, activity…), the need of keeping trace of the collection, elaboration and interpretation of those information has been manifested towards the development of a plethora of different heuristic and pragmatic tools, methods and strategies (Dorst, 2019). All of these tools are connected by the ultimate goal of bring some order into this complex environment from which design activity takes inspiration (Kolko, 2010), so that it will be easier to organize, manage and re-elaborate those collected information.

This need for information organization and management is directly conductible to a tradition of design reasoning that we can easily synthesize, at its first stage, with the activity of *framing the design task* itself. This framing activity usually considers all of the following criteria: the disordered nature of design problems (Rittel, 1988); their embeddedness in cultural and social processes (McDonnell, 2015); their dependence of contextual variables that are going to be important to frame the design task (or not) (Dorst, 2018).

Because the ultimate intent of the designers is to control the scope of what they have to deal with, the designer reasoning process of task framing cannot be made in one single step, but by its nature is forced into an *iterative*, *long* and *variable-dependent creative process* (Dorst, 2019; McDonnell, 2015).

So, framing a design task of each nature into a complex context is characterized by the ability of the practitioner in organizing, managing, elaborating a potentially huge amount of information into a context-dependent environment. And this is impossible to make in one shot, an iterative approach is compulsory.

Due to this context/time/social-dependency of design activity, the proposed work will focus on observing if it is possible to collect information for a design task framing by mixing academic and non-academic sources, in order to profit from a complex scenario instead of trying to make order in it, trying to update one of the existing tools.

[1]Further information on: https://ec.europa.eu/info/research-and-innovation/strategy/goals-research-and-innovation-policy_en

[2] We use the locution "design task" instead of design problem because of the co-evolution of problem and solution concepts in the design activity (Dorst, 2019; McDonnell, 2015)

2. Methodology

2.1 Research through design (RTD) approach

Research Through Design (RTD) approach, is based on the assumption that a typical design activity may play a significant role in generating knowledge (Stappers & Giaccardi, 2017).

It tries to employ methods and processes from design practice as a legitimate method of inquiry, presenting the intrinsic ability of converge different information together through a process of composition and integration (Zimmerman, Stolterman, & Forlizzi, 2010).

With this approach, 'doing design' is a part of 'doing research' because of the realization of prototypes (usually artifacts) that promote the birth of new interactions, engagements and interrelations that would be otherwise not easy to emerge.

Assuming that the prototype should not be necessarily a physical product, but more a source of data to be analyzed and observed (Savic, Selena Huang, 2014), the proposed experiments have been built upon a common design tool, born and developed with the role of enlightening new interactions and interconnections: the mind/concept map.

2.2 Mind and concept mapping as a design tool

Displaying complex information is an old practice that can be traced back to the '70s (I. Nassi, 1973) and '80s when flow charts and other visual models (Tufte, 1983) were developed.

Mapping, as a qualitative visualization tool (Eppler, 2006), has become a common practice in the design field. Mind maps, concept maps, (Eppler, 2006) (Davies, 2011) system maps and journey maps (ServiceDesignTools[3]) are just a few examples of types of node-links maps that could be applied in the design process.

According to Eppler's classification, the *mind map* is a radial diagram that represents semantic or other connections between portions of material, while the *concept map* is a diagram showing the *relationships between concepts*, including cross-connections among them.

If the mind map could be intended as a note-taking instrument, the function of concept map is to foster learning or knowledge sharing in a constructive and systematic manner.

However, in the field of service design, mind maps are used to support unconstrained thinking starting from a topic, idea or problem put at the centre of a blank surface.

[3] Further information on the website *https://servicedesigntools.org/tools*

2.3 GIGA-maps: an overview

While the aforementioned examples are characterised by clear and defined shapes and patterns, the structure of the GIGA-map is less rigid, tailored to each specific case.

To introduce the concept of GIGA-mapping, authors rely on the thinking of Sevaldson and his framework of systemic design (Sevaldson, 2018).

GIGA-mapping is one among the System Oriented Design (SOD) methodologies that have been developed in the Oslo School of Architecture and Design (AHO) since 2005. Such practices have been introduced in order to cope with the need of teaching design students how to investigate design problems in a systemic way.

Similar systemic methodologies are very useful in design practice, because they help in framing problems that are complex and context dependent. The same problems described in the introduction.

In fact, one of designers' main challenges of these times is certainly the fact that they have to learn how to leverage "causes and effects, trends and dynamics, requirements and parameters" (Sevaldson, 2018) that influence the design process. This is also due to the fact that resulting outcomes, namely products and services, become part of a globalized world where cultures and technologies are in rapid development.

In order for projects to be successful, a consistent inquiry needs to be conducted in collaboration with experts, users and stakeholders. GIGA-mapping emerges organically as a tool for carrying out this *systemic co-inquiry*.

Differently from other analytical tools with systemic purposes, like the ones developed and used in system engineering or in hard system models, GIGA-mapping draws from design and theory of constructivism (Hein, 1991).

In reaction to a specific problem, it doesn't simply help in understanding the world 'as it is'. Instead, GIGA-mapping is most profitable in pursuing *'what ought to be'* and in understanding which are those "courses of action aimed at changing existing situations into preferred ones" (Simon, 1969).

GIGA-maps need to be designed according to the specific situations, therefore they can present custom and heterogeneous forms. Being visualizations, they usually exploit known models based on hierarchy, time, space/geography and intensity or concept maps, but then GIGA-maps reinterpret such base-layers, mixing them between each others and providing, for instance, *blends between quantitative and qualitative information* (Sevaldson, 2011) - Figure 1.

Figure 1. Example of many different GIGA-maps available online. Each one presents a tailored form. Their purpose is process visualization, not visualization for communication.[4]

In fact: "the format of the GIGA-map, allowing and encouraging the mix of differing categories, graphic expressions, media, and mixed methods approach, results in a very resilient and adaptive mapping model because they are design constructs and not obliged to follow predefined rules" (Sevaldson, 2018).

It is important to emphasize that the produced visual artifact is just the tick of the iceberg. The most of the value of GIGA-mapping resides in its capability to assist the group of people involved into the mapping with the achievement of new composite understandings and perspectives.

They are result of negotiations and balancing among point of views belonging to people with different backgrounds. Empathy based on knowledge of other perspectives is the precondition for dialogue and the prevention of destructive conflicts. GIGA-mapping helps in building such requirement, by leveraging system thinking with intuitive and flexible visual tools.

While describing GIGA-maps, Sevaldson mainly refers to experts, users and stakeholders as the people who take part into the process. Epithets of those actors are already clues of the

[4] For high resolution images go to http://bit.ly/gallery-GIGA-maps or https://archive.is/MQASD.

reasons behind their selection. However, the mapping could certainly benefit from the involvement of a critical mass of contributors that are not directly selected by the leaders of the inquiry and that can help in overcoming the saturation of topic that is naturally reached in later stages of the process.

Furthermore, it could be especially useful when dealing with design problems that tackle debated topics. In such cases, important insights derive not only from the understanding of the problem itself, but also from how the general public acknowledge and interact with it.

However, the involvement of such a large public requires explanation of the tasks and other work of communication design. Up to the moment of writing, GIGA-maps do not cope with any of those.

In fact, as described, GIGA-maps proved to be a successful practice, one that is capable of leveraging huge amounts of information. Yet, to accomplish such results, GIGA-maps "break the barriers of information quantity by separating the process tasks and the communication tasks" (Sevaldson, 2011). If the GIGA-map is meant to be understood by its creators only, how can any general public intervene on them?

The presented contribution wants to further explore on the practice of GIGA-mapping by considering it as a hybrid form of mind and concept map applied to the design practice and customized for a research-trough design experiment. In doing this, the authors tried to set up the conditions useful for extending the mapping also to a general public.

In the following experimentation, the GIGA-map, likewise a prototype, is then considered as the expedient also for overcoming natural limitations that concerns to a mapping activity and, more in general, to design task framing:

- Saturation of the contents due to the number of people dealing with the task framing
- Saturation of the contents due to time available for the framing activity
- Saturation of the physical space available to collect, manage and organize all the information necessary to define the frame.

Those limitations will be better presented in the following paragraphs, strictly related to the task framing activity towards the GIGA-map tool.

3. RTD EXPERIMENT ON GIGA-MAPPING

A general approach to the generation of GIGA-maps was introduced during a doctoral course on designing RTD Experiments. In this course, only the first activity was set: the choice of the ideal type on which to set the display. Afterwards independently, different groups of students approached the mapping activity.

In the specific case of the authors, the activities that have been carried out, the results and findings to which they have led will be described below. As previously mentioned, the group's approach to GIGA-mapping has to be considered as an RTD experiment. The main objective of the experimentation was not to provide a complete fulfillment of the concept framing itself, but mostly to explore how to overcome natural limitations of the GIGA-mapping activity.

3.1 RTD experiment activities

- Activity 1: Choosing the ideal type

The base-step to start mapping a concept or framing a task is, for sure, to define the starting point: the ideal type. The ideal type is defined as: “social constructs for empirical investigations” (Fox and Alldred 2017). It must be a single concept idea, without any positive or negative connotation from which expand the knowledge. So, in order to produce a nice amount of information and push the mapping activity to the limit, the authors choose a quite controversial design-themes: plastics, bioplastics and materials selection. In fact, to monitor the evolution of the map itself, the authors tried to choose an ideal type for the map that could be interpret on several, multiple layers and commonly easy to understand.

The following activities have been set up and defined by performing them during the very first experimentation upon the “plastic” ideal type and then they have been repeated for the subsequent two ideal types (bioplastics and material selection).

- Activity 2: Ideal Type Review

The mapping experiments are intended to monitor the gravitating concepts around three ideal types taken from the authors' research areas that can be easily identified as complex systems related to materials. In fact, the choice of the ideal types was made on research topics of which the authors were experts, to facilitate the research of initial information and data and to analyze with a critical lens the subsequent collected information. Then the literature, the state of the art of research and the market have been reviewed and grouped, ready to be disclosed. The activity was carried out until a feeling of saturation was reached.

- Activity 3: Map fulfillment

As the map started to be populated with several keywords, authors experienced the incoming of the first limitation of the mapping tool: the number of people involved in the map fulfillment income into a ‘content-saturation’, where new keywords proposed were related to already written ones - Figure 2.

Figure 2. Image of the pilot mapping activity made by the authors on the "Plastic" ideal type.

To overcome this first limitation, authors choose to place the ideal type at the mercy of more people, trying to establish co-design and co-building activities.

Authors have not provided pre-knowledge or rules to the new participants to maintain no judgement approach. The activity was carried out within the authors' home university with the involvement of about 40 students of master course about material selection - Figure 3.

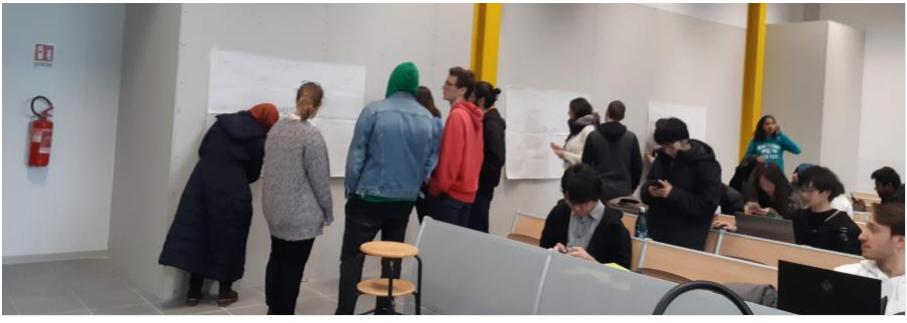

Figure 3. Ideal types at the mercy of the students.

- Activity 4: Clustering/Layering

A "critical" review of the information collected in Activity 3 was therefore made. Thanks to the knowledge base (Activity 2) and the map enlargement (Activity 3), authors were able to cluster, organize and manage the new information coming from the previous activities - Figure 4.

Figure 4. Clustering and layering activity by merging authors' previous knowledge of the themes and the new information acquired by the co-mapping activity.

Each information collected was therefore clustered in specific thematic areas and subsequently clustered, based on the perceived meaning of the expressed keyword (positive or negative) and the ability of that punctual information to generate debate.

- Activity 5: Design of digital contents

Once that the map reached a new level of "saturation", due to space and time available to fulfill the map, the enlargement of the map has been promoted by introducing the activity on non – academic social networks. Respecting the approach of mixing sources of information, as suggested by the GIGA-mapping approach, a digital content based on the revised map has been generated.

Social networks allow a diffusion and sharing of contents over space and time. In the academic field, are considered good tools for engaging with one's peers, enhancing awareness and developing professional connections (Kelly, 2018). In order to exploit those platforms to enrich the GIGA-map complexity and interconnection, authors started to design digital contents specifically for a non-academic social network, taking its formats and potential. In this way, three GIGA-maps profiles have been activated: Giga.Plastic (first), Giga.Bioplastic and Giga.MatSel (then) - Figure 5.

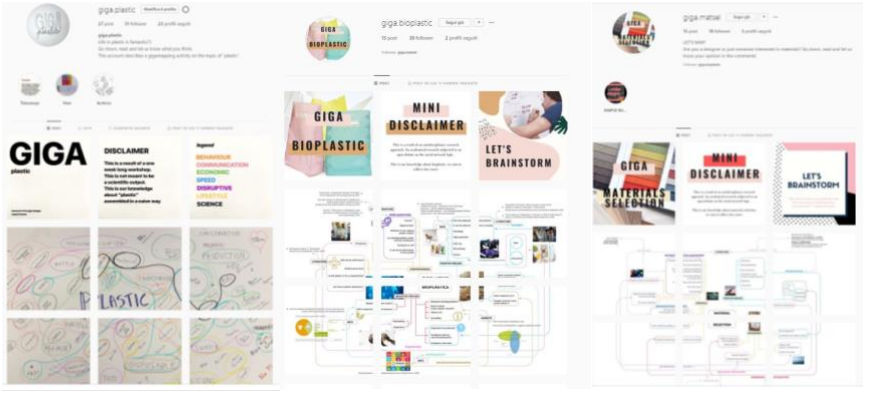

Figure 5. Overview of the GIGA-maps profiles.

- Activity 6: Call to social debate

Above all the contents, the main *triggering* keywords have been extrapolated to create debate and interest. Thanks to the enlightenment of the most suitable keywords that could provide a debate, audience has been called to comment with several unstructured stratagems (tagging profiles, sharing instantaneous contents and spreading profile contents). The social channels (one for each ideal type selected) periodically disseminated to different communities and checked to manage the debate.

- Activity 7: Update social debate

The profiles are still monitored and an update is planned in the following months to respond to the most active debate topics, so that the GIGA-map can grow exponentially.

In Figure 6 are portrayed the planning of the different actions, stakeholder involved in each, and a flow representing the amount of people called into action for each activity.

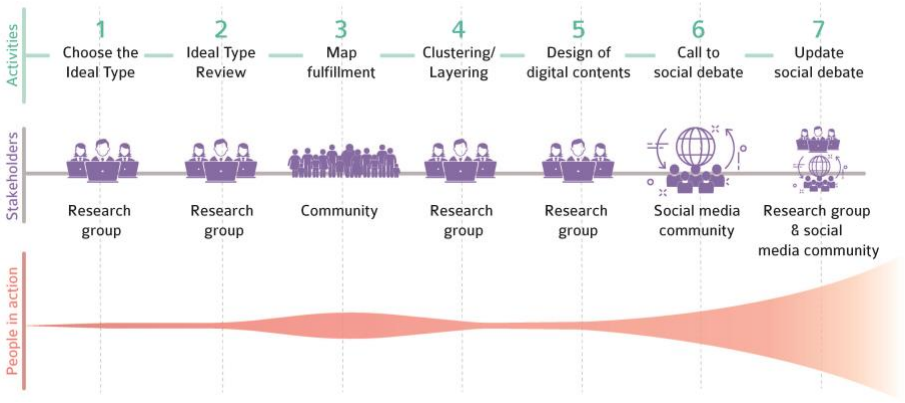

Figure 6. Schematisation of the performed activities, in correlation with the stakeholders and the people in action.

3.2 RTD experiment dimensions: overcoming the mapping limits

In Figure 7 it has been illustrated how passing through the different activities can help practitioners to overcome the limits of GIGA-mapping. The *first dimension* of GIGA-mapping is considered as the starting one, in which a certain individual or research group worked for the visualization of data in an established place and time frame.

Through the third activity proposed (increasing the number of people fulfilling the map) it was possible to overcome the limit of the people involved in the research by bringing the mapping activity to a social level. A *second dimension* can therefore be reached, it enriches the panorama of possible arguments and expands the mapping point of view.

In Activity 6 (call to social debate), in addition to the limit of people, further exceeded, it can be seen how the space variable can also be surpassed. In fact, there is no longer a defined and controlled space where the debate takes place, but it is a multimedial and potentially infinite space. In this way, the *third dimension* of mapping can be reached, which goes beyond the context-dependent limits (people and space available).

The *fourth dimension* can be reached by going beyond the time limit. With the last activity, the seventh, and therefore with an iterative updating of social debating/map-building, the fourth dimension of mapping can be reached. Thanks to this, the mapping can continue to evolve, and it is possible to create and share new contents, strictly dependent and updated to the tenor of the debate aroused or the new research carried out.

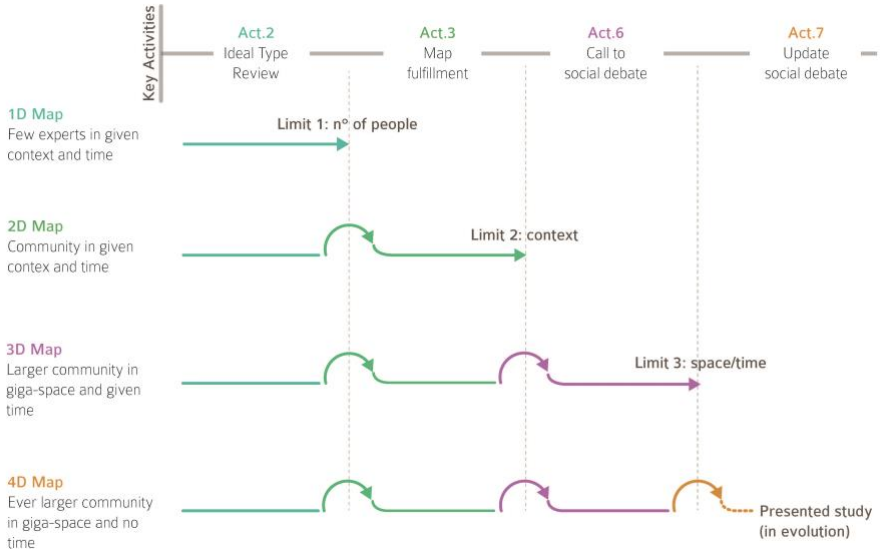

Figure 7. Schematic view of the limitation overcoming by dimensional evolution of the map.

3.3 RTD experiment reliability

Therefore, embracing the iterative nature of the design activity and overlapping this iteration with the dynamic environment of social networks, the authors' objective has been to provide a possible new hybrid scenario. This experimentation opens a view on how to create a dynamic design task framing, by mixing common design tools (maps) directly with "extraneous" platforms where people can easily participate into the debate (social networks). In fact, in potential, the "social-network GIGA-maps" can provide an evolving, context-dependant and updating mapping activity.

In order to maintain a certain rigour and to mediate all the possible information incoming in the social network environment, it is not possible to by-pass the intervention of competent people to have a certain level of contents reliability.

The Figure 6 also focuses on how authors developed the experimentation pinpointing precise moments of review and reflection upon the collected information. In Activity 1, 2, 4, 5 and 6, have been established moments of definition, clustering and mediation of the contents in order to avoid unstructured or too vague information and set the point only on usable concepts. By doing this, all the potential discouraging information can be easily managed by the competent-on-theme people (in this case authors) and the conversation can be carried out by maintaining a neutral view (as much as possible).

4. RESULTS

The presented work has been carried out, however in a limited time span, due to the commitments time span. Nevertheless, with the potentiality offered by platforms such as social networks, it can be easily carried on for a longer time.

So, starting from the main concepts expressed in the Introduction:

- design tasks usually drive practitioners towards a disordered environment and there is a need to put order in it by collecting and elaborating information;
- the embeddedness of design activity into social and cultural processes is something compulsory in the design activity;
- the interdependency between the design activity and its context naturally links to a time-space dependant dimension;

the authors found in the social networks platforms a fertile soil for reinforcing existing tools commonly used by designers to frame their tasks.

One of the most interesting findings of this activity has been to translate the perceivable frustration incoming from the early saturation of the task framing activity into a catchy and amusable one, by using platforms normally addressed to spare time purposes.

In order to maintain a certain rigour and to mediate all the possible information incoming in the social network environment, it is not possible to by-pass the intervention of competent people to have a certain level of contents reliability and some content reviewing and updating steps. So, the social GIGA-map is not an independent reality and must be curated.

The participation to the debate coming from people with unknown and different backgrounds permitted the arising of audience's doubts and concerns related to the topic. This is a very interesting point in order to familiarise and moderate the communication of design research activities, to promote an efficient divulgation that normally follows research advancements – Figure 8.

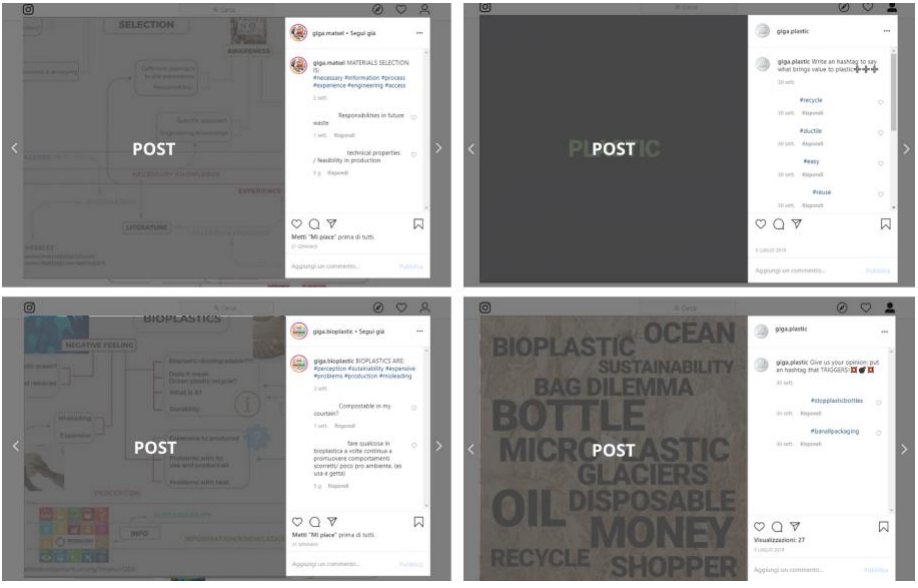

Figure 8. Examples of the audience interaction with the social GIGA-map.

The overall audience reached at the end of the expected time necessary to report the results of this experimentation into this context was of about 121 people and 38 new interactions have been registered to the three profiles.

The profiles will be monitored in the next months to understand also if a more-intense intervention about the social media contents could catch the audience attention and inspire a more intense debate on the defined topic.

5. DISCUSSION

In the presented work are still present some limitations and further adjustments are required.

- Some topics are more suitable than others

In example, the first main limitation may occur on the topic definition: in average, in the GIGA.plastic and GIGA.bioplastics profiles audience was more reactive and curious about the topic itself by suggesting new keywords but also expressing several doubts about it, probably because of the contemporary debate upon those topics also on other levels (newspapers, new government directives, etc.).

The audience stops to interact with the map when the topics are more related to a sectorial public (e.g. GIGA.matsel on material selection) and they limited themselves just to observe the phenomenon.

We can assume then that already engaging topics are more suitable for this kind of approach, because the chosen channel is addressed to an unknown public.

- Engaging a well-defined public should be done before spreading the social profile

All along the experimentation, authors found that to address the profile to a '*probably interested*' public could be more convenient in order to collect a good amount of information. Even if the main objective of this work was not directly linked with the complete framing of the research topics, authors should affirm that the potential of this new approach could be empowered by an accurate a-priori selection of the addressing public (e.g. interacting with already existing platforms that work on dissemination).

- It is necessary to update and constantly nurse the profile itself

It has been noticed during the experimentation that audience reaction was more evident in the immediately following of an updating activity. Exploiting the possibility offered by the social network to post some 24h-lasting contents, authors tried to catch the audience attention by renovating the call to action from time to time - Figure 9.

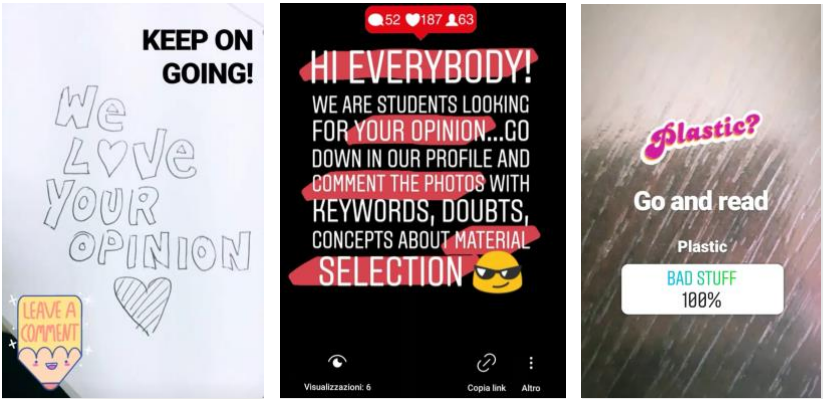

Figure 9. Examples of 24h-lasting contents to keep the audience focused on the topic

By doing this, it has been possible to enlighten an increasing activity of the audience in completing the map; so the suggestion is to structure the introduction of new contents also in terms of time, considering that the audience attention must be kept high on the debate constantly. Those are for sure only preliminary observations about the results, due to the acerbic state of the experimentation itself, being it a first attempt.

Further works and further experimentations are certainly needed in order to establish if the proposed work could set up the basis for a new methodological approach for exemplifying the design task framing activity, exploiting the mixture of several tools.

References

Davies, M. (2011, September). Concept mapping, mind mapping and argument mapping: what are the differences and do they matter? Higher Education, 62(3), 279–301.

Dorst, K. (2018). Mixing Practices to Create Transdisciplinary Innovation: A Design-Based Approach. Technology Innovation Management Review, 8(8), 60–65. https://doi.org/10.22215/timreview/1179

Dorst, K. (2019). Design beyond Design. She Ji. https://doi.org/10.1016/j.sheji.2019.05.001

Eppler, M. J. (2006). A Comparison between Concept Maps, Mind Maps, Conceptual Diagrams, and Visual Metaphors as Complementary Tools for Knowledge Construction and Sharing. Information Visualization, 5(3), 202–210. https://doi.org/10.1057/palgrave.ivs.9500131

Fox, N. J., Alldred, P. (2017). Sociology and the New Materialism: Theory, Research, Action. Sage Publishing

Hein, G. (1991). Constructivist learning theory. Institute for Inquiry. Available at http://www.Exploratorium.Edu/ifi/resources/constructivistlearning.htmlS

Kelly, B. (2018). Using social media to enhance your research. How to Keep Your Research Project on Track, (June 2013), 174–183. https://doi.org/10.4337/9781786435767.00039

Kolko, J. (2010). Abductive thinking and sensemaking: The drivers of design synthesis. Design Issues, 26(1), 15–28. https://doi.org/10.1162/desi.2010.26.1.15

McDonnell, J. (2015). Gifts to the Future: Design Reasoning, Design Research, and Critical Design Practitioners. She Ji. https://doi.org/10.1016/j.sheji.2016.01.007

Nassi, B. S. (1973). Flowchart techniques for structured programming. ACM SIGPLAN Notices, 12–26.

Rittel, H. W. J. (1988). The Reasoning of Designers_Horst.pdf. (August 1987).

Savic, Selena Huang, J. (2014). Research Through Design: What Does it Mean for a Design Artifact to be Developed in the Scientific Context? Conference. 5th STS Italia Conference A Matter of Design:Making Society through Science and Technology Milan, 12–14June 2014, 66(June), 37–39. https://doi.org/10.13140/RG.2.1.4306.6729

Sevaldson, B. (2011). Giga-mapping: Visualisation for Complexity and systems thinking in design. Nordic Design Research Conference, Helsinki

Sevaldson B. (2018) Visualizing Complex Design: The Evolution of Gigamaps. In: Jones P., Kijima K. (eds) Systemic Design. Translational Systems Sciences, vol 8. Springer, Tokyo

Simon, H. A. (Herbert A. (1969). The sciences of the artificial,. [M.I.T. Press].

Stappers, P., & Giaccardi, E. (2017). Research through Design. Chapter in: the Encyclopedia of Human-Computer Interaction, 2nd Ed. Retrieved from https://www.interaction-

design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/research-through-design

Tufte, E. (1983). The Visual Display of Quantitative Information. Cheshire: Graphics Press

Wettre, A., & Sevaldson, B. (2018). Teaching Team Work in Systems Oriented Design. Relating Systems Thinking and Design (RSD6) 2017 Symposium. Oslo, Norway, October 18-20, 2017, 1–13. Retrieved from https://systemic-design.net/rsd6/systemic-design-pedagogy-and-education/#wettre

Zimmerman, J., Stolterman, E., & Forlizzi, J. (2010). An analysis and critique of research through design: Towards a formalization of a research approach. DIS 2010 - Proceedings of the 8th ACM Conference on Designing Interactive Systems, 310–319. https://doi.org/10.1145/1858171.1858228

About the Authors:

Flavia Papile PhD student in Design. Her research activity focuses on materials selection process within industrial contexts. Through systemic information management approach and attention in transition towards more sustainable production, material selection process is reviewed as a resilient process.

Romina Santi PhD student with a grant co-financed by Innovhub. The research activity concerns the aesthetic-sensorial materials design, to guide consumers in adopting sustainable behaviours. She is interested in sustainable, eco-composite, compostable and bio-based materials, especially in relation to the packaging sector.

Beatrice Gobbo Since November 2018, she has been a PhD student in Design at the Politecnico di Milano. She is a member of DensityDesign Lab, a research group focused on data visualization and information design. With her current research she is investigating on the role communication design and information visualisation in the field of explainable artificial intelligence.

Tommaso Elli is a PhD Student in Design from Politecnico di Milano. Member of DensityDesign Lab, he is a communication designer and a creative coder and he's now specialising into information design and data visualization. His work is mainly conducted in the field of Digital Humanities.

Barbara Del Curto Full professor, with research activity concerning design of materials and surfaces, with attention to innovative materials, packaging and "talking" packaging, nanotechnologies and surface treatments and their technological transfer to the world of design, architecture, agri-food and textile / fashion.

Acknowledgements

Authors want to thank professors of "*Designing RTD Experiments Summer School"* at Politecnico di Milano for introducing the GIGA.Maps tools. Another special thank goes to all the students and the community that took part in the completion of the Instagram GIGA.Maps.