Design Implications of Digital Social Innovation: A Playful Approach to Analyse Cases Study Dataset

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Abstract. This paper is a preliminary activity of the DESIS Digital Social Innovation Research Cluster, with the purpose to elaborate the cases of the Social Innovation index, from the projects NT100 and digitaleurope.eu, by framing the analysis with the lens of design. We approach the analysis by information visualization methods and data manipulation tools, and in the paper we present process and results of the visualization, and the discussion of the stories we gather through the analysis. We conclude by discussing the lesson learn by this cases study analysis that privileged the heuristics of digital tools to the hermeneutics of more traditional research approaches.

Keywords: Digital Social Innovation, Case study, Information Visualization, Open Data.

1 An Outlook on Digital Social Innovation from Design Perspective

In the recent literature about Social Innovation, specific researches are focussing on the role of digital technologies. We all believe in the peculiar role of Internet as a dominant constant of contemporary human interactions, as well we observe that many of the exciting innovations that enable people to collaboratively address social issues, are being developed online, or within mediated information systems. Yet, the reflective and analytical knowledge about the impact of technologies in cognitive capabilities and model of social engagement, are not deciphered and exploited; *"Yet this technological capacity far outstrips our knowledge of how to use it. We are not entirely sure what any of this is really for"*.[13] Digital Social Innovation is a recent label, that include the challenge of giving a clearer identity to the digital spirit that nurture our way of knowing, and living. The paper addresses the discipline by the framing of relevant literature and mapping knowledge definitions; as a very preliminary step in understand how the disciplinary contribution of design can dialogue, cope, and provide an impact.

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1.1 The European Input to the Social Innovation Knowledge Base

At the present stage, the more advanced contribution to the studies come from the synergy among European institutions and NGO on soughing best practices for the public impact, and to develop proper funding strategies. In particular, European Commission funded the project to build a living map of organizations that imply a significant use of digital technologies within the framework of social innovation [1]. The preliminary output at the end of 2013 has been an online map at digitalsocial.eu (and related dataset [2]), of significant institutions and organization across Europe; the platform per-se represents an example of early stage social innovation, being a public audit of experiences and actors, giving public access to data and to further implementation, and using mapping as a preliminary knowledge tools.

Another case, the research from the Nominet Trust [3], UK's leading funder of social technology ventures, in collecting 100 cases of digital social innovation as the preliminary index that recognizes the most inspiring applications of digital technology for social good; those selected are again displayed through an online map and an open data-set. Similarly, we would like to name also the Global Innovation Index (GII), published at its sixth edition by Cornell University, INSEAD and the World Intellectual Property Organization (UN). The GII recognizes the key role of innovation as a driver of economic growth and prosperity and acknowledges the need for a broad horizontal vision of innovation that is applicable to both developed and emerging economies, with the inclusion of indicators that go beyond the traditional measures of innovation [4]. In the last report, they conclude that those disruptive innovations that come out of nowhere, are very rare. The vast majority of innovations are in fact incremental changes built on the underpinnings of other knowledge, technologies, or platforms. *"What is important for most innovations to occur is a set of enabling conditions that trigger people and groups with the right knowledge and skills to recognize (even serendipitously) an incremental step that can be taken at that moment in time. Digital technologies, and especially the Internet, are now for the first time in history providing a quantum leap in these enabling conditions on an unprecedented and global scale.*" [4,15].

Europe is fond of positive experiences. A resident project of Lancaster University, Catalyst (mapped on ds.eu), brings together academics and communities to jointly imagine and build the next generation of digital tools for social change, and to explore solutions to major problems in society. Catalyst is a funding based scheme that involve active based research with the citizenship, and through active research pursue to the development of new knowledge that will benefit also the academia. In their words, *"across all these projects lie the common themes of: (1) citizen-led innovation through equal partnerships between the University and its community; (2) digital innovations addressing real problems with real people."* [6,11]

Catalyst explores deep questions about the relationship between digital technology and pressing social problems and it does it by practice, giving tools in the hands of the people and enabling them to the seek of innovation, by failing and learning along a real process, where the social change can be actually experienced. The questions they pose are radical for the notion of interaction design, and for the education we give

around it: *"But do modern digital technologies really make it easier for communities to change the world? Or do they lead to problems of access to information, solidifying the status quo in power structures, and illusions of a quick technological fix? And how should we design future digital technologies – technologies with a social conscience built in?"* [11].

These examples demonstrate the demand and the synergy towards more and more researches in the field, and by having them in practices, and connected to the policies and implementation platforms. The research on these topics is *"ongoing, partial, immature, fuzzy"* [13], and experimental, as we add, but also well supported as all these organization have research agenda and corresponding funding for the next two years. At this stage thou, the knowledge we have is in the form of mapping, localization and aggregations of active practitioners.

Making sense out of this mapping is the starting assumption of this paper, gathering the data from the two index and articulating questions about the role of design in this technology paradigm. Being creators of technology we cannot postpone or demand a reflection about its ethos and qualities. Digital technologies inspire three kind of reactions, *"excitement from the super-optimists who believe we are on the verge of a new era of democracy, co-operation and abundance; alarm from pessimists who think we are undermining respect for authority, expertise and discernment; and scepticism from those who cannot see what all the fuss is about because most of what really matters does not come from a microprocessor or smart-phone"* [9, 11]. Sceptic as researchers are, we believe that what "do really matter" is at the core of the our technological concern, because as interaction designers we know it is where the technology will impact, as it is a cognitive device.

1.2 The Reason We Write This Paper (Our Knowledge Contribution)

The premises of this paper are in a recent initiative of the DESIS Network [16], that recently launch a research cluster on DSI, assuming as a prior research question that digital technology are dominant, but critical, for new ways in which people, users and community collaborate and co-create for a wide range of social needs. They represent the organizational tools for very special interconnected communities and individuals, but we still do not have any argument on how far the influence of the media itself can impact messages, actions, and meanings.

Therefore, this paper has the purpose to elaborate the cases from the two projects NT100 and ds.eu, by framing the analysis with the lens of design, whilst taking into account the level of technologies (which is the digital technology we care about, and eventually we could design, affection non cognitive capabilities), and the issue of collaborative communities and their social engagement (how digital technologies are used in practice, how design can leverage on the engagement, interaction, and participation). In those indexes the variety of the cases is *"Inspiring, because these great examples show the massive potential in tech for good. Frustrating, because, bar a couple of exceptions such as Github, Arduino and Patients Like Me, the majority of these initiatives are relatively small scale and sit on the periphery of the mainstream."* [13] Even further researches will be needed to understand what limits, or

eventually enables, the disruptive capacity of this innovation to expand on a larger scale; we can learn something from the knowledge we have so far. It emerges, for example, as crucial that digital innovation is community based, and glocal. Social innovation is largely distributed across geographical borders (Fig. 1), coming as well from developing countries; every country share their investment among international (less) and country (more) projects, and we can appreciate the large section defined as global. We can also see also that the innovation in developing country mostly come from self-investment as well as North American ideas are widely spread.

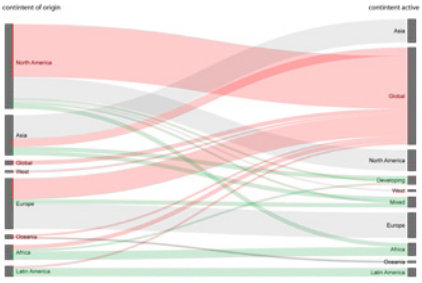

Fig. 1. Alluvional diagram. Relationship between continent of origin of the innovations, and continents where they're active. Colors highlights the comments in the texts.

Social Innovation studies undoubtedly are multidisciplinary, and recently also within design discipline interest arises towards a specific definition of the meaning and role of digital platforms. We believe the multidisciplinary effort will be influential to the scalability asset of those project. By design perspective, we believe that the nature of technology, the structures of interaction and the social qualities represent main challenges for design disciplines, and therefore we proceed in a deeper analysis of the case studies as explained in next paragraphs.

2 Design Concerns

Nowadays, definition of society and societal concerns blends together the physical and the digital contexts in which individuals, people and communities express themselves. Collaborative Services, Social Enterprise, Open Innovation are just some of the definitions already established in literature and innovation practice, which define the boundaries, phenomena that undergo the forms of innovation in which society is involved. Digital applications, often defined as social utilities, have become a staple of our contemporary public networks. Nevertheless, their pervasiveness significantly vary from participative façade (where the interaction is limited to the online publishing and effect in the multiplication of weak and disengaged relationships), to actual social relevant forms of organizations and change (where the digital technology represents the innovation criteria, meaning that technologies are appropriated and used by communities for the generation of specific, shared, incremental social values). This is crucial to designers and practitioner since even we recognize the wild diffusion of

digital technologies is growing, we do not necessarily wish for it, whereas as researchers and educators is necessary to inquiry where is the ethos of technology, mostly if it is social: the same way the ethos ground the space of human interactions, it should ground the digital space of interaction inhabited by humans.

2.1 Preliminary Consideration on the Cases

The two index come along with structural characteristics and two different dataset. NT100 is a trustee-compiled list of cases collected with a mixed approach between peer submission and advisory, whilst ds.eu is mainly grass-roots initiatives with multiple contributors. NT100 is a csv files with the 100 entries, and relative categorization. Data are displayed in the web interface [3], where cases are separate entities (Fig. 2.1), labelled with several values (such as the flags (Fig. 2.4), and the technologies involved (2.3), the colours represent instead the societal challenge that the case refers (Fig. 2.2)) and filtered by technology type and categories (Fig. 2.5). There is a major menu by colours in which are identified the societal challenges involved in the different project. This navigation part is somehow limited because disabled colours whilst navigating do not allow to understand relationship across categories. The interface of ds.eu is instead a geo-based mapping of activities (lines) and organizations (dots) (Fig. 3.1), information that are stored in RDF based database. Filtering in the web interface here is more articulated, based on set of keywords (technology focus, organization type, activity type, domain, country) (Fig.3.2), and visually displaying the connections among the organizations on the map (by lines). Each items (organizations or activities) (Fig.3.3) is therefore open in a separate pages where details are categorized as well following the ontology [17, 2].

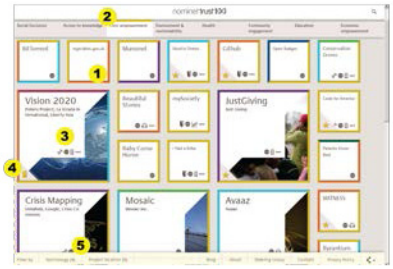

Fig. 2. Web interface of NT100 index

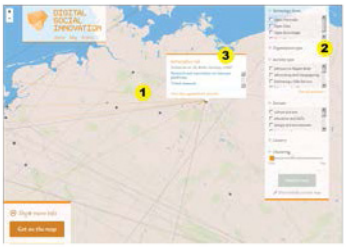

Fig. 3. Web interface of ds.eu project, with a preview on a single items, and the filtering menu

We briefly discuss the ontology: “Organization Type” and “Technology Focus” are the class in which there is correspondence between the filtering keywords and how the items are described in the database. In the class of “activity type” the filtering is limited to the first entries of the class, probably by selecting the threshold of occurrence. “Activity Role” class is not in the filtering, at this is fact very interesting

keyword because represent the stakeholder pattern for each case and could say something about the organizational structures behind the successful organizations, and the stakeholder engagement. The concept scheme of "Area of Society" and "Technology Methods" also include much more variety of details not used in the filtering, but these data are not uniform (keyword as well as descriptive sentence are both included in the schema). Technology is clustered differently, but in both system is a keyword of the principal way of displaying (whilst other information are hidden, or in a second relevance). This relevance is a first crucial issue for us. NT100 interface has a filter by technology that can be multiply selected, and in the database three values describe technology "tech_filter" (used in the display) "platform" (that is not used in the visualization, and simply define the basic platform of use mobile, internet, or GIS), and the "technology_type", that include media, models and domains. The ds.eu instead use a semantic in which technology is grouped and clustered by four attributes of openness, whilst the "technology_methods" ontology is disaggregated and disordered. Nevertheless Fig. 4 shows the diagram for the mapping of the new set of merged technology-related category. The logic of having larger cluster, tech domain, and then more detailed items has been maintained. We will discuss in the conclusion part how better improvement of this data analysis can be done.

2.2 Visualizations of the Dataset

According to the dataset, we played with the visualization in order to get sense out of the data. Authors are not familiar with experienced data visualization tools, whilst understanding and appreciating the potential they have to move from data through stories; therefore this is also a preliminary self-training approach, whilst believing the capability manipulation of linked data is a minimum requirements to those want to research in the field of digital social innovation. We focus our attention on the NT100 dataset and using OpenRefine [8] for the data manipulation and Raw from Density Design Lab [7] for the visualization. Very simple queries have been tested out in the SPARQL [9] environment provided by ds.eu, by realizing that due to limited skills we have too short time frame to be able to have significant outputs from this process. These are all open tools and language for data manipulation and visualization, distributed as opensource software and incredibly powerful digital research tools.

Those index have been compiled with the aim of providing an information service of cases study and best practices. As it is, users can access to the information about the single entities, by several degree of depth of the details of the information itself. In our approach instead, the the prior aim is to look at the dataset not from analytical analysis of the cases, but by grouping and clustering for their shared properties. In this case is more important the information we can derive from them, the pattern that all the cases represent or could represent, more than their specific significance.

If we look for example at Fig. 5, where the the *continent_active* value is related with the *social_challenges* of the 100 cases, we can confirm that projects with a global impact are the more numerous, but we also observe the particular weakness of Latin America; whilst both Europe and Asia distribute quite homogeneously their efforts across the social challenges. A particular significant global issue, is "Access to

Knowledge", as well observing that North America has the most investment in "Health". Is nevertheless interesting to observe that the social challenge with less "global" impact is exactly "Health", suggesting probably the culture-based specificity and conditions of each geographical environment. In the same way Europe is particularly poor of investment in "Economic Empowerment", and this is not a surprise given the historical condition in which the countries live, and being known that entrepreneurship is still not a complete mature economical asset yet. We do also notice that Asia as a very narrow impact on "Environment and Sustainability" and this is also a critical point of chronically and global interest.

Fig. 4. (Partial) dendrogram of the merged taxonomies between NT100 and ds.eu dataset, by the values related to technology

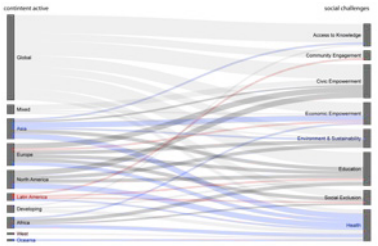

Fig. 5. Alluvional diagram. Overall view of the relationship between continents active and societal challenges. In the next figures the data are the same but differently distributed in the space for a better highlight

In the interface of Fig. 2.4, we mentioned a "flagging" associated to each cases. This is represented by assigning to some of the cases the values of *trailblazer* for those projects that are pioneer in their actions, and *one-to-watch* for those considered particularly promising. Also, in the dataset there is another flag about the development stage of the project. This information is also particularly interesting since we discuss already how much scalability issue will be crucial in the future development of all the social innovation projects.

By Fig. 6 (left) we can observe that among the *trailblazer* a large number is in the "Access to knowledge" challenge, that itself is not that numerous. This could suggest a prominent interest, or need, in that area; as well as for the *one to watch* flag, the more are concentrating in "Environment and Sustainability" where probably the major concerns and intellectual reasoning is concentrated, and where also the involvement of the people through the digital technologies could eventually lead to a real unexpected impact. From the flags and development stages (Fig. 6, right) we can observe something by relating them with the timing of the project. We only know from the database the starting date, but the figure says that pioneer projects are the more recent ones, suggesting that is really in recent times that a certain maturity on

technologies has made possible to more robust solution to emerge. On the other side, the *one to watch* are all more mature, suggesting probably that time impact on scalability and stability issues.

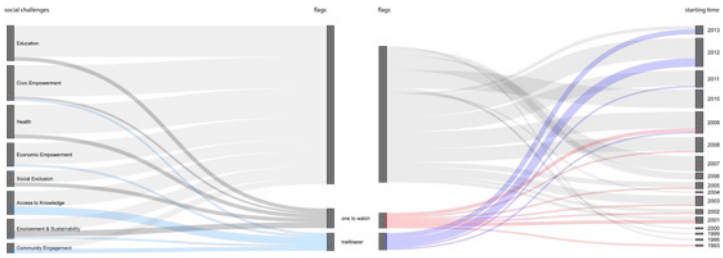

Fig. 6. Left: Alluvional diagram. Distribution of flagged projects along societal challenge. *Right:* Alluvional diagram. Distribution of flagged projects along time.

Others diagram we do not have the space to publish, but will be given online for the Conference time, distribute along the time the different stage of development. Start-up emerge all recent, in the past four years (while projects time span is from early'90s), whilst scaled projects do not get more recent than 2005, and this could refer to more general systemic condition to be suggested.

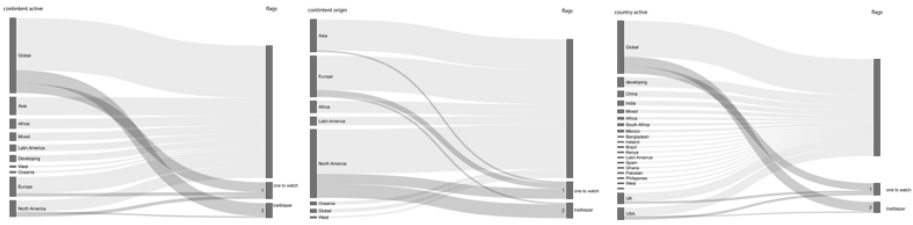

Fig. 7. Alluvional diagram. Continent of origin, and continent/countries active, related with the flags. Note that in the section a,c the visualisation was correct in Raw App, with no overlapping (as it is supposed to be), but it has been manually changed to keep the same labels ordering.

By relating flags with continent of activity, we notice that the both of the flags are indeed assigned to either global, or western countries (EU and USA). This is quite unexpected boundary emerging (Fig.7a). If we view closer from continent of origin point of view (Fig. 7b), and from country view (7c) the boundary is even clearer, with just a contribution from Asia and a clear predominance of USA. Is this saying something about where the innovation come from? And this is definitely a true questions, given the fact that the authors are European and Chinese! In other figures that we do not include, we notice that innovations originated in North America are roughly the half of the start-up, and this is also quite interesting given the global economic scenario, and moreover if related to another figure that shows how almost the half of start-up are connected to "Health" challenge.

2.3 Integration of the Dataset with New Data

We are exploring other queries on the data, like time and geographical distribution, testing mainly if either the Alluvional Diagram or the BubbleChart and Circle Packing would be the best solution. Or by distributing across different continents both flags and development stage in the same view, or flag and social challenges, and verify how Circle Packing is indeed effective.

Being this a first experiment we have been quite free in the manipulation of the data, not only by correcting typos and data incongruity. For example, in the assertion about geographical distribution we cluster in West, Developing, Latin America, according to clear iconic meanings; we grouped the distinction because we were not interesting in specific location, but trends (i.e. Latin America includes Mexico, West is Europe and USA, Developing includes only Africa, Asia (still, there is the big issue if keeping China separate from Asia for its not being anymore developing) and Latin America, etc.). Also, we transform string values in numeric values when more suitable for the visualization format (like flags and development stage). A further activity is instead the real manipulation of the dataset by adding new data. This part is much more aggressive with tools like OpenRefine more than the visualization part. It is actually the phase in which we can create a dataset more suitable for the visualization purpose, and to be interactive with deeper queries.

We start in fact by thinking to merge the two dataset together, and having a larger number of cases to study. Nevertheless, the two formats cannot be directly integrated and time limitations do not allow us to succeed in this part. We, at this stage, have a series of intermediate open process, but not being able to have an outcome yet. As we already referred, Fig. 7 shows the results of the merged technology keywords of the two index. We are doing the next step, clearing and refining the data of ds.eu ontology (that includes several inconsistency, values that represent instead challenges, like "cultural discovery" "co-creation") and merging with the current table to have a several dozens hundreds of technology keywords associates to our cases, instead that 8 like we have now. We are not enough smart (yet) in data refining process to have results yet, but still we believe for the time of the Conference more robust results will be presented. In the NT100, we found three values for defining the social challenge which the project refers, "dom_soc_challenge, a field with unique entry among 8 values, and a "soc_challenge" entry with the same values, but multiple selections, up to five. "soc_challenge" is used to categorize by colour the projects on the web map. Since the association in the database of the different challenges domain are progressive, we believe they could represent a more detailed description, instead that a bunch of unsorted keyword (also because they're only eight, and by a manual random check here and there we kind of evaluate the order of the keyword could make sense).

Moreover, what is the challenge value for the NT100 file, is reasonably mapped with the domain value of ds.eu; for the moment we are still struggling with OpenRefine to find a decent format that could include the mash in a proper way, and we the current output is Fig 8 in which you can see the progressive tagging with the challenges values, and by their proximity relationship, explore possible meanings like how at stage 3 "physical computing" is so connected with "audiovisual". This kind of visualization serves as search and exploration devices, more then extracting well-defined insights like in the previous examples.

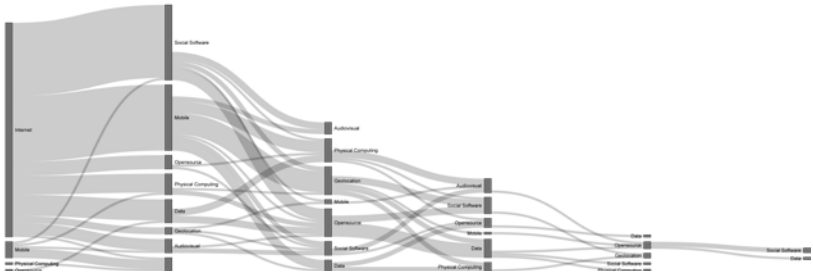

Fig. 8. Alluvional Diagram. Progression of technology-related categorization in NT100 dataset.

There are several others integration of the database that we plan to do and we push to the Conference a deeper discussion. We have quite a clear road-map about this, in the following steps:

- Complete the meshing between "social challenge" and "domain area" in the corresponding database, and adjust the categorization accordingly
- Include in the NT100 database two values derived from the ds.eu dataset, meaning "organization", and "activity type"
- Include in the database a string value that analyse the cases according to the "Attributes of four modes of MCS [14]" as a reference to distinguish the interaction properties of each case
- Dissemination and release of an open data package that includes the visualizations created, and the new dataset generated.

3 Discussion, Limitations and Further Development

In this paper, we acted two kind of methods. Firstly, a reflection about the literature and best practices, whilst giving a scenario about who-is-doing-what in the emerging field of digital social innovation. We clarified the design concerns, that still needs to be developed into a clear agenda. We learn from the literature the power of incremental innovation, that suits with the design expertise on prototype and community engagement, that are by definition resilient and incremental. We therefore proceed to use the data we have so far, from ds.eu and NT100 index, to act a design-based analysis of the cases, not based on analytical hermeneutics, whilst on visual heuristics: by using linked data managing tools, and open-source visualization apps to have an aggregate, transverse view across the dataset.

At the same time, tools, methods and reasoning around open-data is one of the issue within digital social innovation fields, so by practice we were able to draw a clear path on what can be done and what we could do with this data. Taken into account the limitations of the dataset and of our current capabilities, still we believe that the main struggle in this exercise is related to the low semantic features of the data. Both of the index provide detailed description of each case, but they lack on information across

them, about qualities, semantic and taxonomies of the vocabulary of digital social innovation. In our case, by playing with the visualization we were able to create stories around the cases, and connections across contents. We believe that this process of data refining-manipulation-visualisation can be powerful to support the population of the DSI vocabulary, and it is particularly coherent with the current activity of DESIS about the qualities of innovation. Moreover it represent a research tool that is supportive of traditional case analysis. The intention of this paper are limited and modest, but we believe useful in giving guidelines for future researches, and grounded on disciplinary capabilities, meaning therefore able to provide a strong disciplinary contribution. And being the limitations of this research mainly in our organizational and capabilities asset, we probably recognize that pushing a movement of more practice, more field-based, more education orientation than learning orientation is necessary in design discipline [12]. As it is meaningless disconnecting the theory of design by the practice of its impact, we cannot talk about digital social innovation without mastering the tools that apparently are making it possible.

By the point of view of the visualization, to learn something about how these innovations look like, we limit the use of Raw to mainly Alluvional diagrams. We have several tests, yet unsatisfactory, with BubbleChart, Circle Packing, Treemap, and Dendrogram, but still the AD, even if limit the correlation among two variables, is quite good with limited size of qualitative variables, and their distribution. In any case at this stage we are much satisfied with the exploratory approach of visualization as a research tools, that not really focus to the qualitative visual accuracy of final visualization itself. The preliminary intent of DESIS Cluster on Digital Social Innovation is being the definition of both analytical and programmatic design directions of the research agenda; the contribution of this paper shape as

- the need of a semantic about digital social innovation that could be translated in an ontology to be used in datased manipulation
- further development and improved accuracy in the visual data analysis
- the implementation on more accurate design-based keyword, and the integration of the current data with design relevant values

As a final recommendation, we reinforce the importance of multidisciplinary contribution in the field of digital social innovation, by implying the two distinct interests of design: a) more and more design is involved in wide social concerns and actions, and the discipline outcomes move to services, strategies, systems, and the blurred edge with other planning/management disciplines: in fact design orients towards public engagement, services for the communities, and sustainable development; b) technology is a designed artefacts, and a mean for designed interactions, that imply the need of methodology, ethos and critical assessment in the way we design the tools for the social interaction. If is true that Digital Social Innovation is related to the way technology is conceived and used, therefore the design of platforms and interaction is responsible of the social impact itself.

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