Author accepted manuscript of:

Mauri, M., Pini, A., & Ciuccarelli, P. (2017). Designing diagrams for Wikipedia. *Information Design Journal*, 23(1), 65–79.

The article has been accepted on Feb 08, 2017 for publication in the **Information Design Journal, Volume 23, Issue 1, 2017**.

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The final version of this article is available at this URL: http://dx.doi.org/10.1075/idj.23.1.08mau

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Designing diagrams for Wikipedia

1 Abstract

Despite the high usage of diagrams and images in Wikipedia, as well as across all Wikimedia projects, few studies have been conducted on the role of visual contents within the online encyclopedia and on the collaborative creation of diagrams. With the present research, we brought a group of designers into Wikipedia, with the goal of exploring how information designers behave on this platform and how other users react to their involvement. Inspired by the WikiEdu Program, we engaged postgraduate design students in the creation of diagrams for Wikipedia and then followed the reactions of both users and designers. The results of the experiment have been evaluated using built-in Wikipedia functions (e.g., page history and discussion pages) and through an anonymous survey among the students involved. This experience brought to light the different consideration granted to images and diagrams with respect to texts on the online encyclopedia. It also allowed a reflection on the role of designers in the knowledge production process, as well as on the meaning of producing "open" contents, which are meant to be improved by other people.

2 Introduction

Today, Wikipedia represents one of the main access points to information: it is the 6th most visited site in the world (Alexa Internet Inc., 2016), and at the moment of writing it counts 294 language editions ("List of Wikipedias," 2016). Its value goes beyond the publicly displayed information through its interface: the whole process of the creation and refinement of information, the discussions about its policies, and the social relationships behind the project have been stored and made publicly available, making this project one of the most intriguing dataset on the collaborative creation of knowledge and meaning on the earth. Moreover, all this information is free from copyright and without technical limits for its reuse.

Quite a solid research body is taking shape around Wikipedia as a significant data source, thus suggesting the need to apply analysis and visualization techniques to extract and make sense of massive amounts of information (Bao et al., 2012; Massa & Scrinzi, 2013; Wattenberg, Viégas, & Hollenbach, 2007). However, very little research has been conducted on the role of images and diagrams within Wikipedia articles and the collaborative process of their creation (Viegas, 2007). Nevertheless images and diagrams are a relevant part of the Wikipedia ecosystem: Creative Commons, Wikipedia's side project focused on media, counts more than one billion media items ("State of the Commons," 2015), used across all Wikipedia-related

projects. Images and diagrams are indeed a powerful device for information (Ricci, 2010) and users rely on them as well as text, if not more.

By recognizing this dearth of scientific production, with the present research we brought a group of designers into Wikipedia to analyze how information designers act on Wikipedia and how Wikipedia users react to their involvement.

To reach the needed critical mass for a similar experiment, we involved students enrolled in their second year of a master's degree in Communication Design, thus young professionals. Inspired by the WikiEdu Program, we asked our students to design a diagram for a Wikipedia article. The WikiEdu Program is simple and effective: as an assignment, students need to improve a Wikipedia page related to the course's topic ("WikiEdu Website," n.d.). By doing so the students develop writing skills and critical thinking, and at the same time they produce something valuable for the whole community. We saw a great potential in bringing this kind of assignment in graphic design education, specifically in information design. This assignment allowed us to investigate the relationship between Wikipedia and diagrams from two different angles:

- An analysis of how information designers act on Wikipedia, and how Wikipedia users react to designers' involvement. As we will explain later, the assignment's goal was to produce a diagram for a specific Wikipedia page, and for the final evaluation students had to engage with other users to include the diagram in the article.
- The definition of a new format for design education. We transposed the WikiEdu guidelines from the creation of texts to the creation of diagrams, seeing it as an enriching experience both for students and for the Wikipedia community. The experience was a test to understand whether a format that proved to be valuable for texts could also work in the field of information design.

In this article, we will focus mainly on the first angle.

3 Experiment setup

The formulation of the assignment was designed to follow the basic rule of Wikipedia: write on something you know. Each student was encouraged to select a known topic to be able to evaluate if there was a lack of diagrams in the relative article. Since "diagram" can have a vast range of meanings (Ricci, Ciuccarelli, & Valsecchi, 2008), we suggested focusing on a topic belonging to these four categories:

Processes: the making of something, phases, materials, and techniques;

- Technological descriptions: how something works, its components, the relationships among them;
- Historical events: temporal evolution of an event, the main actors, their movements
- Quantitative phenomena: create a visual representation of a dataset, highlighting relevant correlations.

The diagram had to be designed for a specific existing article. In this way, it was simpler for students to identify which part of the topic should be visualized and what kind of knowledge could they add to it. They were free to create a new diagram or to improve an existing one within the article. Since on Wikipedia there are some meta pages containing lists of requested materials, we pointed them to the list of requested diagrams¹ to understand which kind of diagrams are usually demanded by other users. Finally, no technical constraints were given: students were free to choose any visual language and technique.

Students had seven weeks to create the diagram, upload it, and advocate for its inclusion. Preparing this assignment, we took advantage of the knowledge gathered through other projects related to Wikipedia (Borra et al., 2015; Mauri, 2011). These experiences allowed us to better understand how the encyclopedia works, particularly its social dynamics and its policies, formalizing them in the following four guidelines we gave to the students.

3.1 Understand the project

Wikipedia is just the most visible part of a much bigger ecosystem of projects, operated by Wikimedia Foundation.² Each project focuses on a specific type of knowledge: Wikiquote for quotation, Wikisource for historical books, Wikinews for current topic, Wikipedia for the encyclopedic knowledge, and so on.

Wikimedia Commons is the project focused on media: images, videos, and audio files are collected there. Images can be then linked in any Wikipedia page, in any language. Before uploading images, our students had to become familiar with the projects and understand their dynamics.

3.2 Follow the standards

There are no clear standards on Wikipedia about images. The only requirement is to adopt a free license (like as a Creative Commons license). We asked students to identify whether best practices exist and are already shared among Wikipedia users. It turned out that

¹ It is possible to see the full list of requested diagrams visiting this page: https://en.wikipedia.org/wiki/Category:Wikipedia requested diagram images

At the moment of writing, the Wikimedia Foundation operates 12 projects; here is possible to see the full list: https://en.wikipedia.org/wiki/Wikipedia:Wikimedia sister projects

while there are several guidelines for articles ("Wikipedia:Policies and guidelines," 2016), little information is available for designing graphics. Only for geographic maps there are community-defined conventions. Even if this could be seen as a drawback, as our students had no clear instruction on how to create diagrams, it pushed them to experiment with information visualization.

3.3 Follow the ethics

The third guideline is the most important. Even if there are neither strict standards nor conventions, we asked the students to find technical solutions to preserve Wikipedia's ethics. Wikipedia presents itself as the "encyclopedia anyone can edit." This also means that anyone can improve its contents and that contributors must detach from the idea of being the recognized authors. As will be described later, this is a very sensitive topic for graphic designers. In technical terms, this means, for example, that vector formats should be favored over raster images, that text paths should be preferred over traced texts, and that the file layering should be understandable by other people.

3.4 Engage with the community

Finally, we asked the student to actively engage with the community: after the diagram has been created, they must upload it and try to push the insertion of the graphic in the related Wikipedia article, engaging with the other users in the talk pages.

4 Evaluation

To evaluate the reaction of other users, we repurposed the technical and social mechanisms underlying the collaborative encyclopedia: analysis of discussions, analysis of page history, analysis of diagram reuse, analysis of diagram modifications, and remixes. Below, we briefly introduce the Wikipedia technical features we used for the evaluation.

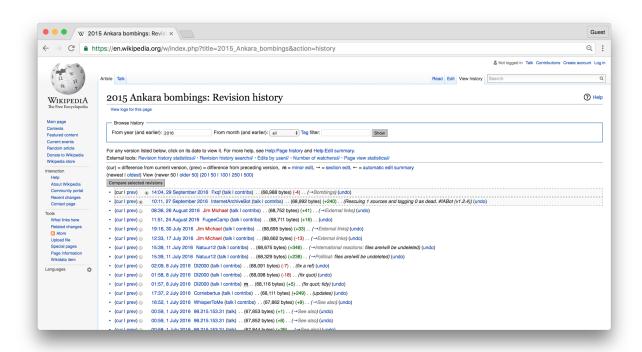


Figure 01. A screenshot of the page history for the "2015 Ankara Bombings" article. It is possible to see the list of edits: for each one it is possible to see the timestamp, the user, and the description.

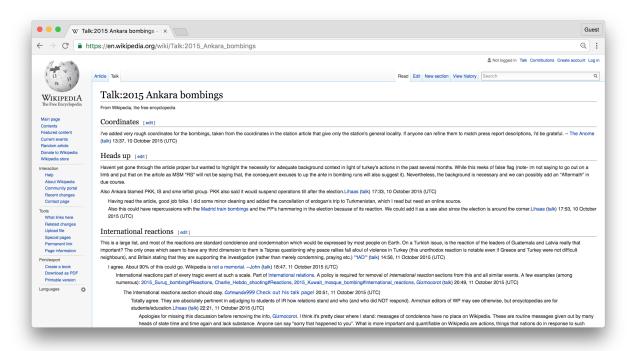


Figure 02. A screenshot of the discussion page for the "2015 Ankara Bombings" article. Each title defines a new discussion, each comment has a different indentation according to the reply chain.

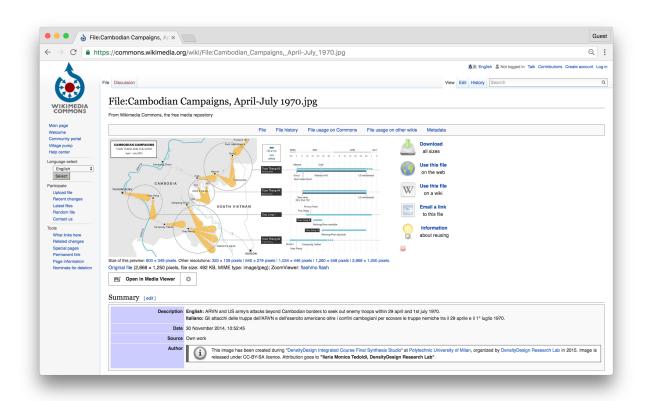


Figure 03. A screenshot of the image page on Wikimedia Commons.

4.1 Page history

All the revisions of each Wikipedia article are stored online, and they are publicly available. In Figure 01, it is possible to see their appearance through the interface. This is originally intended as a versioning tool for editors: in this way, it is simpler to identify the latest edits, who made them and when, compare the latest version with the previous one, and "rollback" it if needed, meaning restore an old version of the page. Each time a user saves a new version of the page, the system asks for a short description of the edits. In addition, when new images are added or removed, the edit is traced. The revision history of an article is useful to determine whether images were deleted and the reason, how long they lasted, and the pace of editing for a specific page.

4.2 Discussion pages

Each Wikipedia entry is composed by the article page and the discussion page. The "talk" tab opens the discussion page—as in Figure 02—where users coordinate on the article evolution, and, if needed, solve controversies avoiding the raise of edit wars³. The discussion

³ According to Wikipedia policies, an edit war occurs when editors who disagree about the content of a page repeatedly override each other's contributions.

pages are organized with a tree structure to show which comments respond to whom. Commonly, new topics are defined by a new title. When commenting, users leave their signature, meaning a link to their user page and the timestamp of the comment. The edit history of discussion pages, as for the articles, is stored and browsable. Discussion pages were useful to understand why some diagrams were rejected or moved to other pages. We encouraged the students to actively engage in discussions, explain the reason for their designs, and accept suggestions and critiques.

4.3 Image pages

Images are stored in the Wikimedia Commons website, the "sister project" focused on media (pictures, videos, sounds). When a new image is uploaded, a *wiki-page* is created, as in Figure 03. The new page shares all the basic characteristics of articles: history and talk pages. There are some additional functions to image pages, such as the revision history of the picture and the link to all Wikipedia articles using it. These pages are useful to trace the image use, in which pages it has been inserted, its usage in other linguistic versions, if derivate works have been created based on it, and if other users have modified and improved it.

4.4 Poll among students

Finally, we set up an anonymous form to collect feedback from our students, in representation of the feedback from the information design area. In the poll, we asked for feedback on their experience regarding whether they found the contribution to Wikipedia interesting, the main difficulties, and their relationship with the project beyond this exercise.

5 Results

The students produced and uploaded 73 different diagrams on Wikimedia Commons ⁴. Students covered a huge variety of topics, creating both still images and animations. The created diagrams are mainly about processes (such as Jack Daniel's production, olive oil extraction, etc.), technical descriptions (how an astrolabe works, why we see mirages), and historical events (the Battle of Thermopylae, or the Cambodian Campaign in 1970). Few students worked on "classical" data visualizations (e.g., the evolution of Haiti economy, the results of Olympics Games). Students created both static images (56) and animations (17). Static images are mainly in vector format: only a third of the diagrams are PNG or JPG.

⁴ The results of the exercise can be found at this link: https://commons.wikimedia.org/wiki/Category:Contents_produced_by_DensityDesign_students

As in Figure 04, the community accepted 45 diagrams, while 13 were rejected. In 15 cases, students were not able to add the image to a Wikipedia article.

We found a correlation between the grades we assigned to the diagrams and their performance on Wikipedia: the lowest graded diagrams were also not accepted in the article.

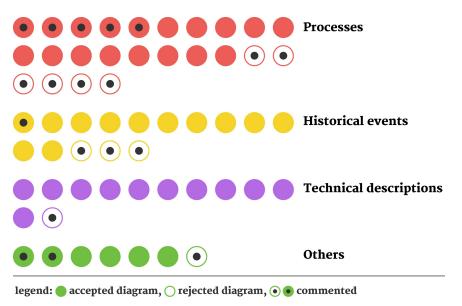


Figure 04. Accepted, rejected, and discussed diagrams per topic.

5.1 Debate

Very few diagrams generated an actual debate in Wikipedia talk pages. All 13 rejected diagrams were at least commented on, while only 8 of the accepted ones created some debate. We explore in detail the discussion topics in the next session (See the section "Results analysis").

5.2 Re-use of uploaded diagrams

Fifteen images were reused in other pages. In most of the cases, diagrams were added to another linguistic version of the same article. Apparently, only one diagram was fully translated in another language. We are saying "apparently" because there are no automatic ways to follow potential derivative works on Wikimedia Commons. When users download and modify an image and then re-upload it, they should put a link to the original work, but this is not automatic.

6 Results analysis

6.1 Type of discussion

Most of the diagrams were accepted without any kind of comment. At the same time, we can identify the main concerns of other users from the few discussions that arose and the main reason for an image's rejection. Four main types of discussions emerged.

- 6.1.1 Misleading/confusing. Some diagrams were rejected based on the argument that they were not clear or, even worst, misleading. Three images received this kind of comment, and as teachers we agreed: The graphics were indeed not visually efficient or the information source was not clear.
- 6.1.2 Does not add information. If the diagram is simply a visual translation of the text, it will probably be discarded. On Wikipedia, apparently, the text has priority over images. This makes sense thinking about how simple is to translate, transform, and repurpose text rather than images, especially in the process of adaptation for different supports (mobile, desktop, etc.) or for visually impaired people. Many images have not been accepted because they were mere visual translations of the information contained in the text. As an example, Figure 05 represents how the production process of chocolate works. It was refused because, according to users, the space for this image would be better used for a textual description:

I don't think this diagram adds enough to make it worth the page space it will take up. (Wikipedia user, commenting on the "Chocolate Production" diagram)

A second example is Figure 06, refused because it is too illustrative and seen as a decoration rather than real information:

I'm not seeing an advantage to the reader in replacing the current interactive graph with the new one. It looks prettier, but is less helpful. I think if there were a way of introducing graphics and color into the present graph, that would be great! (Wikipedia user, commenting on the "Brewing Process" diagram)



Figure 05. (on the left) Diagram representing the chocolate production process.

Figure 06. (on the right) Diagram representing the beer brewing process.

6.1.3 Not suited for Wikipedia UI. In the actual interface of Wikipedia, images are usually rendered as 220 pixel wide thumbnails. This means that diagrams meant to be read at full size risk becoming completely illegible. For example, for the diagram in Figure 07, a user commented:

The main reason for not adding this to the article is that it does not work well as a thumbnail. As the image on the right shows, it doesn't work well as a thumbnail on a web page. Even the clickable version is not easy to read, as the text is too small. It would work best printed on an A4 sheet of paper. (Wikipedia user, commenting on the "Google Acquisitions" diagram)

This kind of critique raises a general question: Should be diagrams designed for the current Wikipedia UI, or can they go beyond it?

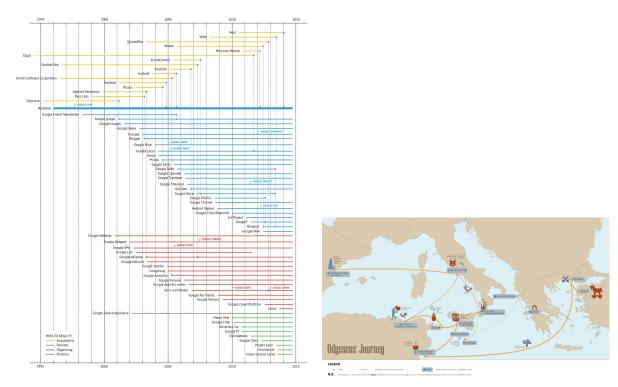


Figure 07. (on the left) Timeline of the acquisition made by Google, colored by typology.

Figure 08. (on the right) A possible interpretation of Odysseus journey.

6.1.4 Original research

In two cases, the discussion focused on the "no original research" (also called WP:NOR) Wikipedia's policy:

Wikipedia does not publish original thought: all material in Wikipedia must be attributable to a reliable, published source. Articles may not contain any new analysis or synthesis of published material that serves to advance a position not clearly advanced by the sources. ("Wikipedia: No original research," 2016)

Since many people edit Wikipedia, and it is not possible to verify their competences, every user is required to cite a proper source for the claims added to the page. A person cannot insert his own analysis of a topic: he should first publish it in a journal, conference or known newspaper and then add it to Wikipedia. This rule applies also to images, but users are allowed to create original work:

Original images created by a Wikipedian are not considered original research, so long as they do not illustrate or introduce unpublished ideas or arguments,

the core reason behind the NOR (No Original Research) policy. ("Wikipedia: Policies and guidelines," 2016)

The diagram in Figure 08 indeed was rejected for this reason. The diagram represents Odysseus' journey on a map, showing with the thickness of the line the number of man with him. The user rejecting it stated:

[...] I've removed it. No one knows whether the places mentioned in the Odyssey were meant to correspond to real geographical locations, so any map like this would be highly speculative at best. In any case, and more importantly, such a map, not coming from a reliable source would constitute original research which is not allowed on Wikipedia. (Wikipedia user, commenting on the "Possible causes of Colony Collapse Disorder" diagram)

A more complex discussion arose on the diagram "Possible causes of Colony Collapse Disorder" (Figure 09). In this case, the diagram was a visual translation of the possible causes listed on the page. This became an interesting discussion about how these policies should apply to images:

That the image is based on the article is actually a bit of the problem. What you've basically done is a novel synthesis not only of the subject matter, but we also should not be using Wikipedia as a source (WP:CIRC). If we were going to have such an image, it would need to have been published somewhere, as [previous user] alluded to, so we could verify it came from a source with expertise to review this topic. The effort is definitely appreciated though, as I'm sure some time went into making the image. (Wikipedia user, commenting on the "Possible causes of Colony Collapse Disorder" diagram)

A second user disagreed with him:

I think it should go into the article, until we have a better replacement. My understanding is that the WP:IMPERFECT policy allows imperfect things in the articles. (Wikipedia user, commenting on the "Possible causes of Colony Collapse Disorder" diagram)

In the end, the diagram was not added to the article not due to the "no original research" policy, but rather because images are more difficult to edit than text:

That policy you mention applies much more to articles that we can easily improve over time. That spirit relates more to starting with something substandard, but acceptable that can be improved over time. When a flaw is pointed out from the beginning though, we don't need to automatically accept that. The other problem is that images cannot be easily edited like text in an article. You need access to GIS software for this. (Wikipedia user, commenting on the "Possible causes of Colony Collapse Disorder" diagram)

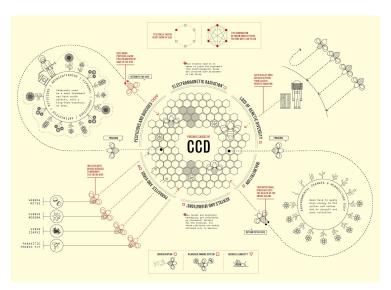


Figure 09. Visual synthesis of "Possible causes of Colony Collapse Disorder."

6.2 Students' feedback

At the end of the course, we asked students to participate in an anonymous survey to understand whether they found the exercise interesting, the main difficulties, and the unexpected results. Out of 74 students, 32 agreed to participate to the survey. Of them, 84% said that the creation of a diagram specifically for Wikipedia and not for other uses was enriching for them. When we asked them why, the main cited reasons are that they felt they were actually contributed to the enrichment of someone else and that they felt responsible for the quality of their work:

You have to design something for everybody. It's an extra responsibility for you. (Anonymous student #18)

Other students said that it was interesting to understand what is beyond Wikipedia (its dynamics and rules) and had the feeling of "giving back" something to a project they use daily, as stated by this student:

At first I didn't understand the utility of this exercise. When it "forced" me to enter into the Wikipedia community and to understand the underlying dynamics, then I found it extremely interesting. (Anonymous student #8)

Finally, few of them said that having a diagram accepted on Wikipedia is valuable for their portfolio visibility.

When discussing the difficulties, 31% found difficulties in contributing to Wikipedia. Most said that the main difficulty is the use of the SVG format, as MediaWiki (the software running Wikipedia) can render only few graphic filters and effects. In particular, a strong limitation is the small number of available fonts: even if one can use any font in an SVG image, MediaWiki is able to render few of them. Sometimes, even for available fonts, the render is not perfect. Other difficulties were related the choice of a topic—some of the students realized the complexity only after starting to visualize it:

The chosen topic, in hindsight, was too complex and historically not clear; therefore, the project realization was complex, and in the end, it was not accepted. (Anonymous student #5)

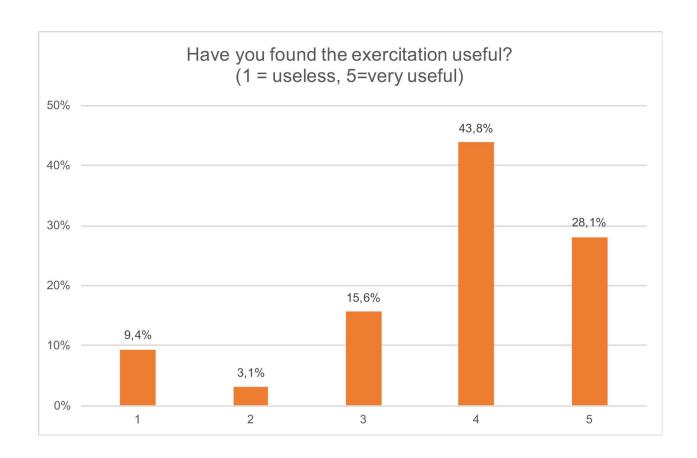


Figure 10. Most of the students found the exercise "useful" or "very useful."

When we asked if they found the exercise useful for their design education, most found it very useful (see Figure 10). Finally, when asked whether there was something unexpected (positively or negatively) in this experience, most of the students said that working on Wikipedia has been enriching beyond what is strictly related to design education. The question "Did you learn something beyond information visualization creating a diagram for Wikipedia?" produced several insights. Many students said that it is simpler than thought:

We never think about it, but it should be something to do more often, it is something for everybody. (Anonymous student #10)

Other students were impressed in realizing how many people read Wikipedia, and therefore see their diagrams:

I learnt something new not related to design. It is nice to think that many people around the world will see my diagram. (Anonymous student #12)

Only one student cited the community feedback as something enriching:

The positive comments left by other users on the utility of my diagram and its reuse on other language editions made me understand the relevance of graphic design and its power in transforming culture (Anonymous student #32)

Being forced to expose their work to unknown people, collecting in most cases a positive reaction, made clear to our students their role as communication designers in the dissemination of knowledge.

Even if most of the students followed the fate of their diagram after the end of the course (75%), and most found the experience interesting, when asked if they continued to contribute to Wikipedia, only one answered affirmatively.

7 Discussion

As we stated in the introduction, our aim was twofold: the definition of a new format for the education of communication designers, and the analysis of how information designers can act on Wikipedia. As a didactical activity, the experience proved to be valuable under several points of view. Students felt that their work was useful for other people, and not just to improve their visual skills in information design. The feedback gathered from external people, not necessarily experts in graphic design, were useful to test their ability to convey meaningful

information. The experience helped them to reflect on the role of designers in communicating information and knowledge as well as on the tradeoff among visual clarity and information richness. Finally, it was an opportunity for them to understand what a collaborative open project is by doing it.

Some issues remain unresolved. Since for the students it was an exercitation, their approach was more focused on convincing other users to accept the visualization rather than to engage in a discussion, at the cost of refining and modifying the diagram. A second finding is the difficulty to keep our students engaged in the discussion with other Wikipedia users. Our students are more familiar with a "finish first, then publish" process. Diagrams, and artifacts in general, are released only when complete and fine-tuned. Adopting an open source mentality, based on the disclosure of the production process (Raymond, 1999), is key if we want to contribute to collaborative processes as graphic designers. The approaches to establish this mentality in our school are yet to be defined. Planning a future edition of this didactical exercise, we would try to involve other users as tutors for our students, guiding them in the policies of the encyclopedia. We would also set up a process based on quick releases, focusing on the discussion with other users for the diagram improvement.

As an experimentation meant to bring information designers on Wikipedia, the experience revealed several limits and, at the same time, opened interesting reflections. The response from the other Wikipedia users, the high rate of acceptance and the low level of discussion, is difficult to evaluate and led to four main interpretations or hypothesis. First, it could be a tacit approval of the produced diagrams. Second, it could be related to the selection of marginal articles by our students, leading to a low interest for other users. A third hypothesis is that the addition or modification of images is seen as a marginal activity, less relevant than textual edits. Finally, since images are seen as difficult to edit, the effort is awarded to encourage further contributions. More research is required to evaluate these hypotheses and to analyze the level of acceptance of visual edits compared to textual ones.

Another criticality is that among all the information designers (our students) we involved, almost no one continued to edit Wikipedia. Nevertheless, all of them declared the experience interesting and enriching. In this case, it is also difficult to evaluate the outcome. It could be a matter of time (the creation of a diagram, its test on the Wikipedia platform, and the discussion are time-consuming), or a lack of reward for the effort. In our experience, young graphic designers are really motivated to work on a personal project when this brings visibility, adding it to their portfolio. In a system that discourages the creation of diagrams and diminishes the relevance of its author, the commitment could be easily lost. Lastly, a motivation could be a lack

of a community of users focused on the creation of diagrams and visualization: information designers could feel lost, with no clear guidance and no one with an overall view on the project. From a technical point of view, the creation and editing of an image proved to be complex and intricate. As we stated in the introduction, the openness of a diagram is not just related to the license one adopts, but also to the technology. If we want to enable other people to edit and modify our work, we should provide files designed to be modified: for example, favoring the use of vector images over raster ones.

With this experiment, we have seen a lack of technical tools to maintain the simplicity of the openness of diagrams and their management. The main limitation is the difficulty in sharing an editable version of the diagram: while it is possible to upload editable files, their rendering and use across Wikipedia is highly unstable. Many students, in the end, opted for the raster images to preserve the visual appearance of the diagram. The overall architecture, in the practice, seems to discourage the creation of diagrams that are simple to edit and update. Even if the project ethic is to produce artifacts meant to be free, reusable, and remixable, there are no formalized tools to enable this approach. In this experiment, we repurposed tools provided by MediaWiki (page history, talk page, Commons pages) to see the evolution of the diagrams produced by our students, but there is a lack of dedicated tools for images. If the Wikipedia community wants to extend to images the same ethics applied to texts, there is a need for new tools to keep track of reuses and transformations of images. As an example, taking inspiration from the Git⁵ environment, it could be useful to have tools to "fork" existing media and reuse them in a new artifact, keeping track of the links.

In general, we felt that, from a technological point of view, the platform is still highly focused on texts to the detriment of other media. Moreover, the problem for videos and non-static artifacts remains open: if we represent something through an animation, how can we give other people the ability to modify it? How can we provide access to the source files, particularly when they have been created with proprietary software?

Even from the point of view of Wikipedia's community policies, the discussions prove how users struggled in trying to understand how to apply existing policies to images. While for some policies the interpretation is quite simple (e.g., "Be bold," meaning The Wikipedia community encourages users to be bold when updating the encyclopedia), others are not. For example, how does the "no original research" apply to images? Until where can the visual transformation of knowledge be considered a linear mapping of already existing information,

⁵ Version control is a system that records changes to a file or set of files over time so that it is possible recall specific versions later. (Chacon & Straub, 2014)

and when does it become original research? Also related to sources, there is a need for reflection on how they could be cited in a diagram.

To conclude, while the experience proved to be interesting and valuable for design education, many efforts are required both to involve information designers and to enable the creation of truly open diagrams on Wikipedia. While a strong community is guiding the textual enrichment of the encyclopedia, there is not yet any form of organized support for its visual dimension.

In our opinion, there are two ways to address such criticalities. The first one is technological and is related to Wikipedia/Wikimedia: it should provide tools for sharing source files, not just the end results. The second one is conceptual and concerns information designers: they should move from the idea of being authors to the idea of being contributors of a diagram.

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