



Creativity + Innovation & Technology

O-CITY PROJECT



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2 -Cooperation for innovation and the exchange
of good practices, Knowledge Alliances.

Topic 2 - Lesson 3. Different applications of information visualization

This lesson has been prepared to introduce students to the main ways of using infographics and data visualizations in different contexts, suggesting some tools that better support the creation of the different applications of information visualization.

Some practical applications of infographics and data visualization

To learn how to properly use the fundamental elements of information visualization, i.e. data and information, you need to understand how to make them reliable, clear, and readable, and how to correctly and effectively represent them with the proper visualization techniques. In addition, you need to be aware of the different applications of information visualization, in order to spot the different styles and interaction modalities that characterize each practical application. Therefore, following, different types of information visualization are presented, in order to help you in finding which one best suits what you want to represent in your infographic. This is a brief introduction to a very vast field, so take this as a starting point to a more in-depth exploration of the potentialities of information visualization, especially when applied to natural and cultural heritage.

Dashboard

Data and information can be visualized through specific User Interfaces, called dashboards. This is the most suitable tool for representing in a quick and easy-to-understand way large amounts of continuously updated data. Generally, dashboards display in a single view different kinds of graphs, charts, and other graphical representations of data supporting the search and elaboration of insights and the decision-making process based on data. A similar visualization, even if less overloaded, can be found in some apps displaying data from sensors for monitoring different parameters or indicators. Think, for example, of running apps.

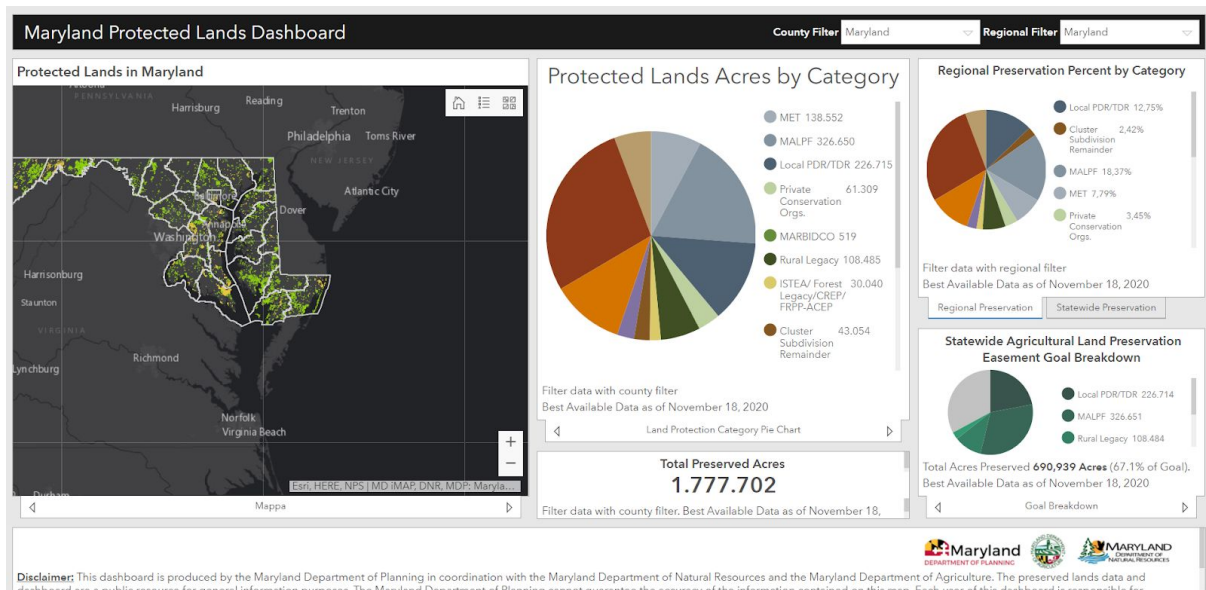


Fig.1 - Example. Dashboard applied to land preservation in Maryland. Source:

<https://maryland.maps.arcgis.com/apps/opsdashboard/index.html#/Of3ffd3350b24b17bd3b8e1705af3df5>

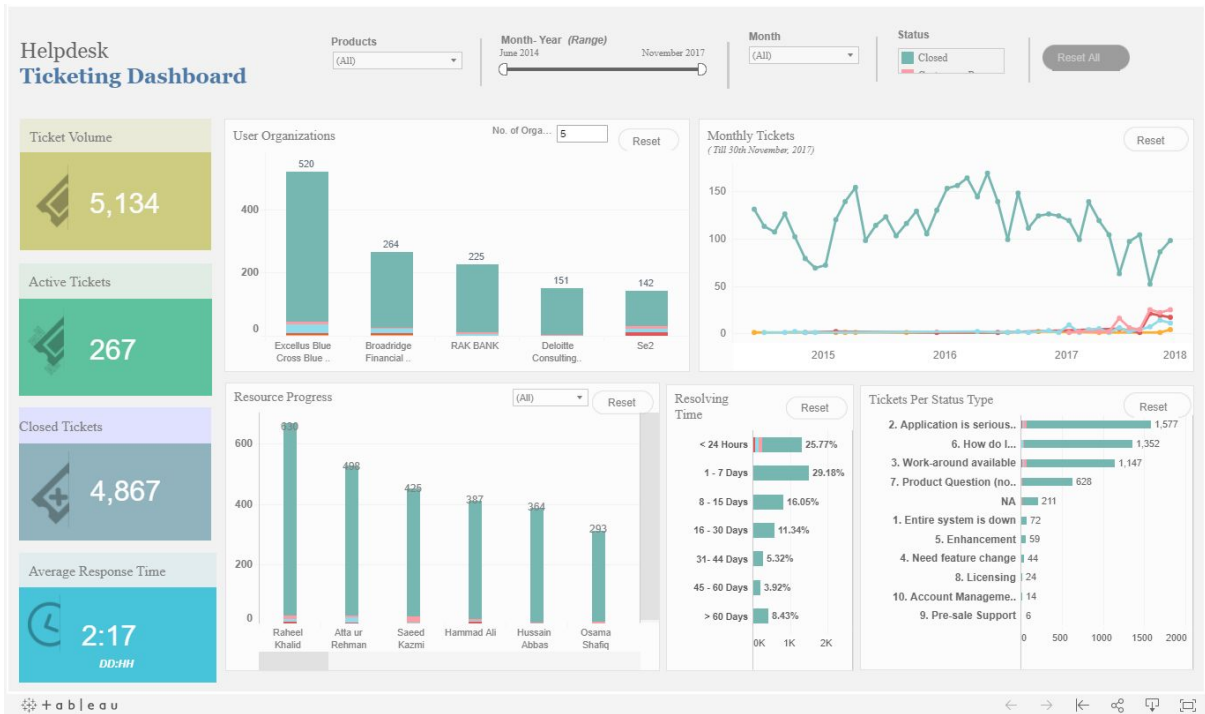


Fig.2 - Example. Ticketing dashboard by Sanchit Katiyar. Source: <https://public.tableau.com/en-gb/gallery/helpdesk-ticketing-dashboard>



Fig.3 - Example. Garmin Connect fitness app UI. Source: <https://play.google.com/store/apps/details?id=com.garmin.android.apps.connectmobile>

Reports and analytics

Generally, reports deal more with providing compiled data and information, while analytics focus on delivering data analysis and interpretation to provide insights.

However, both make a critical use of graphs and charts for communicating facts about a specific issue or system, especially organizations (public and private), and for supporting decision-making.

They can be considered static information visualizations, since they present the statistical or numerical picture (as-is or to-be) of a given subject at a given time. Therefore, they use data

visualization and infographics to show the results of a research or some forecasts derived from studies, instead of displaying continuously updated data. So they are particularly useful for marketing and business purposes.

Financial support (or lack thereof) comparison

As a final analysis, we compared the expected economic impact for museums that stated that they had not received any financial support and for those that stated that they had received at least one. In this case data shows that, for all categories with the exception of future access to public or private funds, the expected negative impact percentages are generally lower. This further highlights how necessary it is for museums to be able to access financial support to ensure their stability.

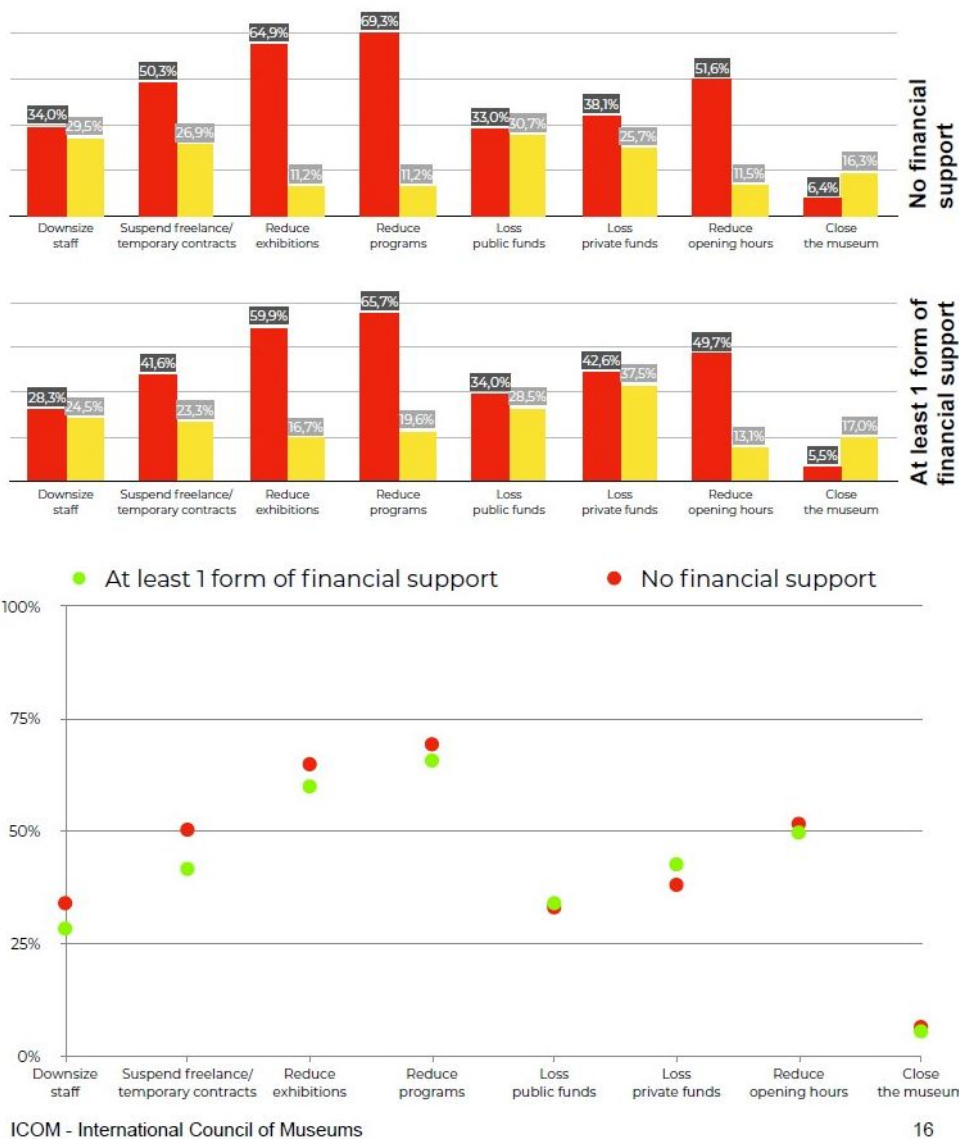


Fig.4 - Example. Report on “Museums, museum professionals and COVID-19: follow-up survey” by ICOM, November 2020. Source: https://icom.museum/wp-content/uploads/2020/11/FINAL-EN_Follow-up-survey.pdf; <https://icom.museum/en/news/follow-up-report-museums-covid-19/>

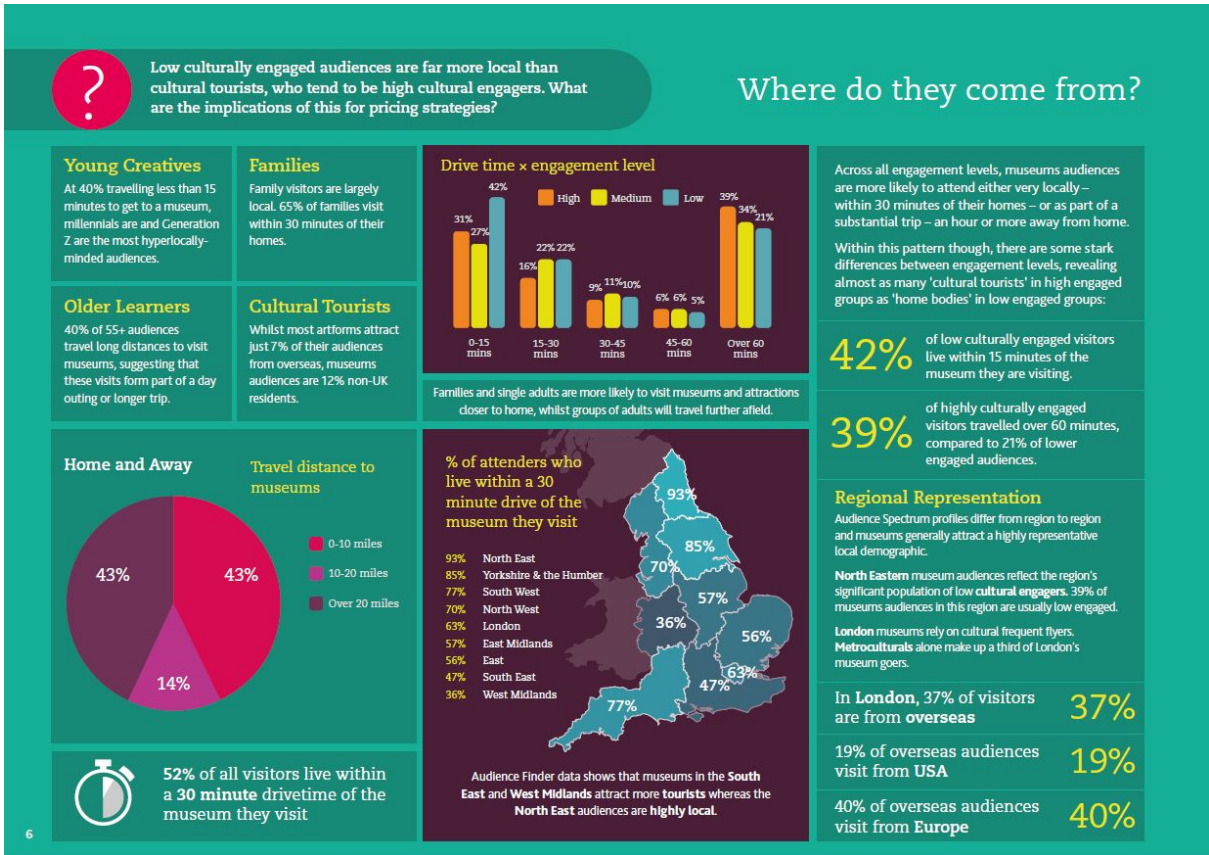


Fig.5 - Example. Analytics from "Museum Audience Report" by The Audience Agency, November 2018. Source: <https://www.theaudienceagency.org/resources/museums-audience-report>

Scientific visualization

An even more specialized and expert use of data visualization is made by the softwares and relative user interfaces employed by scientists and physicians. In this case, a more accurate and rigorous graphical representation of scientific data is needed, in order to understand, analyse, explain, and collect patterns and insights from data.

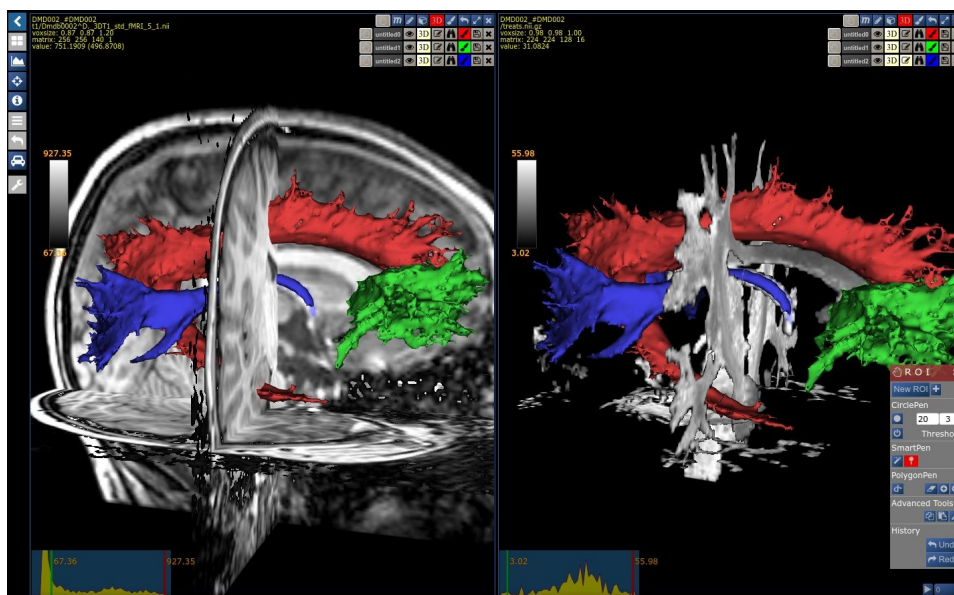


Fig.6 - Example. Visualization of scientific data in the medical field by Nora. Source: <https://www.nora-imaging.com/>

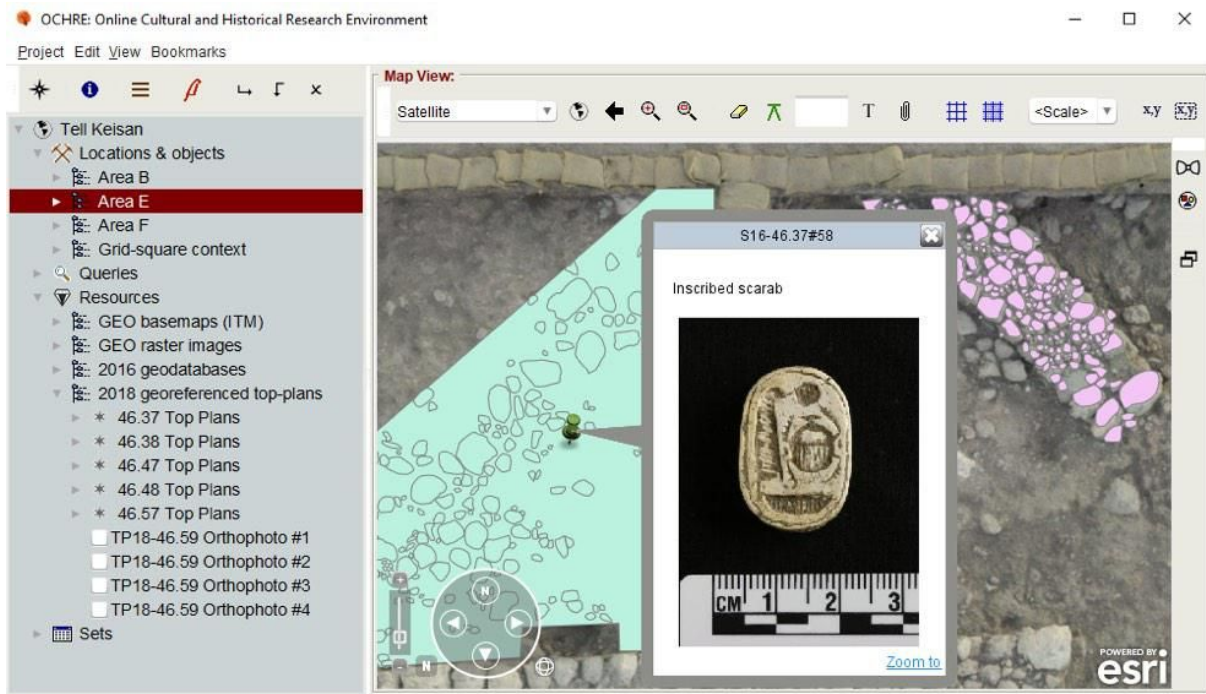


Fig.7 - Example. Visualization of scientific data in the archeological field by OCHRE. Source: <https://developers.arcgis.com/success-stories/ochre/>

Data journalism

In recent years, because of the new trends in the digital era and the easy access to tools for analysing and representing data, infographics and data visualization have been used for journalistic purposes, as they are a powerful form of communication. In this case, they are both used to inform and entertain. Indeed, they are especially effective when presenting a focus on a specific topic of interest or when they are used to clearly explain complex mechanisms and matters, since they allow to have a deeper insight on a news story or to highlight relevant data. They can be static or interactive information visualizations.

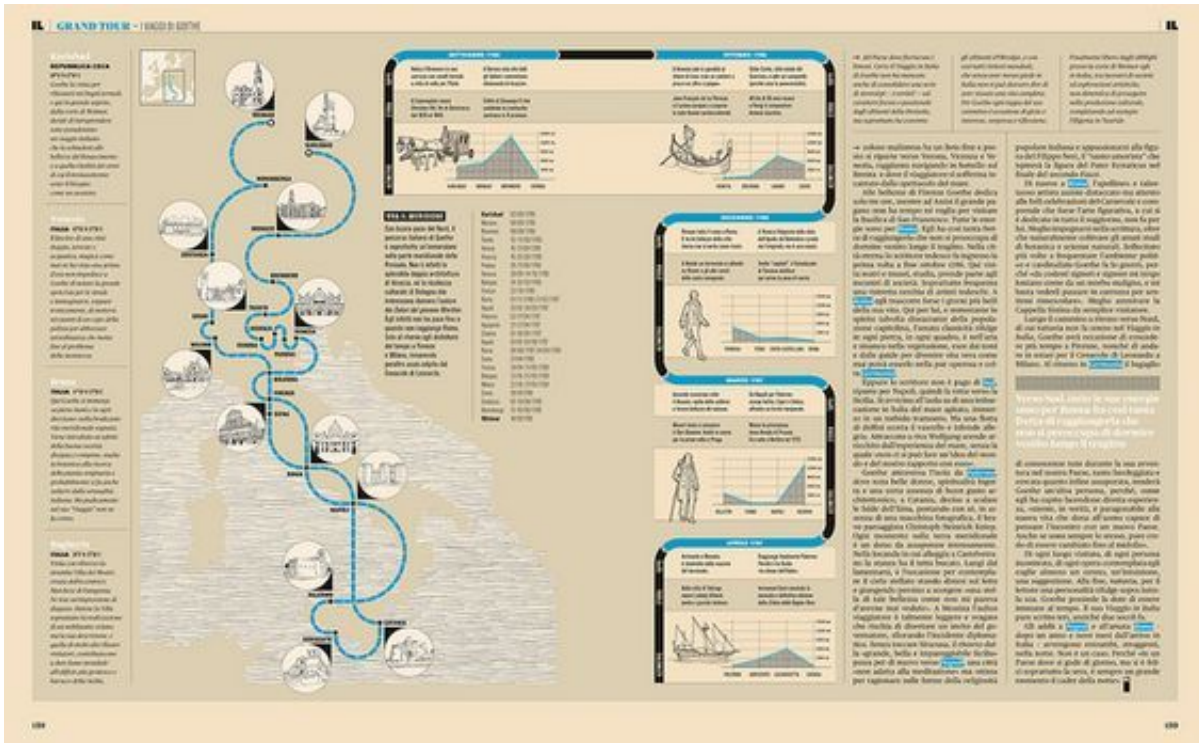


Fig.8 - Example. Infographic made by Davide Mottes and Danilo Agutoli about the Grand Tour of Goethe, published in the Italian newspaper "La Repubblica". Source: <https://pl.pinterest.com/pin/273312271109986216/>; <https://www.flickr.com/photos/ffranchi/5345923369/in/photostream/>

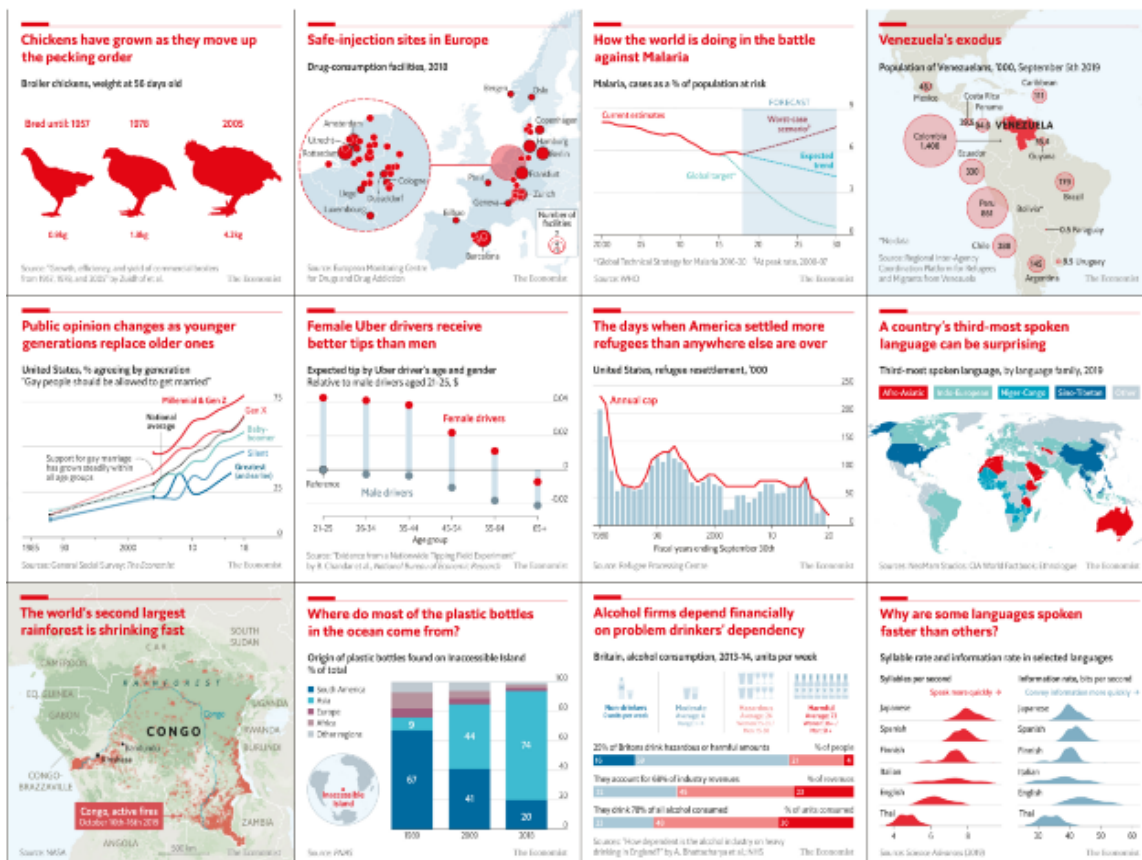


Fig.9 - Example. Visualizations of data and information made by Helen Atkinson for the Instagram channel of The Economist. Source: <https://medium.economist.com/charting-new-territory-7f5afb293270>

Installations and exhibitions

Data visualization also became a form of digital art. It can be used in exhibitions to create engagement through interactive installations that allow people to explore or manipulate data in a dynamic or even creative way.

Interacting with data became a cultural experience that may involve people in an active way (for example through crowdsourcing), or not, as part of the visitor experience. Installations having data as subjects or raw materials can employ very high level technology, such as artificial intelligence, to meld art and information. On the contrary, data visualization can be used to simply display relevant data and information about an exhibit or a part of it.

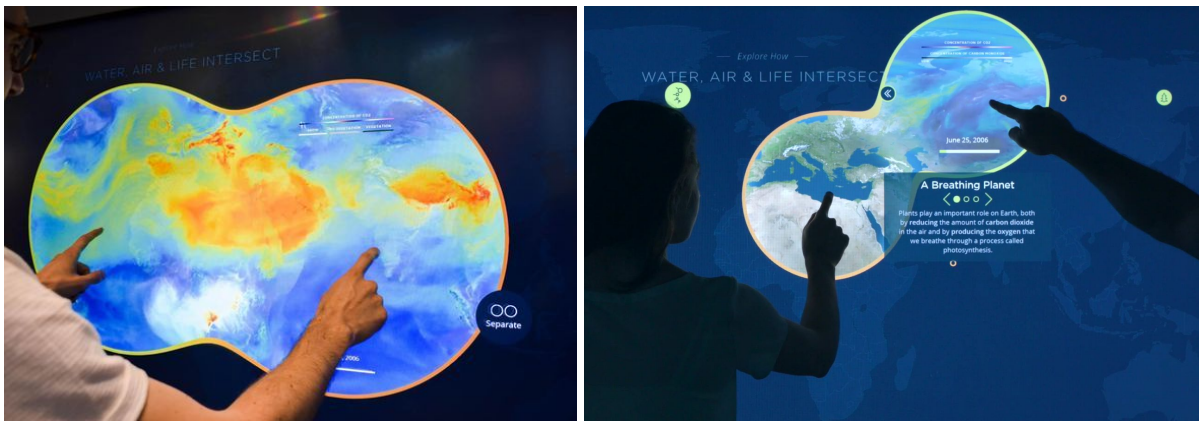


Fig.10-11 - Example. "Data Lens" by Bluecadet at NASA's Goddard Visitor Center, interactive installation using data visualization. Source: <https://mw18.mwconf.org/glami/nasa-data-lens>



Fig.12 - Example. Interactive information panel about the exhibit by Evolve Media. Source: https://pl.pinterest.com/evolvemedia1/_created/; <http://evolve-media.ro/en/index.php>

Infographics and data visualization applied to natural and cultural heritage

The different applications of information visualization mentioned above invest into areas concerning natural and cultural heritage to varying degrees. However, infographics and data visualization can be applied to this sector with high benefits for promotional, educational, and experiential purposes, in order to enhance the relationship with the public and improve the fruition of natural and cultural heritage. Indeed, as already mentioned, they are powerful tools for telling stories, both for delving more deeply and for making more understandable a specific topic. They can adopt different styles, being static and simpler or interactive and more elaborated visualizations.

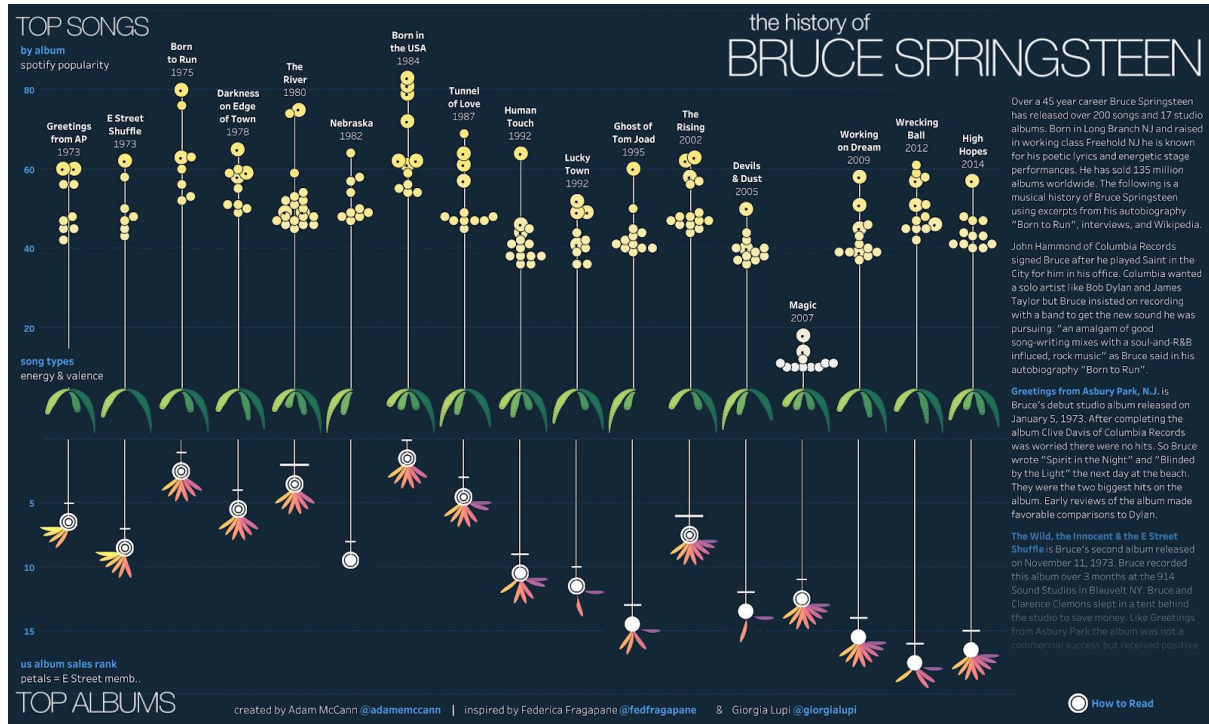


Fig.13 - Example. Interactive data visualization about the history of Bruce Springsteen by Adam McCann. Source:

<https://public.tableau.com/en-gb/gallery/history-bruce-springsteen>

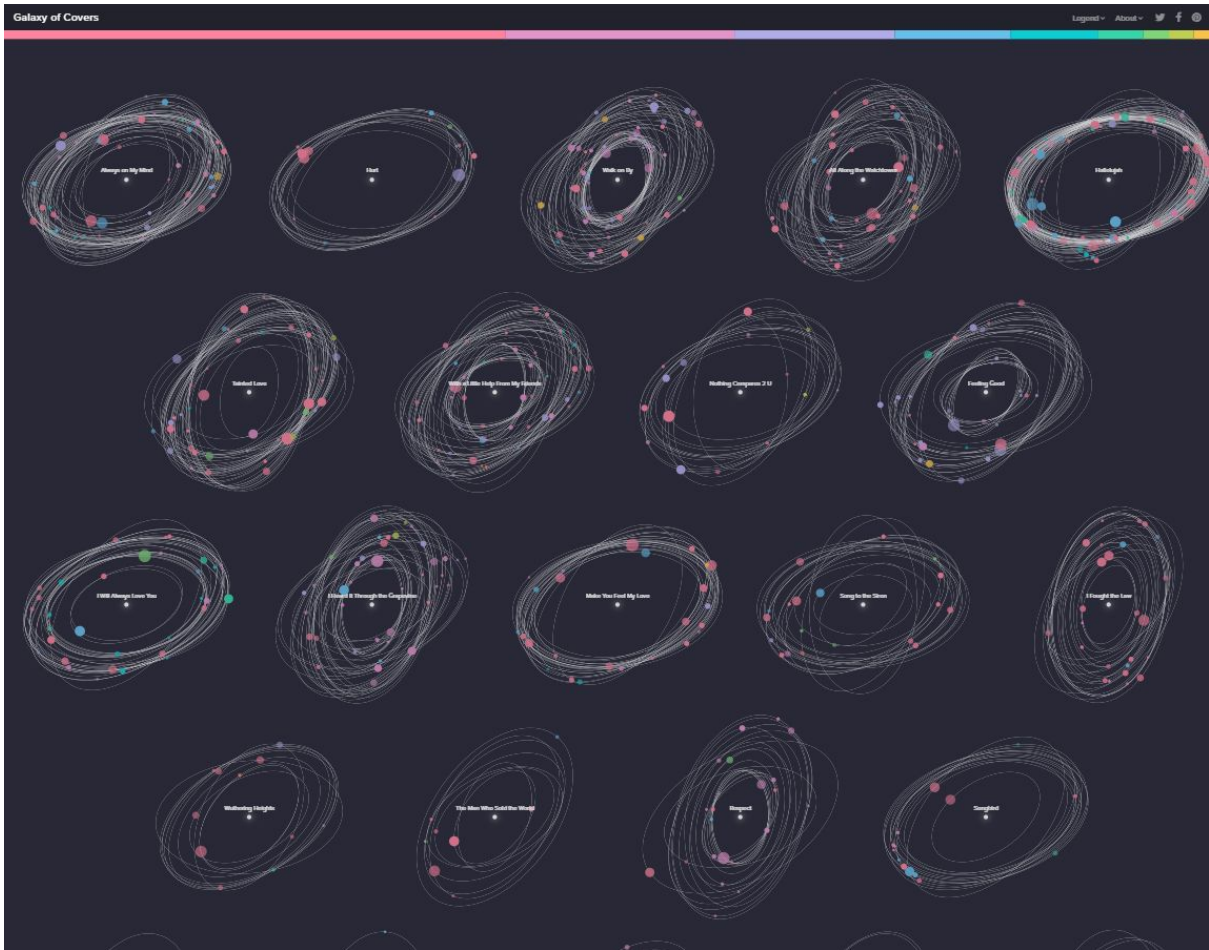


Fig.14 - Example. Interactive data visualization about the 50 most popular cover songs of all time by Interactive Things.
 Source: <https://galaxy-of-covers.interactivethings.io/>

For example, infographics can be used for disseminating scientific data in a more accessible way, like The Natural History Museum did (Figure 16), employing data visualization and infographics for educating and engaging people, in the view of establishing a new kind of relationship with the audience.

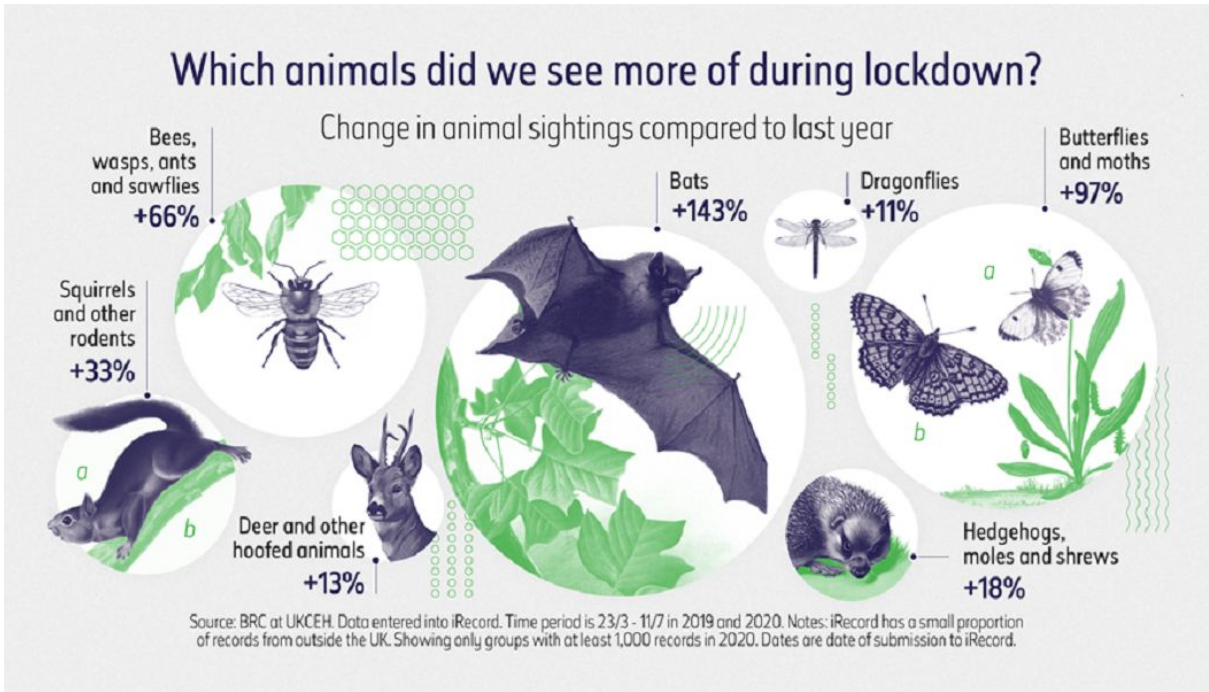


Fig.15 - Example. Natural History Museum’s infographic about the Environmental impacts of lockdown. Source: <https://advisor.museumsandheritage.com/news/environmental-impacts-of-lockdown-charted-in-new-natural-history-museum-infographics/>

In museums, but also in other contexts, infographics and data visualization can be used to disseminate knowledge and educate, especially kids.

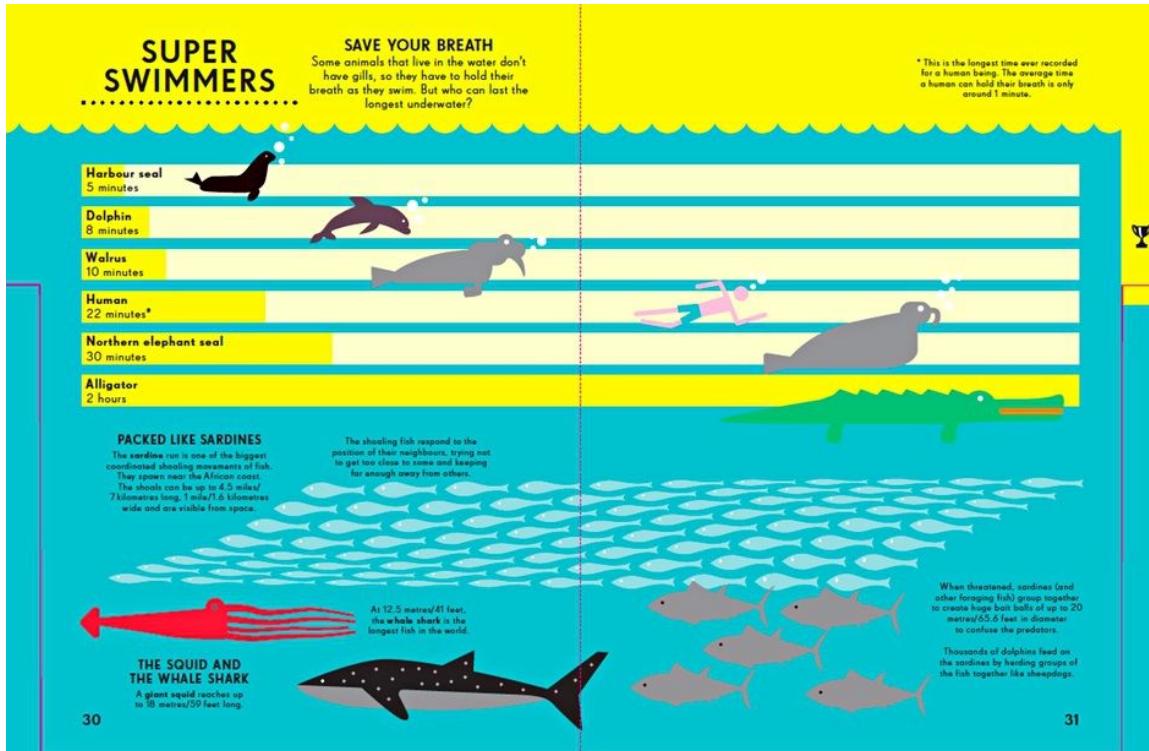


Fig.16 - Example. Visualization from the infographic book for children “Information Graphics: Animal Kingdom” by Simon Rogers and Nicholas Blechman. Source: <https://www.theguardian.com/news/datablog/2014/mar/07/infographics-for-children-can-learn-from-data-visualisations>

Another important and considerable application of infographics and data visualizations is made in physical and digital environments for giving information and guiding visitors in a journey through the available resources of the natural or cultural heritage. It is the case of description and information panels, maps, etc.



Fig.17-18 - Example. Infographics at the exhibition “The Collection as a Character”. Source: <https://www.behance.net/gallery/26367445/The-Collection-as-a-Character>



Fig.19-20 - Example. Friends of the Wissahickon Trail and Wayfinding signage and information panel by A.D. Marble Communications. Source: <http://admarblecommunications.com/friends-of-the-wissahickon-trail-and-wayfinding-signage/>

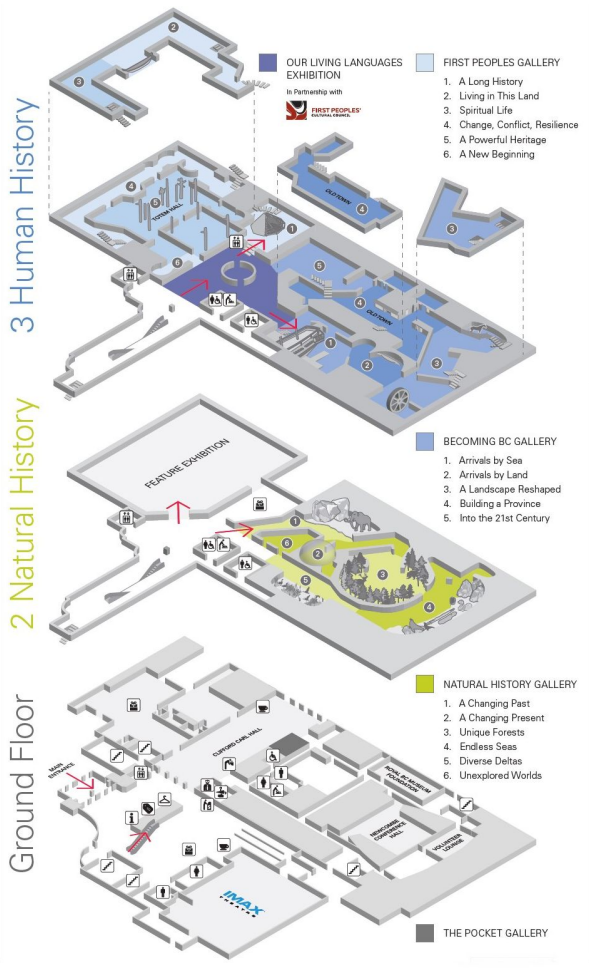


Fig.21-22 - Example. Guide Map of the Royal BC Museum showing the floor plan. Source: <https://royalbcmuseum.bc.ca/>; https://royalbcmuseum.bc.ca/sites/default/files/sites/default/files/images/InfoGuide_Eng2017_03.pdf

Infographics can even be used to decorate the physical environment as a means for busting motivation and creative inspiration.



Fig.23 - Example. Infographics by 2am decorating the walls of the Blackpool Aspire Academy. Source: <http://2ammedia.co.uk/blackpool-aspire-academy/>



Fig.24 - Example. Room signage by Ashton Design for the Mica Founders Green residential complex. Source: <https://ashton-design.com/work/mica-founders-green/>

Information panels are very varied in topics and visual representations. However, timelines are visualization techniques very frequent, especially in museums and exhibitions, for synthesizing information about historical events or telling a story highlighting changes that occurred.

1496-1500
Esegue gli affreschi della sala dell'Audienza nel Collegio del Cambio a Perugia. Ricorda il Vasari che «questa opera, che fu bellissima e lodata più che alcun'altra che da Pietro fusse in Perugia lavorata, è oggi dagli uomini di quella città, per memoria d'un sì lodato artefice della patria loro, tenuta in pregio».

1501
Inaugura a Perugia una seconda bottega, dopo quella aperta a Firenze negli anni Settanta.

1502
Inizia il polittico per la chiesa di Sant'Agostino a Perugia e la Sposazione della Vergine per il duomo, in cui riutilizza spunti architettonici e prospettici della Consegna delle chiavi della Sistina.

1503
Definito il meglio maestro d'Italia da Agostino Chigi in una lettera del 7 novembre 1500, ormai all'apice della fama, il pittore è richiesto dalla marchesa di Mantova Isabella d'Este, che gli commissiona per il suo studiolo nel Palazzo Ducale un dipinto con la Lotta tra Amore e Castità (Parigi, Louvre).

1508
Esegue gli affreschi sulla volta della Stanza dell'Incendio di Borgo in Vaticano.

1518
Dipinge il Martirio di San Sebastiano per la chiesa di San Francesco al Prato a Perugia.

1521-22
Dipinge l'Adorazione dei Magi per la chiesa di Santa Maria delle Lacrime a Trevi (Perugia).

1523
Muore di peste a Fontignano (Perugia) dopo aver formato, come narrato dal Vasari, «molti maestri di quella maniera, et uno fra gli altri che fu veramente eccellentissimo, il quale datosi tutto agli onorati studi della pittura, passò di gran lunga il maestro; e questo fu il miracoloso Raffaello Sanzio da Urbino».

BIOGRAFIA BIOGRAPHY

Paints the frescoes for the Hall of Audience in the Exchange in Perugia Vasari recalls that "this work, which was very beautiful and praised more highly than any other that Pietro had painted in Perugia, is still held in high esteem by the men of that city for the memory of such a worthy artist of their homeland."

Opens a second studio in Perugia, following the one he had opened in Florence in the 1470s.

Begins the polyptych for the Church of St Agostino in Perugia and the Betrothal of the Virgin for the cathedral, in which he re-uses architectural motifs and perspectives from the Handing over of the Keys in the Sistine Chapel.

Having been called "the best master in Italy" by Agostino Chigi in a letter of 7 November 1500, and now at the height of his fame, the painter is summoned by the Marchesa of Mantua Isabella d'Este, who commissions for her cabinet in the Ducal Palace a painting of the Battle between Love and Chastity (Paris, Louvre).

Paints the frescoes on the ceiling of the Room of the Fire in the Borgo in the Vatican.

Paints the Martyrdom of St Sebastian for the Church of St Francesco al Prato in Perugia.

Paints the Adoration of the Magi for the Church of Santa Maria delle Lacrime in Trevi (Perugia).

Dies of the plague in Fontignano (Perugia) after training, as Vasari recounts, "many masters of his manner, and one who was truly most excellent among them, who devoted himself entirely to the honoured studies of painting, far exceeded his master, and this was the miraculous Raffaello Sanzio of Urbino."

Lo sviluppo della figura umana nella scultura greca

The human body in Greek sculpture An evolution of styles

La riproduzione del corpo umano, con la ricerca delle ideali proporzioni e dell'armonico posizionamento nello spazio, ha sempre rappresentato per gli artisti greci un argomento privilegiato. Nel corso del VI secolo a.c. si sviluppa il tipo figurativo del giovane uomo in nudità (kouros), caratterizzato dalla posizione stante, rigorosamente frontale, con una gamba avanzata. Anche la figura femminile (kore) appare riprodotta similmente con i piedi giunti, abbigliata con pepi, tuniche e mantelli. Durante il V secolo a.c. si assiste a una vera rivoluzione nella raffigurazione del corpo umano: si evolve la ponderazione della figura, ossia il bilanciamento del peso sugli arti inferiori; la distinzione tra la gamba di appoggio e quella flessa si traduce in un dialogo tra forze in tensione che animano tutto il corpo. All'esplicito dinamismo del Discobolo di Mirone (lanciatore del disco), si contrappone il Doriforo (portatore di lancia), ideato da Policleto, modello di figura maschile atletica, basato su proporzioni ritmiche tra le parti del corpo. Le figure femminili sono dapprima rappresentate in severo aspetto, avvolte da pesanti mantelli (Aphrodite Sosandra); sarà poi Fidia, con le meravigliose sculture dei frontoni del Partenone, a mettere in risalto le morbide forme femminili, che ben si intuscano al di sotto di leggere tuniche aderenti dall'effetto sensuale di "stoffa bagnata".

In the 4th century BC the creations by Praxiteles are characterized by a stronger oscillation in the direction of an adjoining support, often a tree trunk. Figures with an elegant but at the same time casual posture are preferred, such as the melancholy Apollo Sauroktonos, young and flexuous satyrs and the sensual Aphrodite of Knidos. Praxiteles' masterpiece, where the sculptor chose to represent the goddess completely naked. The Apollo of Leochares is even more dynamically set in space: his limbs, both lean and elastic, are outstretched in opposite directions. Finally, the creations by Lysippos seem to challenge gravity by setting the arms and legs in an even more precarious form of balance, often accompanied by dynamic torsions, as in the dancing Menade. Lysippos, the favorite sculptor of Alexander the Great, following the already experimented athletic and heroic models, developed original figurative solutions. In the Apoxyomenos, an athlete that cleanses himself with a strigil, the human figure opens itself to space, lit with new dynamism thanks to the emphasis placed on the arms' extension, the far-off gaze, and the animatedly ruffled hair.

590-580 a.c. **540-530 a.c.** **460 a.c.** **450 a.c.** **440 a.c.** **438-432 a.c.** **360 a.c.** **350 a.c.** **350 a.c.** **330 a.c.** **330-320 a.c.**

Kouros **Kore** **Aphrodite Sosandra** **Discobolo** **Doriforo** **Diome e Afrodite** **Afrodite Knidia** **Apollo Sauroktonos** **Apollo del bevitore** **Menade danzante** **Apoxyomenos**

Fig.25-26 - Example. Two different types of timelines at Vatican museums (Musei Vaticani) in Rome. Photo courtesy of the author, Elisa Cruciani.



Fig.27 - Example. The New York City Marathon timeline. Source:

<https://www.archdaily.com/471468/pharmacy-museum-site-specific-arquitectura/52e72098e8e44e081d000267-pharmacy-museum-site-specific-arquitectura-photo>

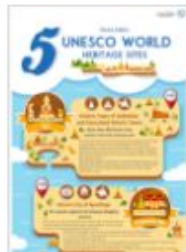
Infographics and data visualizations can also be very captivating tools for promotion and rise of awareness.

For example, see how the tourism office of Thailand uses them for marketing purposes (Figure 27) or the initiative of the Welsh Museums (Figure 28).

CATEGORY

- Country (5)
- Province (10)
- Lifestyle (29)

COUNTRY (5)



Thailand's 5 Unesco World Heritage Sites

Category: Country

[DOWNLOAD .PDF](#)
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10 Adventures in Thailand

Category: Country

[DOWNLOAD .PDF](#)
[DOWNLOAD .JPG](#)



10 Dream Destinations in Thailand

Category: Country

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Annual Thai Festival You Should Not Miss!

Category: Country

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[DOWNLOAD .JPG](#)

Fig.28 - Example. Infographic website promoting tourism in Thailand. Source: <http://travelthailand.tourismthailand.org/infographic/>

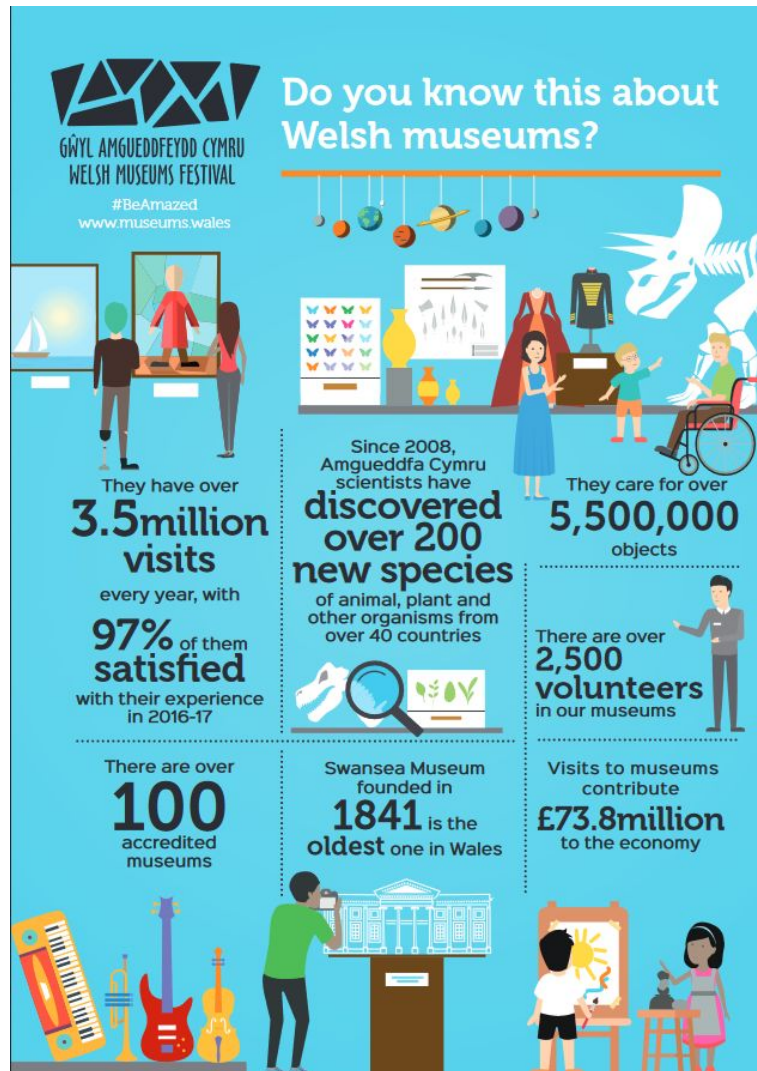


Fig.29 - Example. Infographic promoting Welsh Museums. Source: <https://www.pinterest.co.uk/pin/233694668151498448/>; <https://museum.wales/>

Even simplified and length-reduced reports illustrating cultural policies and plans (Figure 29), statistical surveys, or visitors feedback (Figure 30) can be used to inform and engage people. In this case, the style for data visualizations and infographics will be different from that used for business purposes, aiming at having a less serious and more joyful look.

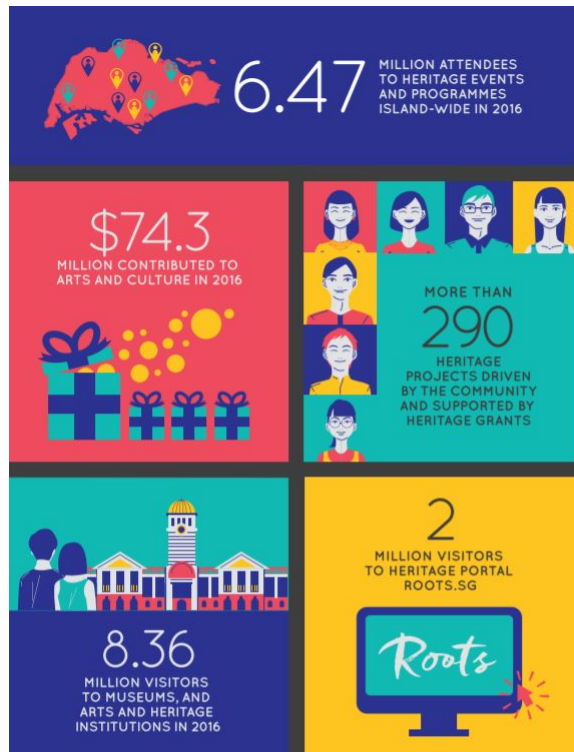


Fig.30 - Example. Report about Singapore's heritage plan. Source: <https://www.oursgheritage.gov.sg/>; <https://www.oursgheritage.gov.sg/wp-content/uploads/2018/04/English.pdf>

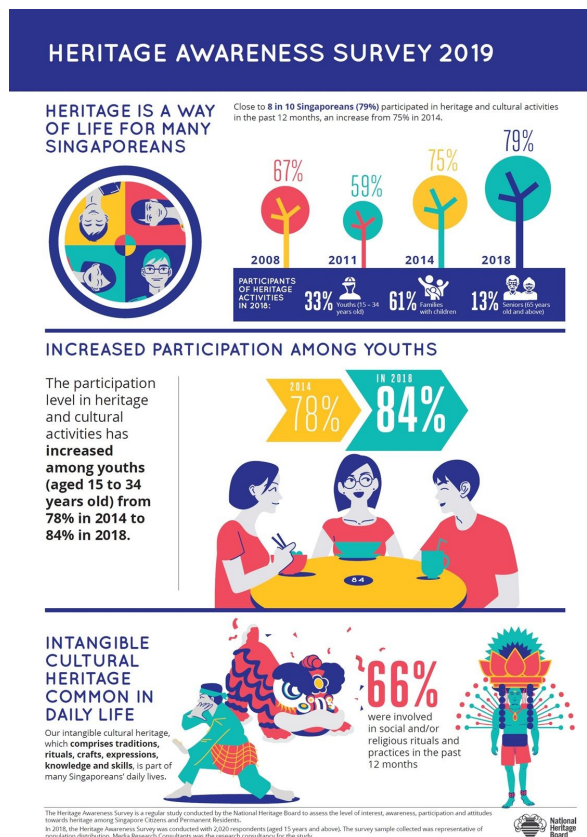


Fig.31 - Example. Results of the heritage awareness survey 2019 publicly presented. Source: <https://www.nhb.gov.sg/what-we-do/our-work/sector-development/heritage-awareness-survey-2019>

Lastly, notice that many apps, websites, and other online platforms, make large use of visual elements typically applied in infographics and data visualizations, such as maps, icons and photos, illustrations, especially in the field of natural and cultural heritage, as the visual language is very effective in conveying meanings and creating engagement. Therefore, it is a valuable resource for promotion and dissemination.

Some tools for the creation of infographics and data visualizations

As already said, the realization of infographics and data visualizations may require some specific technical skills referring to graphic, data analysis, and programming.

However, there are a lot of specialized tools supporting non-experts in creating their projects and offering to expert people a lot of functionalities to make amazing information visualizations. For example, some of the online tools for data visualization allow users to upload already compiled spreadsheets or databases and then directly work on graphically representing data.

In this lesson we have seen some practical applications of different types of information visualization. Now, have a quick look at some of the most suitable online tools to create them. In detail, the different tools suit different design needs according to the type of application the infographic or data visualization is made for. Some are more recommended for creating charts and visualizing data, others for creating more pictorial and illustrative visualization of information, in a static or interactive form. You can use them or find others more suitable to you for your future projects.

1. Plotly (<https://plotly.com/>)

Plotly is an online data analysis and visualization tool perfect for creating dashboards. It allows to create different types of interactive web apps, graphs, and visualizations in any programming language.

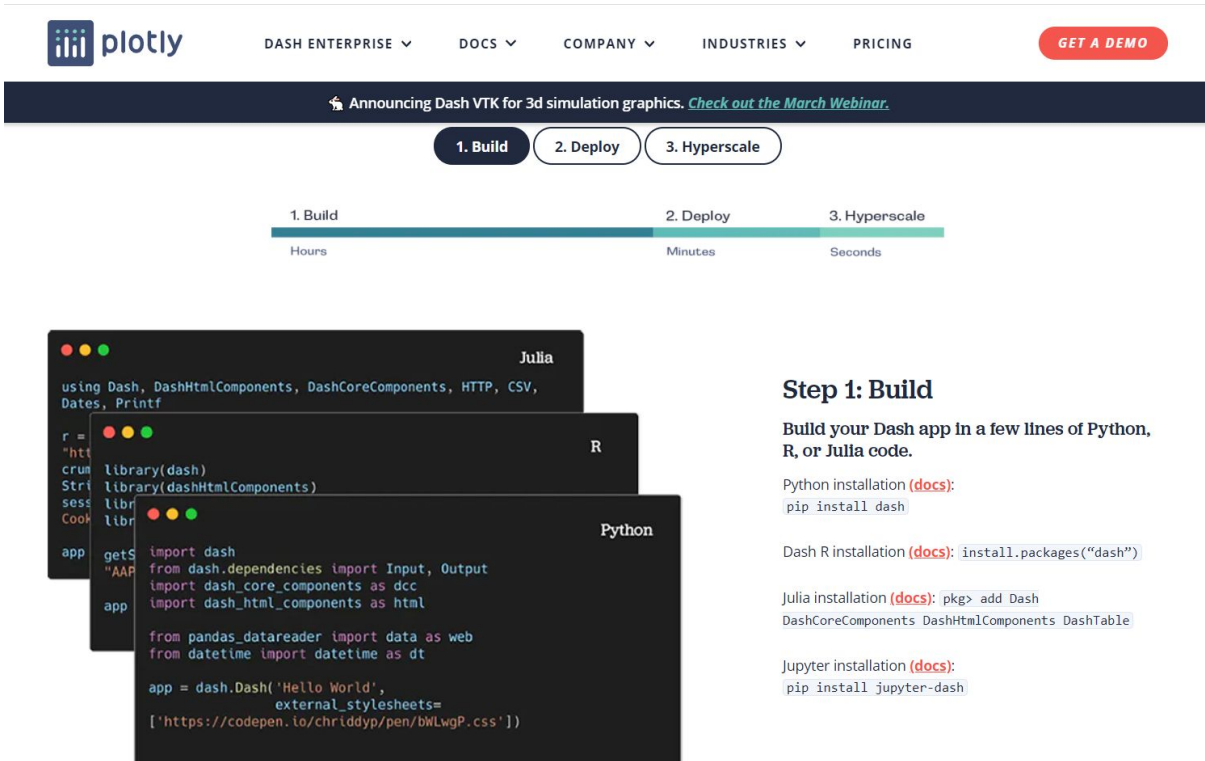


Fig.32 - Screenshot of the Plotly website.

2. Microsoft Power BI (<https://www.finereport.com/>)

Microsoft Power BI is another online data analysis and visualization tool perfect for generating and publishing reports for business intelligence. It allows to import and process data, creating rich and interactive reports with visual analytics.

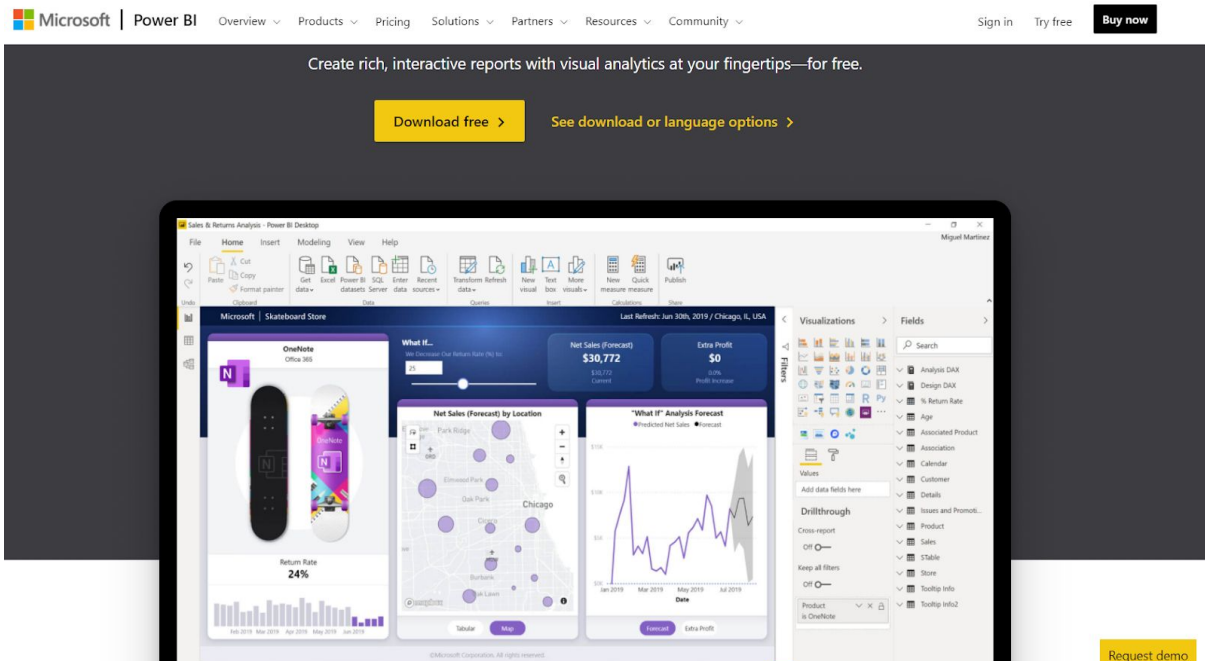


Fig.33 - Screenshot of the Microsoft Power BI website.

3. ParaView (<https://www.paraview.org/>)

ParaView is an open-source application especially useful to scientists and researchers for data analysis and visualization. It allows users to import, visualize, and analyze data. The exploration of the scientific data can also be done interactively in 3D or programmatically.

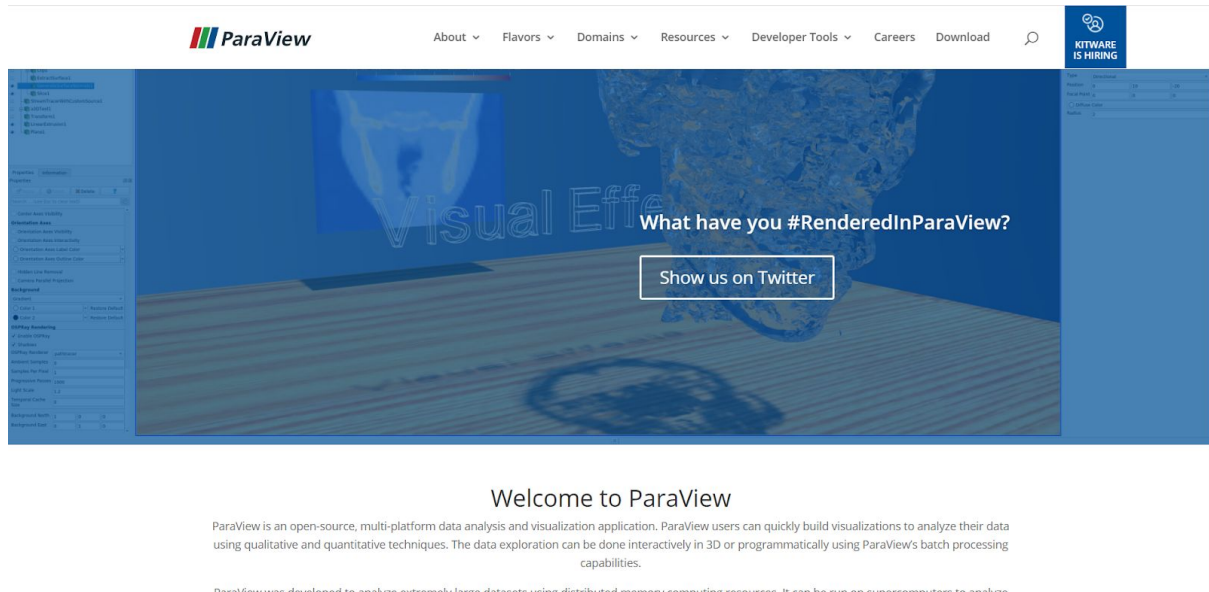
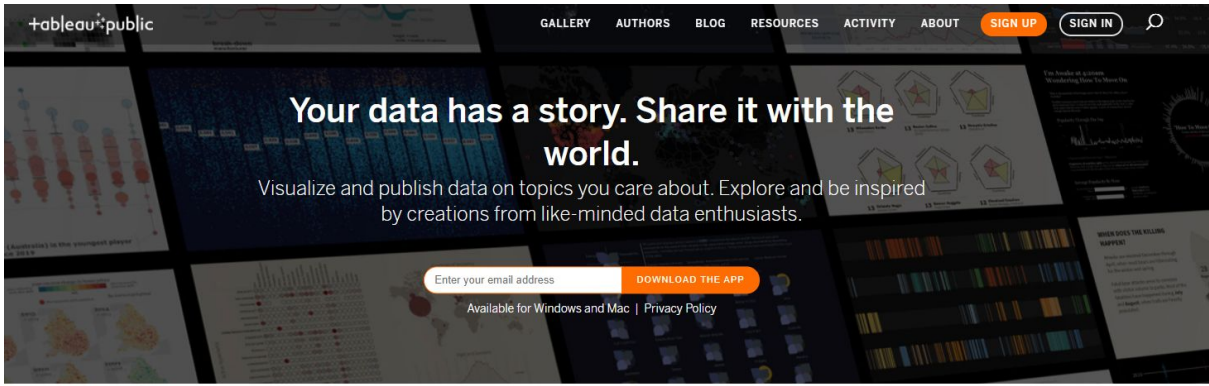


Fig.34 - Screenshot of the ParaView website.

4. Tableau Public (<https://public.tableau.com/en-us/s/>)

Tableau Public is an online data visualization tool largely used for many different projects, including data journalism and more. It allows users to create interactive data visualizations as well as analytics and reports. The different creations made with Tableau Public can be shared and explored online.



Data Storytelling

Easily create stunning interactive visualizations on our free platform. No coding required.

Spark Conversation

Connect with authors from around the world. Embed your visualizations on a personal website, blog, or social media.

Be Inspired

Explore and interact with the most extensive library of data visualizations in the world with over 1 million user-generated possibilities.

WHAT IS TABLEAU PUBLIC? [LEARN MORE](#) —

Fig.35 - Screenshot of the Tableau Public website.

5. D3.js (<https://d3js.org/>)

D3.js is a JavaScript library useful to people that have some skill in programming, or at least in using HTML, SVG, and CSS, for developing dynamic and interactive information visualizations. It allows users to create data visualizations in web browsers, combining powerful visualization components and the manipulation of documents based on data.

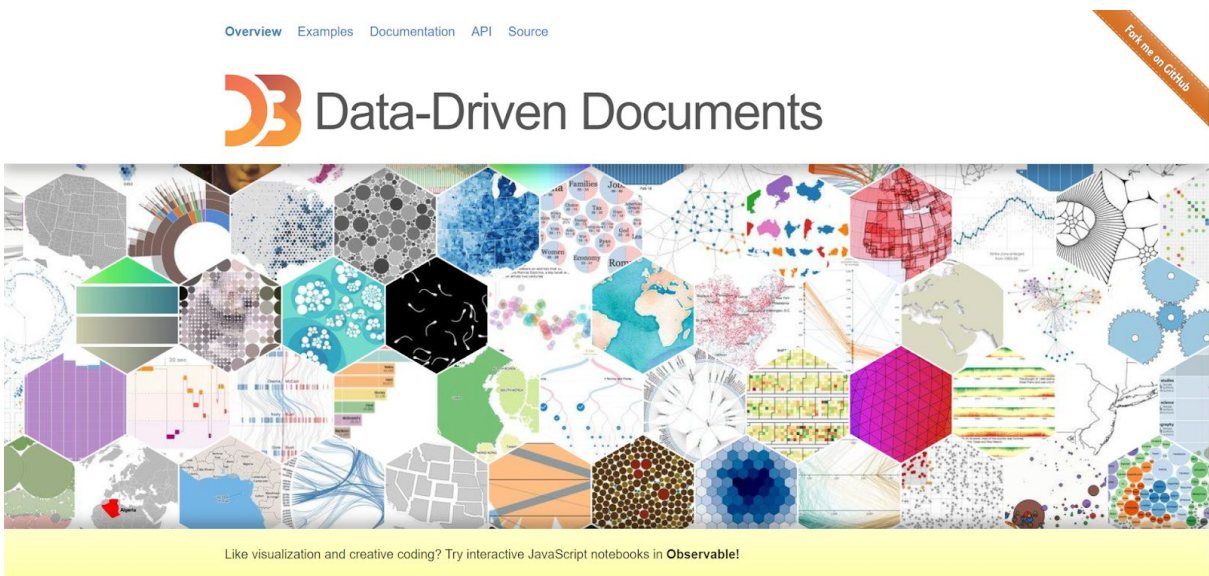


Fig.36 - Screenshot of the D3.js website.

6. Infogram (<https://infogram.com/>)

Infogram is an intuitive web-based tool for creating infographics and visualizing data. It allows users

to make and share engaging visuals, reports, and interactive charts and maps. Other similar tools are: Visme (<https://www.visme.co/>), Venngage (<https://venngage.com/>), Easel.ly (<https://www.easel.ly/>), etc.

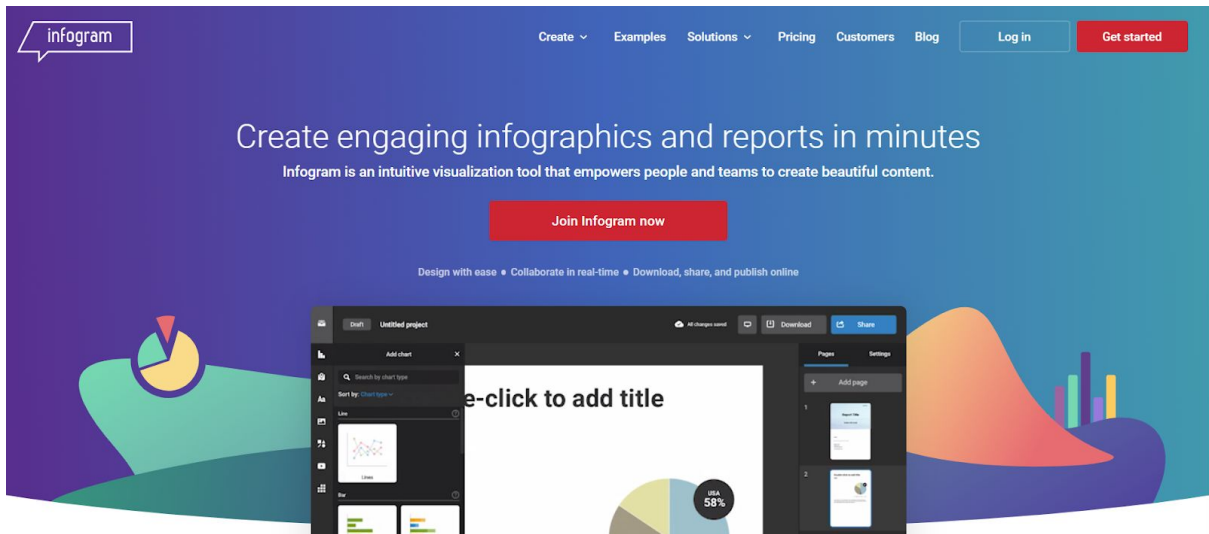


Fig.37 - Screenshot of the Infogram website.

7. Genial.ly (<https://www.genial.ly/>)

Genial.ly is another web-based tool suitable for making interactive presentations, infographics and quizzes. It allows users to create video presentations and information visualizations, with interactive contents, too.

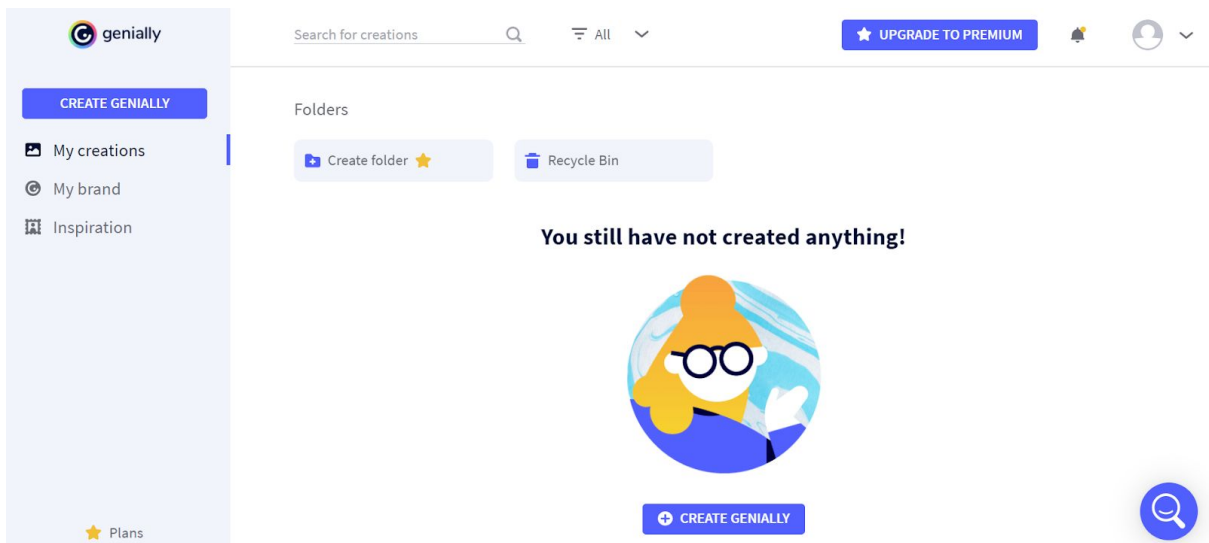


Fig.38 - Screenshot of the Genially web-based application.

8. TimelineJS (<https://timeline.knightlab.com/>)

TimelineJS is an open-source tool that enables users to build interactive timelines. Beginners can create a timeline using Google spreadsheet, experts can use their JSON skills.

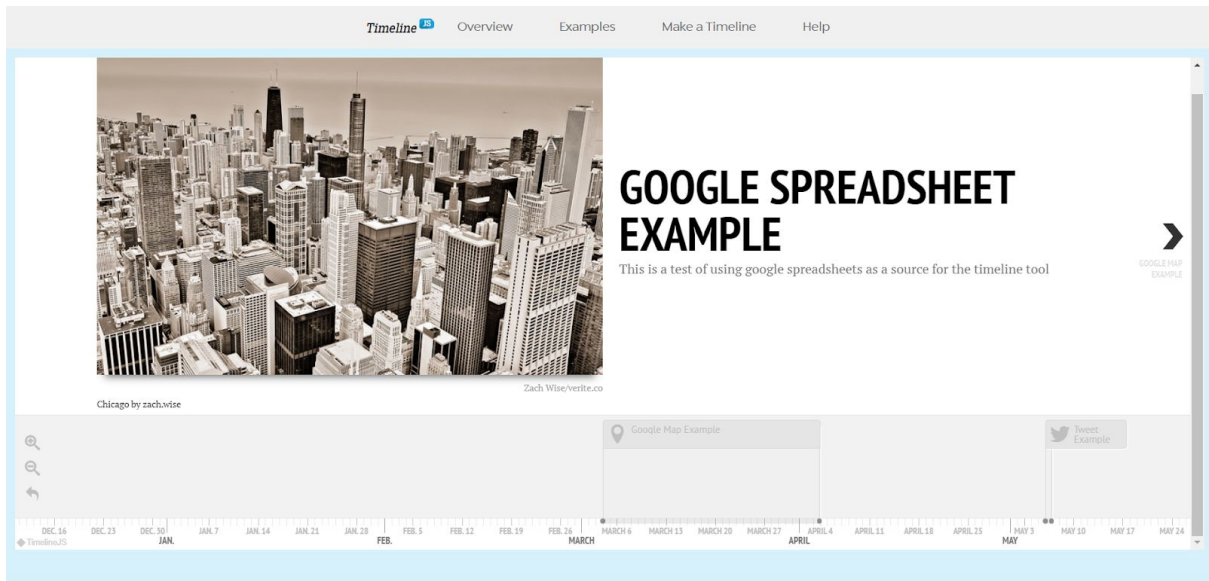


Fig.39 - Screenshot of the TimelineJS website.

Conclusions

Thanks to the skills acquired with this lesson, students will be able to increase their references about the different applications of information visualization and the most suitable online tools to create them, so that they can make more informed choices when creating their infographics.