Sophie Ashdown

24003550

MA Fine Art Digital

srcoady@gmail.com (preferred)

s.ashdown0620241@arts.ac.uk

Table of Contents

Research Topic: 3

Abstract: 3

Key Words: 3

Introduction: 4

Constructivism – Origins and aesthetic elements 5

Data as the New Industrial Material 7

What is Data Visualisation? 7

Contemporary Data Visualisation and Data Art 9

Nathalie Miebach 10

David McCandless 13

Comparison of Miebach, McCandless, and Constructivism 16

Related Areas to Explore 17

Conclusion: 19

Bibliography 20

Research Topic:

Data as a raw material in art. How contemporary data artists echo the Constructivist use of geometric forms by treating data itself as the modern equivalent of an industrial material, comparing specifically how Artist Nathalie Miebach and Data Journalist David McCandless incorporate the design elements of Constructivism in their artistic interpretations of data.

Abstract:

Just as Constructivist artists embraced the materials and logic of the machine age to reflect a new social order, contemporary data visualisation artists treat data as a raw material. They use data as a new industrial substance to shape, interpret, and communicate.

While Nathalie Miebach transforms data into tactile, expressive structures that showcase emotional complexity, David McCandless refines data into clear, elegant forms aligned with information design. Both consistently use the core geometric shapes and forms of the original Constructivist movement.

Through research into Constructivism's geometric legacy with the analysis of data visualisation and its merits, comparison of the difference between data visualisation and data art, plus analysis and review of the works and intentions of Nathalie Miebach and David McCandless, this paper will discover how in this modern age data is used as a material in art and the legacy of Constructivism lives on in these artworks.

Key Words:

Data Art influenced by Constructivism

Introduction:

In our modern world we are surrounded by data, and indeed bombarded with it through the news, social media, advertising, corporate communication, and more.

As data multiplies, the need to communicate it effectively increases, elevating the artistic value of the data visualisations.

A new form of art using data as a key element has emerged, and this paper will explore how and why the artistic use of data is both important and beautiful.

> "The art of information display is every bit as artful as any other type of design or illustration, with the notable exception that it must tell a factual or linear story, rather than an expressive tale or polemical message." (Helley & Landers, 2014, page 7)

This will be done through exploration of two different types of artists who use data as their base material in different ways. Nathalie Miebach and David McCandless both create fascinating visualisations of data in different ways. Artist Miebach transforms meteorological data into colourful tactile sculptures whilst McCandless refines a wide variety of data into engaging and intriguing infographics.

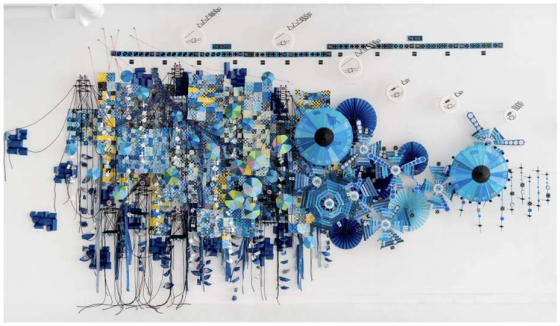

Fig. 1 - The Floods, Nathalie Miebach (*The Floods*, no date)

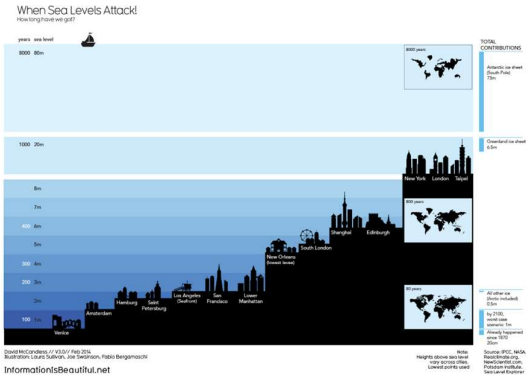

Fig 2 - When Sea Levels Attack. David McCandless (Beautiful, no date)

Analysis of their collected works will be done through the lens of Constructivism, a Russian abstract art movement from the 1920s, looking at how these artists use the core geometric elements of this art movement in their work today, and whether that is a conscious decision.

This research is relevant because it explores how artists today are responding to a world increasingly shaped by data, as the Constructivists were doing in the 1920s to a world shaped by industry.

Constructivism – Origins and aesthetic elements

Constructivism was a revolutionary art movement that started in Russia around 1915. The key aesthetics that identify Constructivist art include geometric shapes, primary colours, repetition of lines and grids, spatial construction, and industrial references.

Vladmir Tatlin (1885-1953) and Alexander Rodchenko (1891-1956) are largely accepted as the two key founders of the movement. Their intention was to develop a "new style of pure, abstract art that was appropriate for a modern industrial society" (Moore/Winner, 2021, page 7)

Fig 3 - Madonna, Vladimir Tatlin, 1913 gouache and pencil (*Vladimir Tatlin Sculptures*, no date)

Fig 4 - Composition géométrique, Alexander Rodchenko, 1918, (*Composition géométrique by Alexander Rodchenko on artnet*, no date)

The art wasn't meant to be purely decorative like much of the art of the previous century, but instead to use abstract styles, geometric shapes, and industrial materials to reflect the modern era. At that time it was the dawn of the Russian revolution which saw huge political, social, and industrial change. The Constructivist art movement sought to capture that momentum with its bold aesthetic that mirrored the public sentiment of the time.

"Constructivist art is about an artistic choice that relates to the inner mathematics in us that finds rational beauty in forms, in patterns, and in known and unknown structures." (Petitgas and Pallant House Gallery, 2017, page 16-17)

Early Constructivist art started with bold propaganda posters (Fig 5) that reflected the socialist movement of Russia at that time, but the movement soon shed its politics to focus more on pure geometric abstraction. This led to the abstract Constructivist style of geometric shapes and bold lines that it is more recognised now (Fig 6.)

Fig 5 - Lenin and Electrification, Shass and Kobelev, 1925 ('Lenin and Electrification 1925f – Soviet Posters', no date)

Fig 6 - Composition, (*Aleksandr Rodchenko. Composition. 1919 | MoMA*, no date)

Aesthetically, constructivist art is dominated by bold forms, geometric shapes, and solid lines, resulting in industrially inspired abstract works. It gained momentum into the 1920s and faded in the late 1930s under the Bolshevik regime. Constructivism is part of the abstract momentum in the early 20th century that influenced and inspired the De Stihl, Bauhaus, and Pop Art movements.

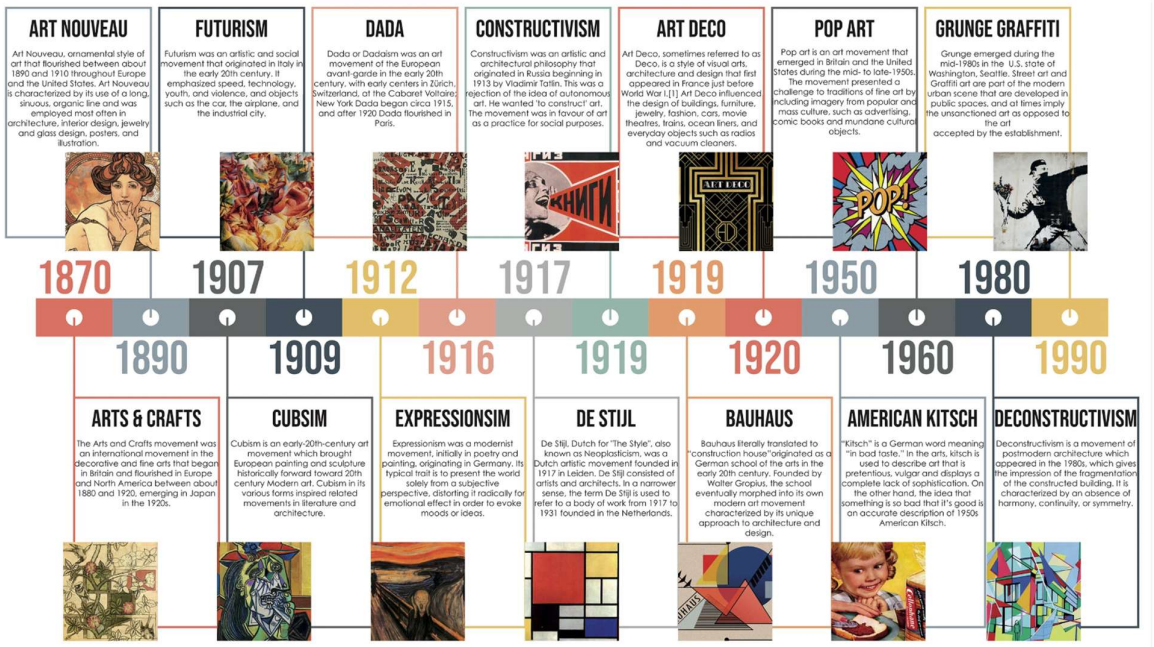

Fig 7 - History of Graphic Design (Behance, 2018)

What is unique about Constructivism is how its basic principles have stood the test of time, with further artists and groups of artists taking on these key elements to create more art in this style. In the early 1950s there was a resurgence in Constructivism in Britain, as some Russian artists had migrated to the UK after the war. Later in the 20th Century, the "New Constructivists" group formed in London, comprising twelve artists that still exhibit annually at the Chelsea Town Hall.

Constructivism continues to influence artists today, as will be discussed in relation to using data as a source material.

Data as the New Industrial Material

Constructivism used geometric forms and industrial materials (metal, wood, glass, text, printing) to convey their intention of reflecting the modern world at that time. Today we can say that data is today's equivalent of an industrial material, to be used and manipulated to create beautiful and evocative pieces of art.

In this modern technological age, data is everywhere and growing all the time. Data provides structure and feeds systems. We have many modern tools to manage and analyse data. Data has become essential to people, businesses, governments etc.

Data can be a medium for evoking emotion when it is presented in a relatable, tangible way. There are stories to be found in data that can be displayed visually, so the viewer can connect to it both visually and emotionally.

What is Data Visualisation?

With so much data bombarding us constantly, there is a need for people to understand, learn, and get value from it, which is where Data Visualisation comes in.

Data Visualisation is defined by IBM as:

> "representation of data through use of common graphics, such as charts, plots, infographics and even animations. These visual displays of information communicate complex data relationships and data-driven insights in a way that is easy to understand." (*What Is Data Visualization?* | *IBM*, 2021)

This is not a new concept. History shows that the first known example of statistical graphic representation is attributed to Michael Florent Van Langren, a Flemish astronomer who created a line graph in 1644 to show how to measure longitude (Fig 8.)

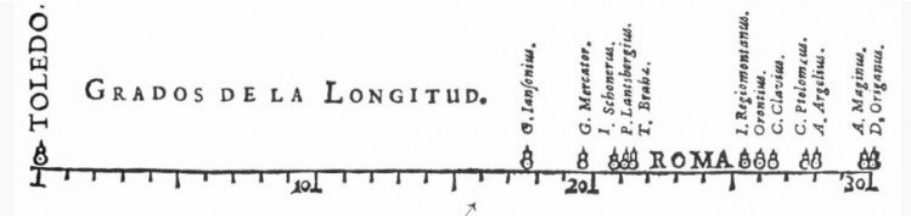

Fig 8 – Gados de la Longitud ('The Data Visualisation Revolution – Plotting Distance to Digital Humanities', 2020)

A more recent, but still manual example came from Winston Churchill during the second world war. Churchill and his cohorts used detailed data tracking to map the number of planes, u-boats and other military vehicles. Examples of these can be seen at the Churchill War Rooms exhibition:

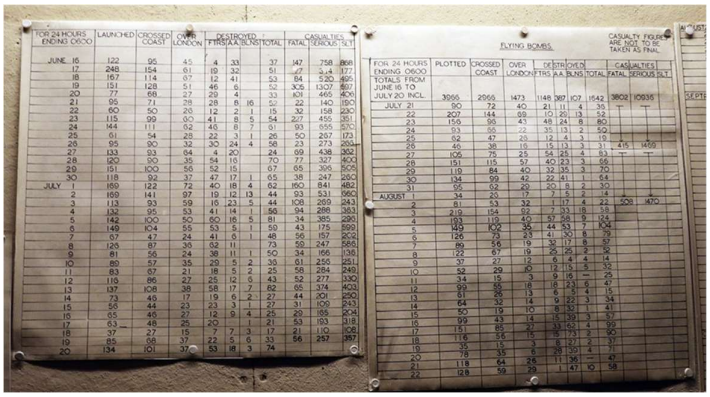

Fig 9 - (*Churchill Archive for Schools - Guide to Primary Sources_Charts and Gr*, no date)

He and his team analysed this data to plot various data visualisations, where they used only typewriters, rulers, and coloured pens to create the charts:

Fig 10 - (*Churchill Archive for Schools - Guide to Primary Sources_Charts and Gr*, no date)

Data visualisation doesn't have to be just for government or business data. It can be used for any information and for any audience.

What are the benefits of Data Visualisation?

- **Makes the data accessible.** Instead of reading through lists of data and trying to make sense of it in our heads, data visualisation lays it out so the viewer can take in a large amount of information quickly and easily.
- **Helps to make comparisons.** By displaying the data points in meaningful ways, the viewer can recognise the differences, similarities, and trends being shown. For example a chronological chart can demonstrate the progress of numbers through time.
- **Exposes relationships.** Seeing the data in a visual representation helps to recognise how data points affect each other. For example on a line chart the viewer can evaluate why two trending lines cross.
- **Recognise patterns.** Viewing the data visually makes it easier to see patterns and anomalies in the data.
- **Tell a story with the data.** Successful data visualisation will tell a story about the data it is based on. For example a company may tell the story of how their business is performing or a parent may see how their child has grown over the years.

(Above bullets partially sourced from (Club and Abukar, 2023))

In today's society we have become used to seeing the standard formats of data visualisation through bar charts, pie charts, heat maps, etc. Anyone with Excel on their computer can easily create a chart in seconds. Over time expectations of data visualisation have grown and the inventiveness of designers has increased steadily.

Contemporary Data Visualisation and Data Art

There is Data Visualisation and Data Art, which have the same original purpose – to display data in a visual way – but with different effects. Both are a visual representation of data, but they have different impacts and different audiences.

Broadly one could say that Data Visualisation helps us to understand the data, whereas Data Art helps us experience the data. Both tend to use clean lines, bold colours, simple shapes, grids, and patterns. This links back to the Constructivist visual language using the same elements.

Data Art is about humanising data through art. Building artworks that cause us to confront the questions of how data is used and affects us in everyday life.

Even data that is representing something we were not directly involved with, by seeing and understanding it through visualisation, we can engage and connect to the source or reasoning for that data.

This paper will explore two data visualists who approach the concept in different ways. David McCandless's work represents Data Visualisation, finding new and interesting ways for viewers to understand and draw conclusions from the data. Nathalie Miebach's work represents Data Art, by creating beautiful pieces of art and sculpture she represents data in a tangible way that allows viewers to experience and engage with the data in a different way than traditional Data Visualisation.

Nathalie Miebach

Nathalie Miebach is a German/American artist born in 1972 in Zeven, Germany who resides in Boston, Massachusetts USA.

Fig 11 – Nathalie Miebach, About (*About Nathalie Miebach*, no date)

Miebach creates large collage wall art pieces, sculptures, and musical scores based on meteorology, ecology and oceanography. Her main focus currently is on creating large woven sculptures using basket weaving. Each element of her pieces is carefully crafted to specific data points.

Central to her work is her "desire to explore the role visual and musical aesthetics play in the translation and understanding of complex scientific systems, such as weather." (Miebach, "About", no date)

Miebach has been an active professional artist since 1995, as a certified Visual Arts Teacher with a Master of Science in Art Education from the Massachusetts College of Arts in Boston Massachusetts. Miebach also has a Master of Fine Arts in Sculpture from the Massachusetts College of Arts in Boston MA.

Miebach believes that "art is so important in helping us to understand data better." (*The Weather Artist: Chasing Storms With Sculpture*, 2016)

One of her most famous pieces is "The Floods" (Fig 12), a large wall sculpture (17' x 10').

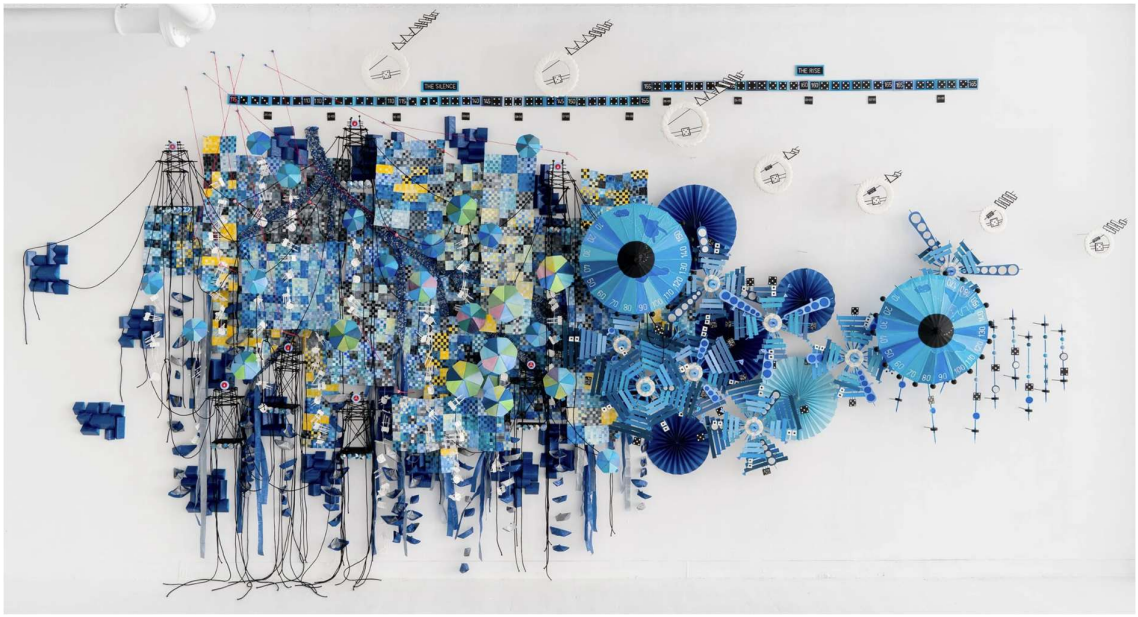

Fig 12 - The Floods (*The Floods*, no date)

It is based on data about Hurricane Maria, an extremely powerful and damaging tropical cyclone that devastated the northeastern Caribbean in September 2017. It destroyed 95% of homes in Puerto Rico and killed 4600 people.

What is fascinating about this piece is that Miebach describes the materials used for this artwork as "Wood, paper, rope, data" proving that the artist herself considers data to be a medium in her art, just as much as the physical elements.

Each component of the collage is tied to a data point, so whilst creating a beautiful piece of art, Miebach stays true to the data that is the basis upon which the concept is structured.

By representing the storm using 3D shapes and materials, Meibach invites the viewer to feel like they are part of the storm. The viewer can see and imagine the intensity of the wind, rain, and damage represented through the geometric elements in the piece. Miebach's choice of colour, shape, and placement take the viewer on a journey through the storm. She weaves the data into stories rather than just literal interpretations of the numbers and statistics, giving the viewer a tactile and accessible experience.

"What I like about this work is that it challenges our assumption about what kind of visual vocabulary belongs in art versus science." (*Art made of storms*, 2011)

Another example is “The Andrea Gail”, a sculpture that represents an American commercial fishing vessel of the same name that sank off the coast of Massachusetts near Miebach’s home of Boston, killing everyone on board. This was due to the “Perfect Storm” in 1991 which was a cyclone that escalated into a hurricane on the east coast of the US, causing high waves and extensive flooding. In conjunction with musicians Miebach created a musical score based on the storm which then provided the data points for the sculpture.

Fig 13 - “The Andrea Gail”
Reed, metal, wood, data
Nathalie Miebach, 2011
(Sierzputowski, 2016)

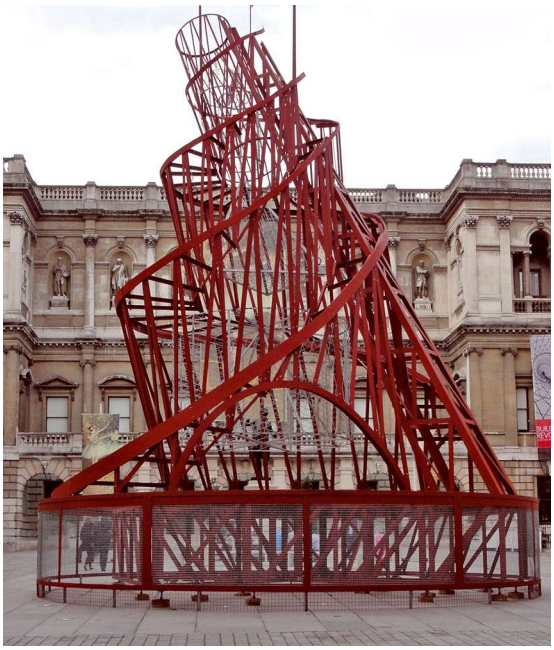

Fig 14 - “Tatlin’s Tower” (reproduction)
Metal and wood
Vladmir Tatlin, 1920 (original)
(Neokentin, 2020)

Miebach’s sculpture bears a striking resemblance to “Tatlin’s Tower” which was a project by Vladmir Tatlin (Constructivism co-founder) for the Monument to the Third National in 1919-1920. It was intended to be built in St Petersburg at the Communist International headquarters, but was never built as intended. Several scale versions of it have been built across Europe including in Stockholm, Moscow, and Paris.

It is obvious to see the similarities in shape, structure, movement, and colour between the two sculptures. They have a similar spiral form, geometric construction, and sense of movement. Despite their differences in scale and material, they both merge the themes of art, science, and architecture.

David McCandless

David McCandless is a British author, designer, and "data-journalist." Originally working on gaming magazines, he found a keen interest in displaying information in unusual and engaging ways. This led to a blog called "Information is Beautiful" that eventually led to a series of books.

In 2009 he released a book titled "Information is Beautiful" which is largely a collection of his most intriguing and thought-provoking data visualisations.

> "Every day, every hour, maybe even every minute, we're looking and absorbing information. What we need are well-designed, colourful and – hopefully – useful charts to help us navigate." (McCandless, 2009, Page 6)

Originally he first pitched the book with the title of "Information Maps" and received little interest from publishers. This led him to change the title to "Information is Beautiful" which scored him a book deal.

The book was then a surprise success for both David and the publishers. He followed it with "Knowledge is Beautiful" in 2014 and "Beautiful News" in 2021.

David now has a whole team who help run the "Information is Beautiful" website that continues to create and publish intriguing examples of data visualisation. It has created something of a movement amongst data professionals which was launched through a 2010 TED talk shared on LinkedIn.

In the TED talk, David explains the value of:

> "visualising information so we see the patterns and connections that matter, and then designing that information so it makes more sense or it tells a story or it allows us to focus only on the data that is important." (McCandless, TED Talk, 2010)

David's approach to data visualisation is that he starts with an idea of what information he would be interested to see, then does his research to find the most accurate data, then trial many different methods to see how best to express that data in a meaningful way. He often rejects a dataset partway through the process because the results are not impactful or interesting enough.

Although David considers his work to be data visualisation and not data art, he recognises and celebrates the connection, and in striving to make his work "beautiful", could certainly be considered as a form of data art.

In this video collaboration he did with Microsoft, David talks about how he transforms data into art:

> "Data feels like a kind of raw material and if you get your hands dirty and dig through it, it starts to come alive. I think data is a great lens we can use to see things in a different light. We can open up new patterns. Information is beautiful. Data is beautiful." (McCandless, Turning Data into Art, c2020)

McCandless gives talks and training workshops around the world based on his method of visualising data. On October 13th 2025 he held a session in London, to which this author attended. He presented his view of what makes a good data visualisation, expressed rather appropriately through a visualisation from one of his books:

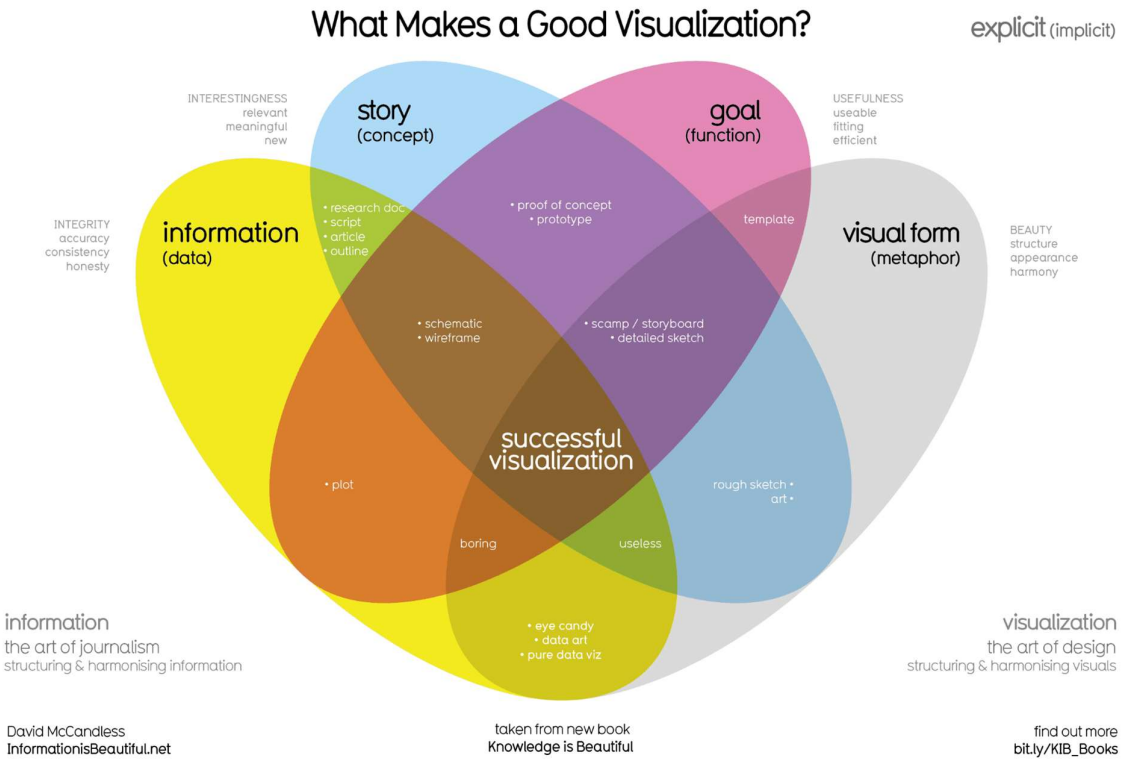

Fig 15 - What makes a good visualisation? (McCandless, 2014, page 242)

He makes it clear that one of the key elements is the visual form, and that "art" comes from a combination of the visual form with the story of the data. He stated in the workshops that data visualisation is a combination of "science and art, bringing together two sides of the brain." (McCandless, 2025)

It is significant that many of his data visualisations utilise the standard geometric elements of constructivism that are still being used in data art today.

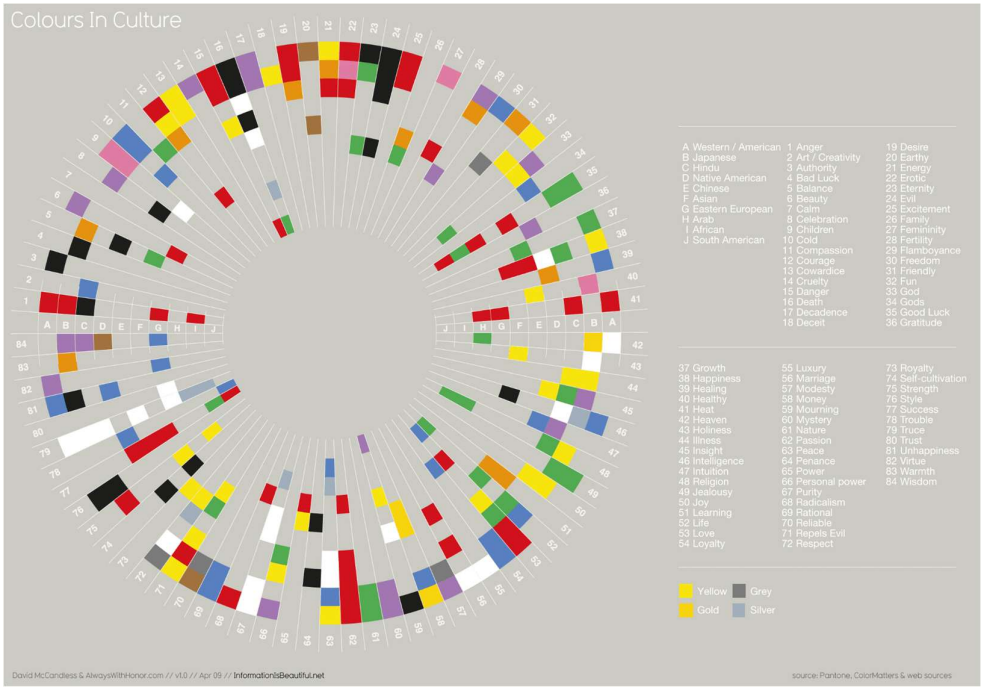

Fig 16 - Colours in Culture (McCandless, 2009, page 76)

This data visualisation depicts the colours associated with different words in different cultures. For example “Truce” is white in most cultures, whereas “Evil” is all black. Both “Passion” and “Anger” are mostly red. “Love” is a mix of blue, red, yellow, and green.

If the letters and numbers are taken away, we would be left with a beautiful circular shape of multiple colours, that could stand on its own as a piece of art, demonstrating McCandless’s mantra that information is beautiful.

Evaluating this work, it is clear to see the elements familiar to constructivism, specifically geometric shapes, bold colours, and straight lines.

Comparison of Miebach, McCandless, and Constructivism

Two comparable data pieces by Miebach and McCandless are:

Fig 17 - "Lake Michigan", Nathalie Miebach (*Lake Michigan*, no date, webpage)

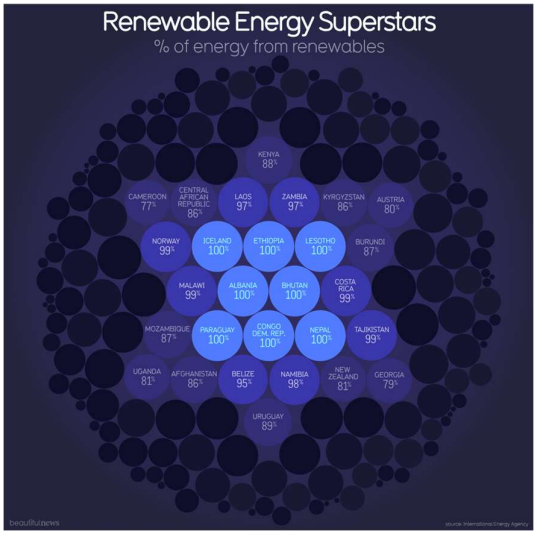

Fig 18 - "Renewable Energy Superstars", McCandless (McCandless, 2021, pg 175)

Fig 17 is "Lake Michigan" which was created by Miebach to "better understand how the lake is responding to Climate Change and how communities who live near its shoreline respond to them." (*Nathalie Miebach on Instagram: Lake Michigan*, 2024)

Fig 18 was created by McCandless in his book "Beautiful News" and shows which countries use renewable sources to produce their entire electricity output.

Whilst the topics are very different, both demonstrate effective use of circles and lines in different shades of blue as the primary colour.

The main differences are in the materials used, the medium, and the intent. Certainly the audience experience of Miebach's 3D pieces of such colour and vibrancy will have a different reaction to McCandless's clean informative graphic representation. McCandless imparts logic whilst Miebach invites engagement.

Comparing these artists gives us an opportunity to reflect on their styles and intentions, plus also the aesthetic beauty of the images, regardless of the data they are based on.

Whilst it is unlikely that Miebach and McCandless are specifically referencing Constructivism in their work, the similarities in shapes, colours, and forms are undeniable. These elements naturally lend themselves to representing data points. It is more likely that both have been influenced over many years, as many artists have been for the past century, by the enduring legacy of Constructivist principles.

Related Areas to Explore

Conducting the research for this paper has considered a wide range of other aspects that would be relevant to the topic, but could not be included due to the word count. It is still valid and useful to briefly mention some of these areas, as perhaps there may be an opportunity in the future to expand upon the work done here.

A key point of the research is that the geometric elements from Constructivism continue to appear in modern data art. It is certainly true that particular shapes continue to recur, but other art movements having similar elements can be considered.

For example cubism which came before constructivism has, even by its name, some geometric elements that could be extrapolated as being present in data art. “Braque and Picasso, working together from the winter of 1908, developed a style that relied heavily on Geometric forms.” (Fortenberry, 2017, room 330) However those elements are not as obvious or as well defined, since much of cubism can still be figurative and there is much less incidence of circular forms and primary colours. (Fig 20)

Fig 19 - The Portugese, Georges Braque, 1911 (Fortenberry, 2017, room 330)

De Stijl, Bauhaus (Fig 20), and Op Art are other art movements that have many of the same geometric elements commonly found in data art, but those elements are believed to have been influenced by Constructivism, which came before those movements.

Fig 20 - The Portugese, Georges Braque, 1911 (Fortenberry, 2017, room 345)

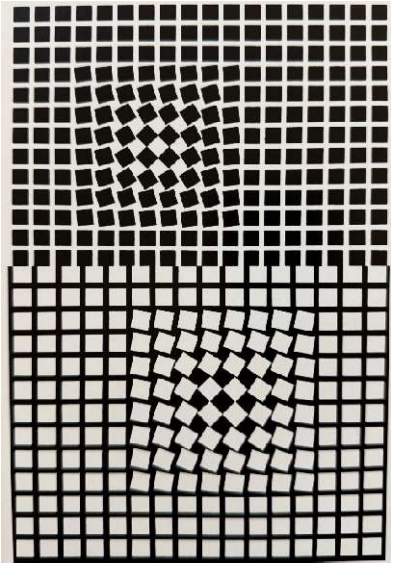

Fig 21 – Eridan III, Victor Vassarely, 1956 (Fortenberry, 2017, room 377)

There are other artists that work with data that could be explored further:

- Giorgia Lupi and Stefanie Posavec, who spent a year creating data art based on their lives and sending it weekly to each other via post. (THE PROJECT, no date)
- Refik Anadol, a Turkish-American artist who uses data and machine learning to create mesmerising digital art.
- Golan Levin, an American artist and professor who creates digital and interactive art based on machine code

Surprisingly, there are not yet many data artists who are widely known, but this is likely to change in the near future as data continues to be a significant part of life in general.

An enormous area of further research could be focussed on AI. Certainly with the direction that AI is going, we could get to a point where AI has been fed all of the process and methods of manually creating data visualisation, so that it can create the kind of output that many data artists would dream to achieve. There are upsides and downsides to this of course, as there are with most AI innovations.

Hopefully AI can create some useful and engaging data visualisations that will help businesses and governments to explain important data sets to a wide range of people.

However the concept of true art based on data should be kept as its own genre where there will still be a desire for the handmade versions of making information beautiful.

Conclusion:

Through this exploration of the origins of Constructivism and the world of modern data visualisation, this paper has sought to demonstrate how data is used as a tangible material to create art, much like the original Constructivists used industrial and machine elements as a basis for their work.

The Constructivist art movement was significant in using the materials of their time to incorporate into striking pieces of art. The key geometric elements of Constructivism continue to influence artists today, and appear significantly in artistic translations of data.

In today's world it is impossible to avoid the abundance of data that is available and indeed thrust upon us. Data visualisation and data art seek to translate that information into works that tell the story of that data, that engage with the viewer, and that appear visually appealing.

Nathalie Miebach and David McCandless both draw from Constructivist aesthetics, but use data as a material in their visualisations in different ways. One seeking order and communication and the other seeking engagement and emotional connection. Their use of bold shapes, colours, and lines to effectively communicate data demonstrates the suitability for this purpose and also echoes the endurance of elements core to Constructivism that have continued to perpetuate over the past century.

To summarise, researching this topic has proven how data can be a viable and useful basis for the creation of beautiful art, and the use of similar geometric elements across different types of data visualisation demonstrates that the aesthetic legacy of Constructivism persists in data-driven art, as it does in modern art movements.

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List of Figures (all cited from Bibliography above)

Fig. 1 - The Floods, Nathalie Miebach (*The Floods*, no date)

Fig 2 - When Sea Levels Attack. David McCandless (Beautiful, no date)

Fig 3 - Madonna, Vladimir Tatlin, 1913 (*Vladimir Tatlin Sculptures*, no date)

Fig 4 - Composition géométrique, Alexander Rodchenko, 1918, (*Composition géométrique by Alexander Rodchenko on artnet*, no date)

Fig 5 - Lenin and Electrification, Shass and Kobelev, 1925 ('Lenin and Electrification 1925f – Soviet Posters', no date)

Fig 6 - Composition, Aleksandr Rodchenko (*Aleksandr Rodchenko. Composition. 1919 | MoMA*, no date)

Fig 7 - History of Graphic Design (Behance, 2018)

Fig 8 – Gados de la Longitud ('The Data Visualisation Revolution – Plotting Distance to Digital Humanities', 2020)

Fig 9 - (*Churchill Archive for Schools - Guide to Primary Sources_Charts and Gr*, no date)

Fig 10 - (*Churchill Archive for Schools - Guide to Primary Sources_Charts and Gr*, no date)

Fig 11 – Nathalie Miebach, About (*About Nathalie Miebach*, no date)

Fig 12 - The Floods (*The Floods*, no date)

Fig 13 - "The Andrea Gail" Reed, Nathalie Miebach, 2011 (Sierzputowski, 2016)

Fig 14 - "Tatlin's Tower" (reproduction), Vladmir Tatlin, 1920 (original) (Neokentin, 2020)

Fig 15 - What makes a good visualisation? (McCandless, 2014, page 242)

Fig 16 - Colours in Culture (McCandless, 2009, page 76)

Fig 17 - "Lake Michigan", Nathalie Miebach (*Lake Michigan*, no date, webpage)

Fig 18 - "Renewable Energy Superstars", McCandless (McCandless, 2021, pg 175)

Fig 19 - The Portugese, Georges Braque, 1911 (Fortenberry, 2017, room 330)

Fig 20 - The Portugese, Georges Braque, 1911 (Fortenberry, 2017, room 345)

Fig 21 – Eridan III, Victor Vassarely, 1956 (Fortenberry, 2017, room 377)