SHAKING THE FOUNDATIONS OF AN EMPIRE: AN INTERACTIVE DATA VISUALISATION OF THE DANDI SALT MARCH

Submitted in partial fulfillment of the requirements
of the degree of **Master of Design** by

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Guide:
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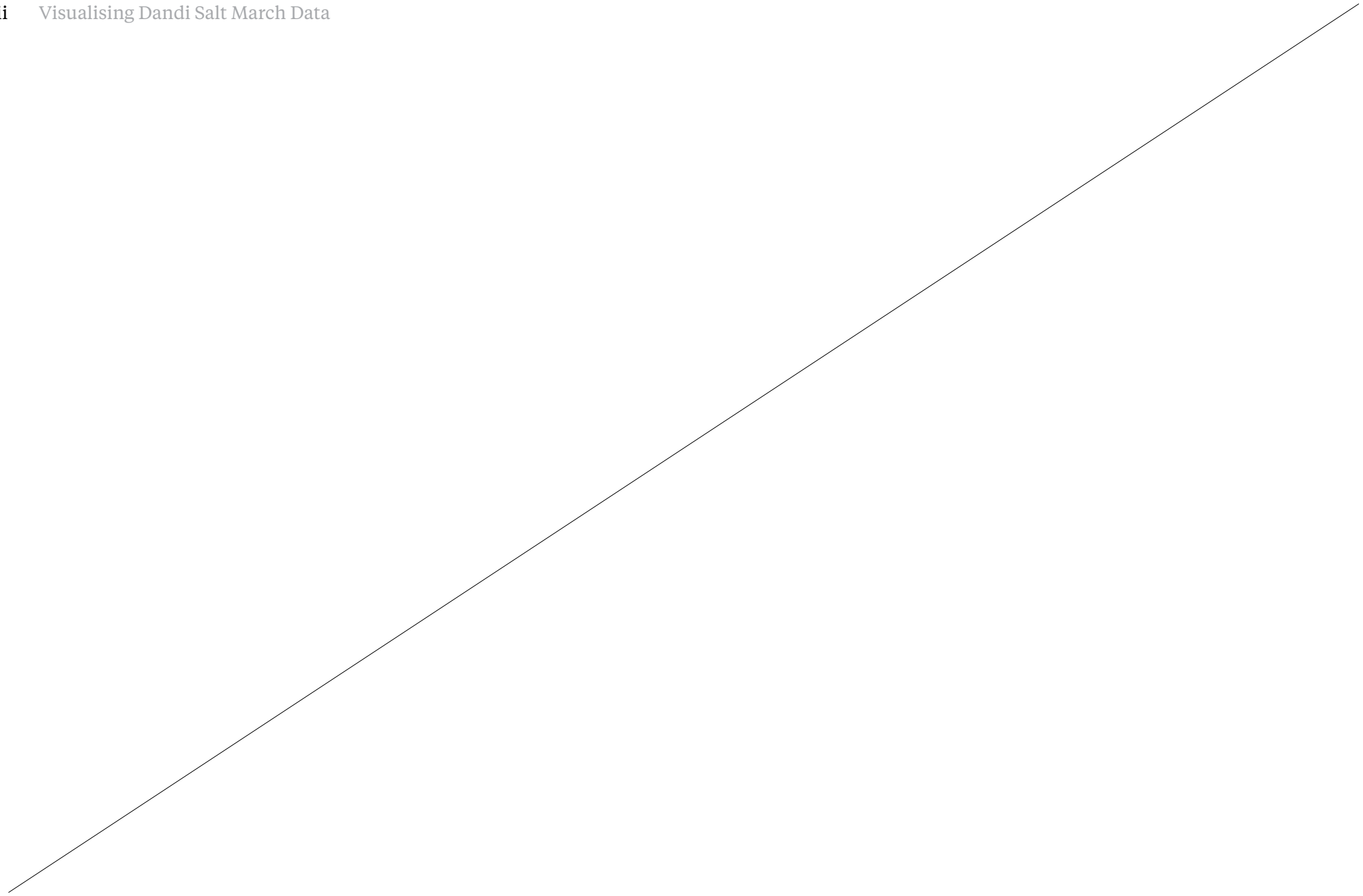
Industrial Design Centre
Indian Institute of Technology Bombay
2017



Approval Sheet

The Interaction Design Project II titled
"Shaking The Foundations of An Empire:
An Interactive Data Visualisation of the Dandi Salt March"
by Abhijith KR (Roll Number 156330003), is approved,
in partial fulfilment of the 'Master in Design' Degree in
Interaction Design at the Industrial Design Centre,
Indian Institute of Technology Bombay.

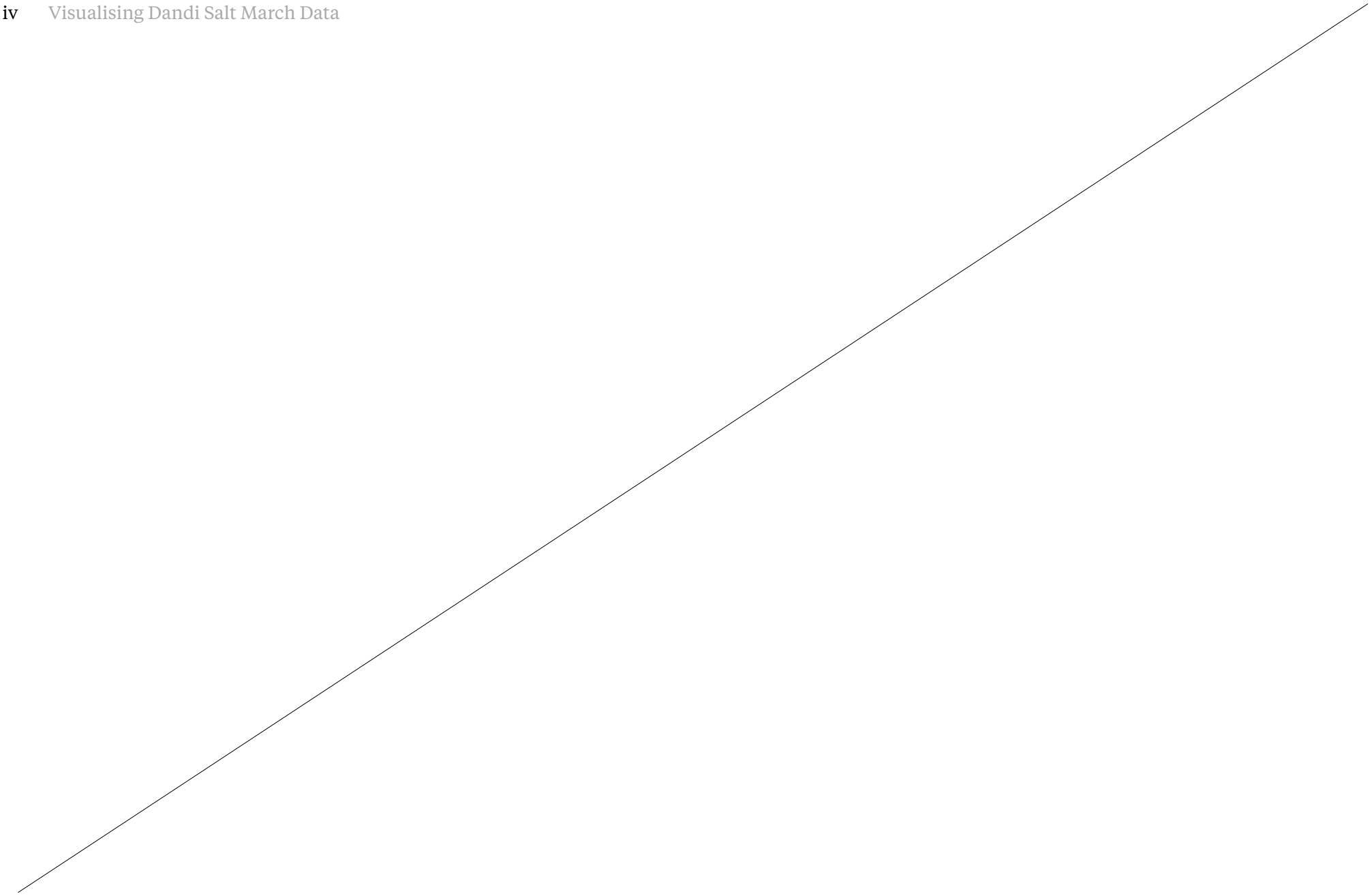
Guide R. Venkatesh 21/11/2016

Chairperson

Internal Examiner

External Examiner

Date



Declaration

I declare that this written document represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources.

I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission.

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Abhijith KR
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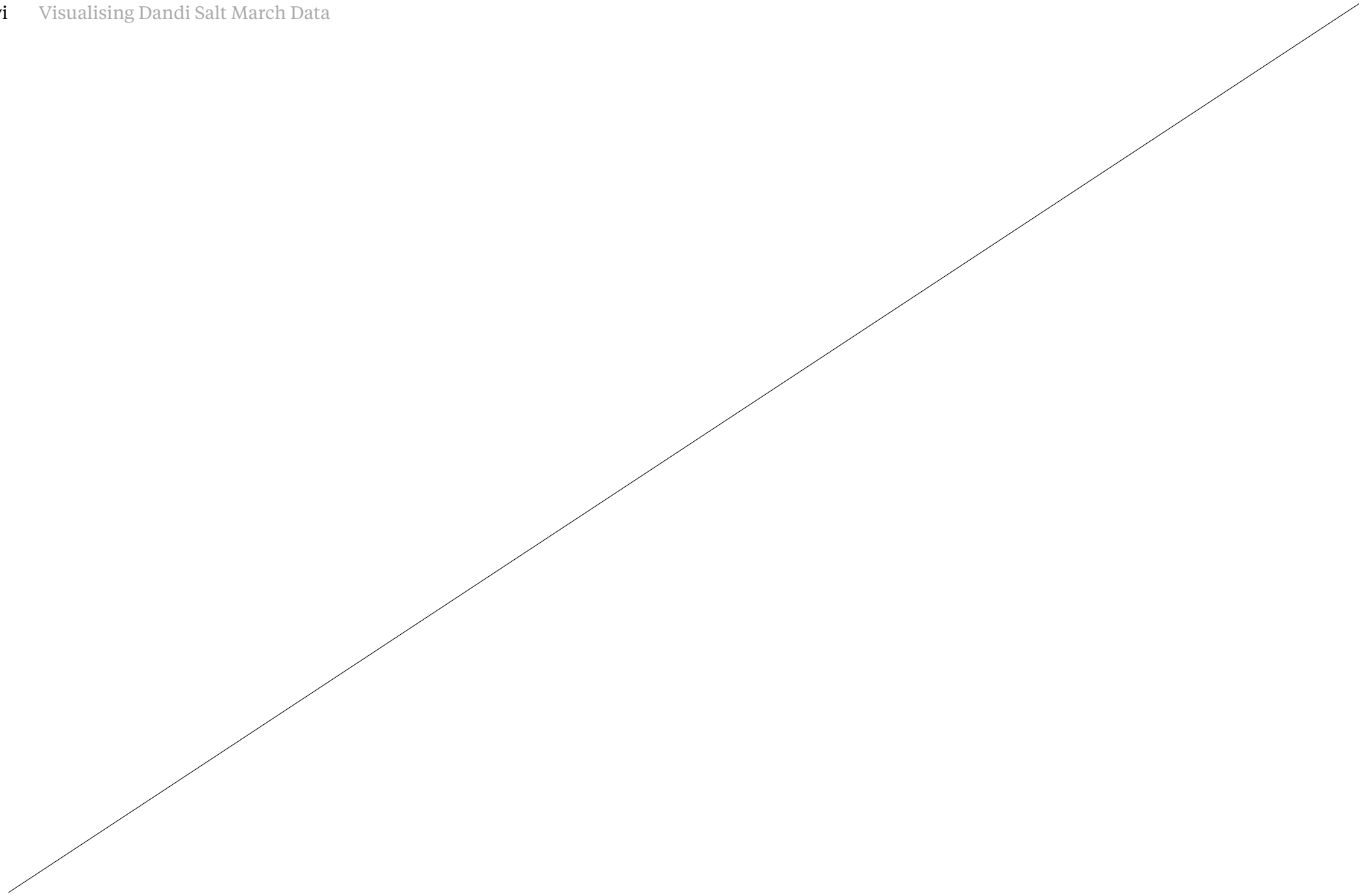
November 2016



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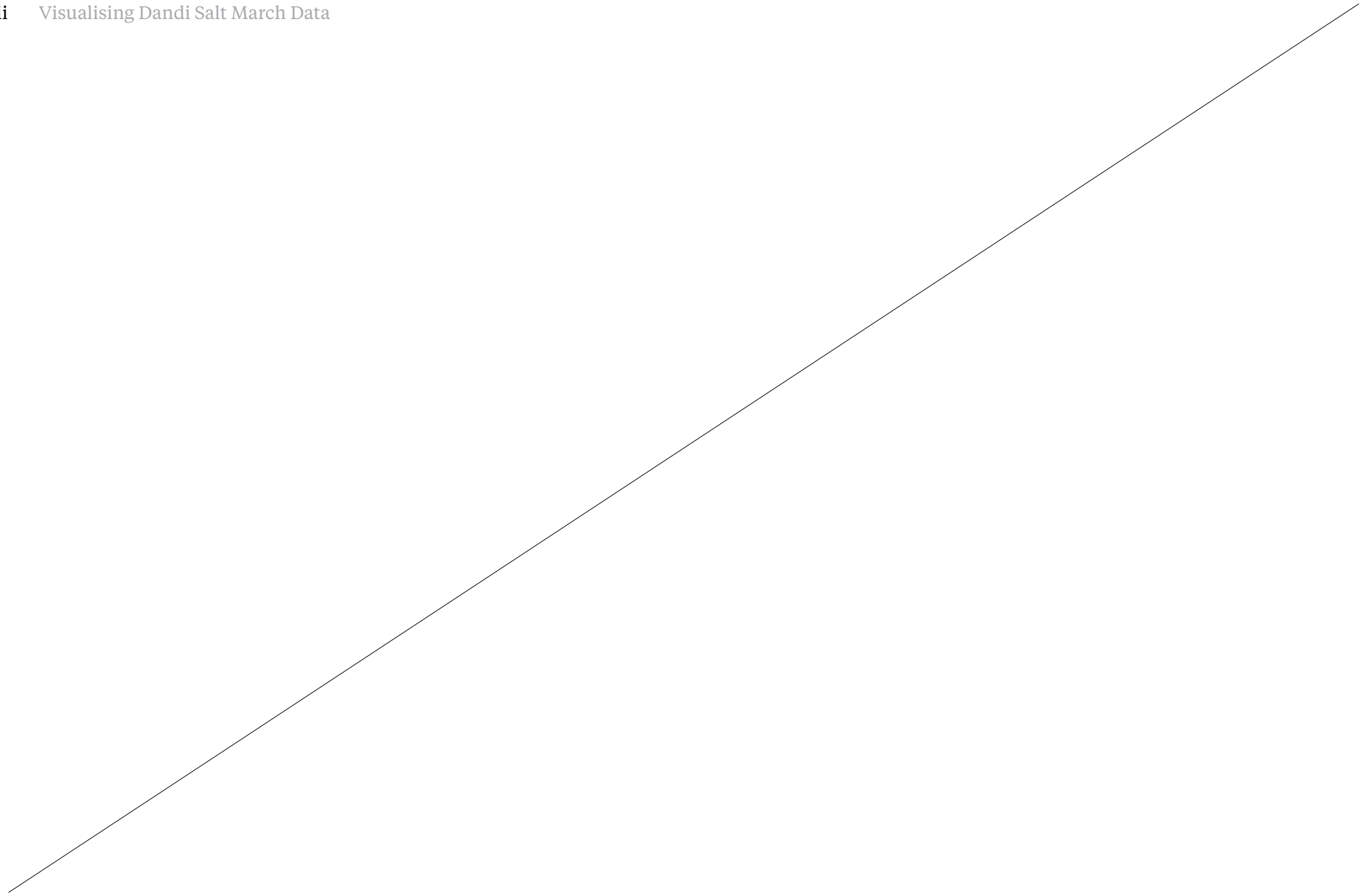
Thanks to batch-mates and other friends at IDC for their encouragement and inputs in the project that saw me through the few dull days.

Abhijith KR
November 2016



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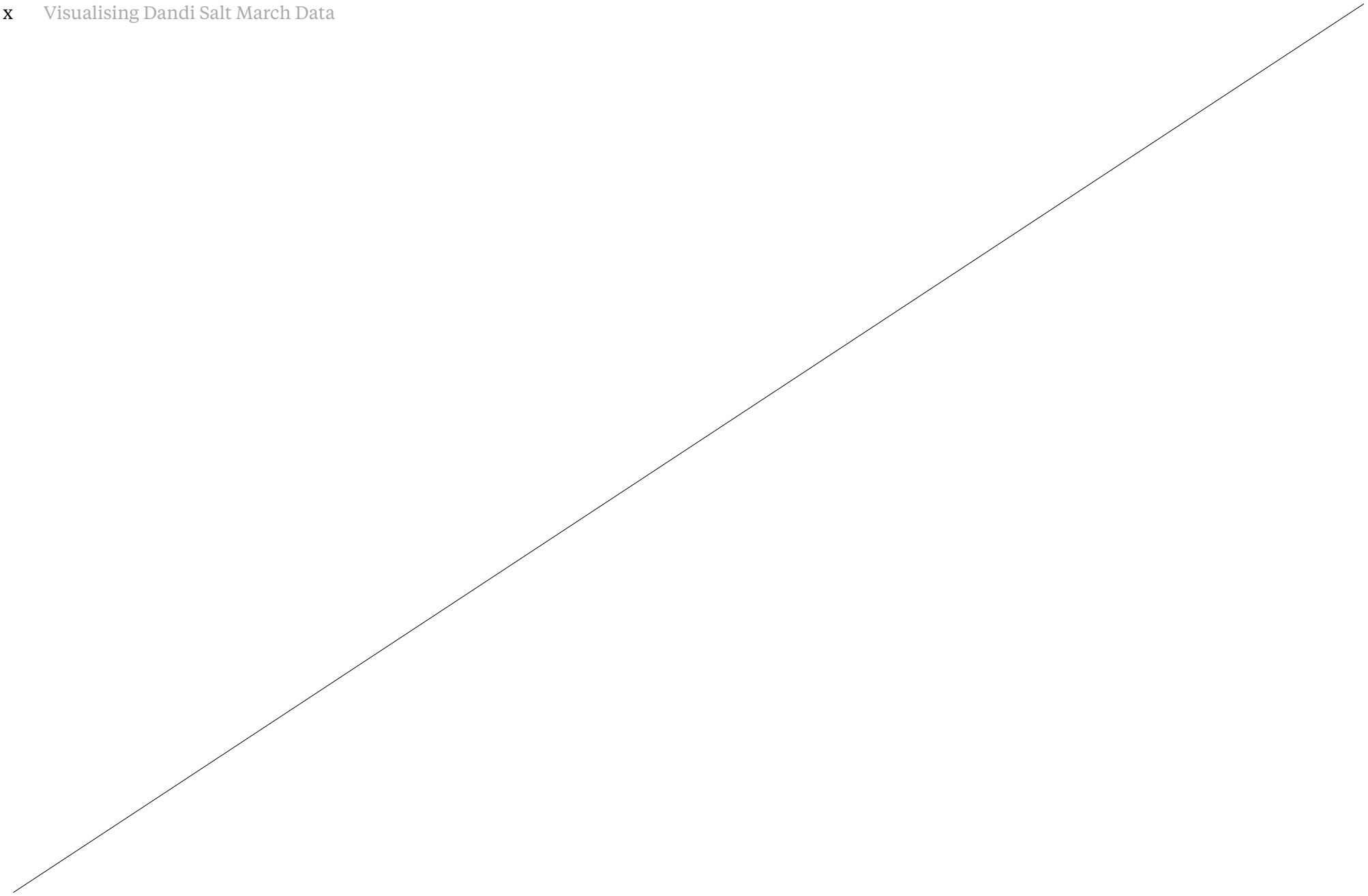


Abstract

In an act of civil disobedience against the British rule of India and their misappropriation of power, Mahatma Gandhi, and 81 fellow satyagrahis, marched from Sabarmati to Dandi in Gujarat, breaking the salt law that criminalised domestic manufacture of salt.

Background

The event is often presented as textual and other media-rich narratives (documentaries, films and books). The wealth of data available on the March has so far not been presented as a narrative. This project has an exploratory focus on such a data-centric narrative, aspiring to enable a fresh perspective on the March.

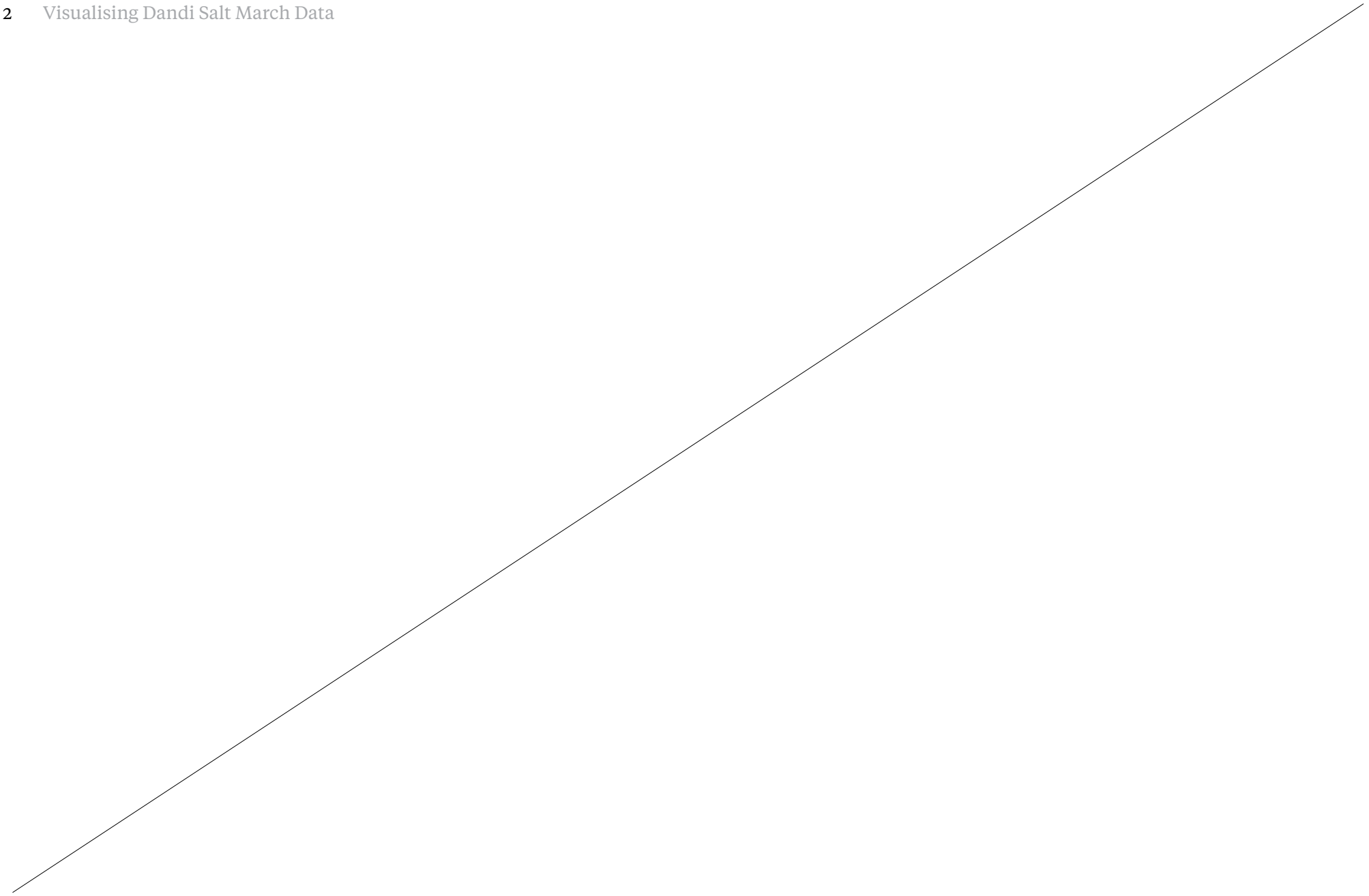
Motivation

Through an interactive data visualisation employing numerical and other data (historical time-line on Salt Taxes, distances covered, halts, crowds attending meetings, number of women, donations from various groups and analysing the content of Gandhi's speeches along the way), the project proposes a retelling of this historic event in a data-centric narrative, to communicate the feelings of nationalistic pride and highlight the significance and rich historical context of the March.

Goals Of The Project

The project, deployed as an interactive website, is shared online, people are invited to interact with the data. The evaluation takes into account observations, feedback and suggestions for improvement from the visitors gauging the impact and fine-tuning the experience.

Outcomes



Introduction

The Dandi Salt March

In an act of peaceful protest against the British rule over India (and in particular, their monopoly over salt production and unjust taxation of edible salt), Mahatma Gandhi led 81 satyagrahis from Sabarmati Ashram and across India, on the Dandi Salt March (12 March–6 April, 1930) from Sabarmati to Dandi in Gujarat, India. At Dandi, Gandhi broke the salt law by producing salt from sea water. The March is seen as a major milestone in India's independence struggle.

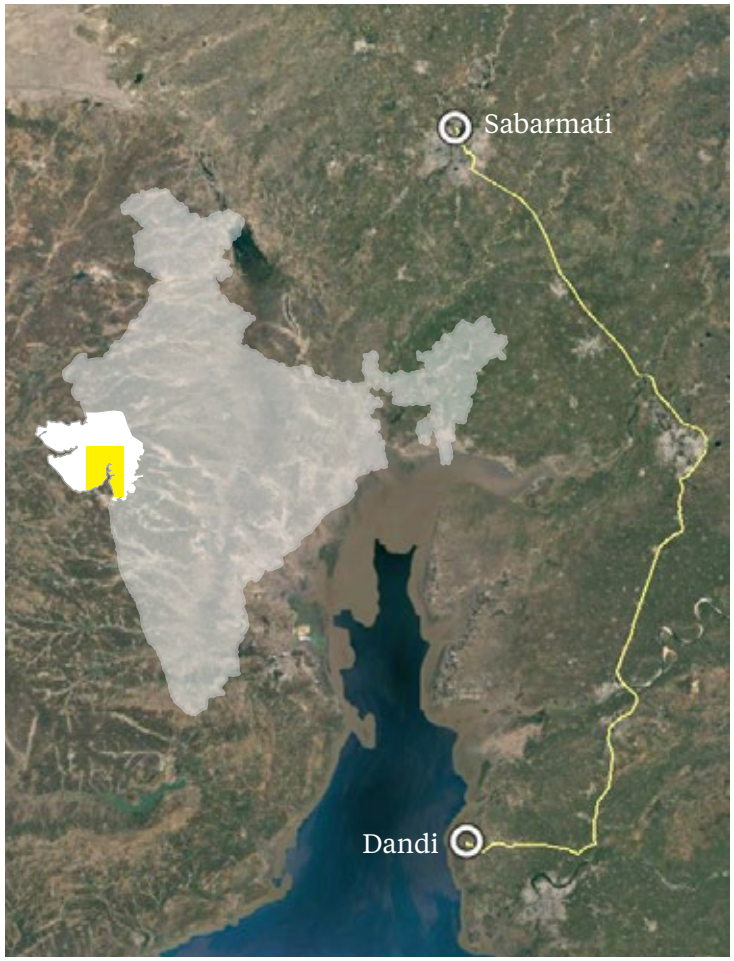
Apart from being an inspired idea that evokes nationalistic pride in us, it is also relevant as an embodiment of the life-philosophies of civil disobedience, self-reliance and equity in access to resources.

Retellings of the March So Far

The March is often discussed (in text books as well as other impassioned accounts of the event) as a formative moment in our freedom movement.

Most of these are textual, pictorial or other media-led accounts of the event, focusing on the emotional and nationalistic aspects of it.

From these retellings of the March it is possible to extract information (in the form of numbers and other kinds of data) which could enable a different perspective on the significance and impact of the event. There are not many attempts looking at the Dandi March from such a data-centric perspective.



Map showing the route of the Dandi March. Overlaid is a highlight of the region on the map of India. Map data: Google Earth, India map: Wikimedia Commons

"The Salt March was notable for at least three reasons. First, it was this event that first brought Mahatma Gandhi to world attention. The March was widely covered by the European and American press. Second, it was the first nationalist activity in which women participated in large numbers. The socialist activist Kamaladevi Chattopadhyay had persuaded Gandhiji not to restrict the protests to men alone. Kamaladevi was herself one of numerous women who courted arrest by breaking the salt or liquor laws. Third, and perhaps most significant, it was the Salt March which forced upon the British the realisation that their Raj would not last forever, and that they would have to devolve some power to the Indians."

Excerpt from Page 360 of the Class 12th NCERT Text Book, Theme 13, Themes in Indian History, Part 3: Mahatma Gandhi and the Nationalist Movement

The Project

Through interactive data visualisations (for the web), the project proposes to situate Dandi Salt March in a deservedly richer context and communicate the feelings of pride as well as the ideas it stood for, employing numbers and other available data.

What is in it?

A primarily data-centric story involving numbers (of marchers, breakdown along gender, communal, caste lines), locations, distances covered daily, supplies, weather-patterns, size of receiving crowds, duration of speeches, daily national and international press coverage, external related and non-related incidents and events influencing some or all of the above etc. The focus is on telling the story of this historic event while trying to reference present realities of ours as a nation, and in doing so, exploring ways of bringing appropriate (to the content as well as the audience) technology and design to its telling.

Scope for exploration

The data involved is complex in its relationships. There are raw numbers, personal relationships, space and time, politics of the time, and events occurring in parallel. This leaves ample opportunity to explore different representations, interactions with the information and use of media.

The project also brings together previously disparate information on the March to a single platform.

From an experience design perspective, the effort is to communicate feelings (of national pride, etc., as embodied by the March) through dispassionate numbers.

Research

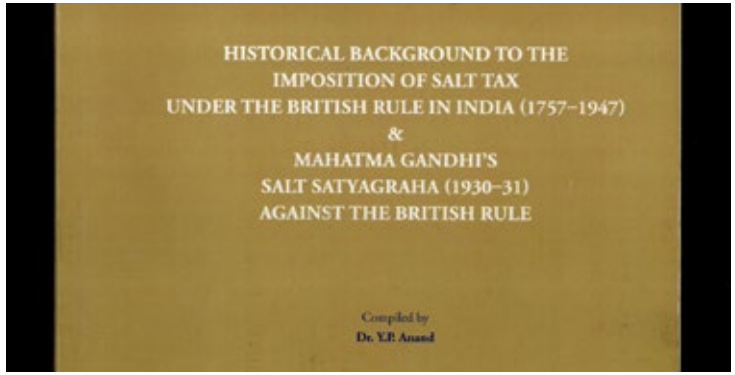
1. Looking for Datasets

While the event is discussed in detail by many books and online resources on the subject, usable datasets are harder to come by. The fact that records of environmental and climatic data in the days of the Raj was in handwritten documents and are lacking in provincial data in many cases make only approximations of many of these (temperatures, humidity, wind, etc.) impossible.

Historical Background on Salt Taxes and History of Protests Prior to 1930, from Dr. Y.P. Anand's Book [1]

Data: Historical time-line of events leading up to the March, tax figures, details of Marchers.

The Dandi Project at IIT Bombay has put together a variety of resources including Dr. Y.P. Anand's collection of historical documents and texts on the Salt Tax and the March, detailing the history of tax collection by the British. This provides a much needed context to why mahatma Gandhi picked salt to be the pivot around which the satyagraha was built and why the masses took to the movement the way they eventually did.



On the Salt March: The Historiography of Mahatma Gandhi's March to Dandi by Thomas Weber [2]

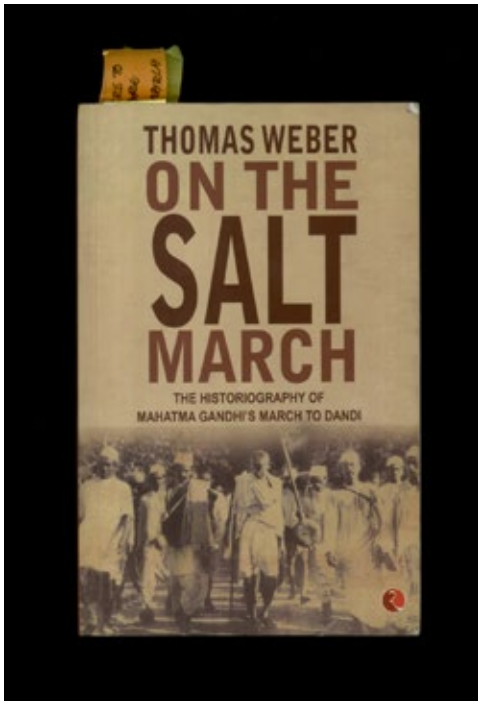
Data: Detailed day-by-day descriptions, crowd sizes, halts, analysis of the impact of the March.

Thomas Weber's tome is the definitive work on the March, discussing in detail each day's events put together from newspaper articles, interviews with surviving marchers and diaries of some of the marchers. The chapters dealing with each day of the March also provides number of people gathered at each stop, mentions the money collected at the end of each day and the distances travelled and the time taken to travel them.

He also provides information on the mood of the crowds and the Mahatma himself, detailing events that influenced his speeches or incited reactions from him.

The numbers are often exaggerated by nationalist sources while extremely under-reported by official press and CIDs sent to report on the progress. Weber mentions these in the footnotes where there is a huge mismatch and hints at a plausible figure based on these multiple accounts and the population of the venue in question.

Another piece of non-continuous information is the stories of people involved with the March at different stages; there is the one about a reformed murderer joining the group against some disagreement, and the one involving an ashramite indulging on ice-cream despite strict instructions to follow austerity and simple living. These pieces could be a second layer of information to discover after the first data-led layer is experienced.



On the Salt March: The Historiography of Mahatma Gandhi's March to Dandi, Thomas Weber (July 2009)

Collected Works of Mahatma Gandhi, Volumes 48 and 49 [3]

Data: Translated text of speeches and written communication during the March.

The text, available as PDFs at *gandhiashramsevagram.org* provides access to detailed translations and original English texts of Gandhi's speeches, letters and articles throughout the March. For brevity and to keep the focus on the day-to-day happenings of the event itself, the project focuses on the speeches only.

In the beginning, Gandhi himself wasn't able to predict the exact outcomes of the proposed action. There was always the chance of getting arrested before the law could be broken. During the prayer meeting at Sabarmati Ashram on the eve of the March, Gandhi tells the crowd:

"In all probability this will be my last speech to you. Even if the Government allow me to March tomorrow morning, this will be my last speech on the sacred banks of the Sabarmati. Possibly these may be the last words of my life here."

Reading in Parallel: Walden, Civil Disobedience by Henry David Thoreau [4]

Information: Conceptual grounding of civil disobedience

To familiarise with the idea of civil disobedience, and to find an essence of what it stands for, I turned to this text. In the last paragraph, it says:

"The authority of government, even such as I am willing to submit to- for I will cheerfully obey those who know and can do better than I, and in many things even those who neither know nor can do so well- is still an impure one: to be strictly just, it must have the sanction and consent of the governed. It can have no pure right over my person and property but what I concede to it."

This sense of restraint in rebellion is a running theme throughout the March itself.

GPS Data of the Original March Route from retracinggandhisaltmarch.com [5]

Data: GPS coordinates of the original route of the March

Prof. Greg Polk, Mr. Himanshu Dube and Ms. Linda Logan-Condon retraced the route in late 2015 and shared the original route's GPS coordinates. The site also does the day-by-day summary of their journey, along with pictures and description of landmarks and people along the way. This body of work is the only source of accurate route data one could find during the search for the original route over a detailed satellite map.

Research

2. Visualisation Techniques, Concepts

Paper: Ben Shneiderman,
The Eyes Have It: A Task by Data Type Taxonomy for Information Visualizations [6]

In this seminal paper on information retrieval, Shneiderman presents the Information Seeking Matra: overview first, zoom and filter, then details on demand.

Broken down to constituent components, the users' work-flow hints at goals of any information visualisation project, specifically dealing with the top three tiers (visual design, information design, information architecture and interaction design) of Garret's model of user experience elements.[7]

Explained in detail, quoted from the paper:

```
Overview: Gain an overview of the entire
collection.
Zoom: Zoom in on items of interest
Filter: filter out uninteresting items.
Details-on-demand: Select an item or group and
get details when needed
Relate: View relations hips among items.
History: Keep a history of actions to support
undo, replay, and progressive refinement.
Extract: Allow extraction of sub-collections and
of the query parameters.
```

Speaking of the attraction of visual displays, Shneiderman theorises that they utilise to great benefit our ability for perceiving visual information, by using variations in shape, colour, size and highlighting techniques for directing the attention of the user.

The discussion on filtering options is of a largely programmatic focus. The key learning from this section is how important it is for the user to be able to reset filters and be able to use them in a logic familiar to them. (The example of the 'and' operator narrowing selections in Boolean expressions. On the other hand, in natural language, it expands selections.)

Relevance to the Project

In deciding for user interaction scenarios, the project may consider the Information Seeking Mantra as the basic framework and evaluate the appropriateness of incorporating the stages listed.

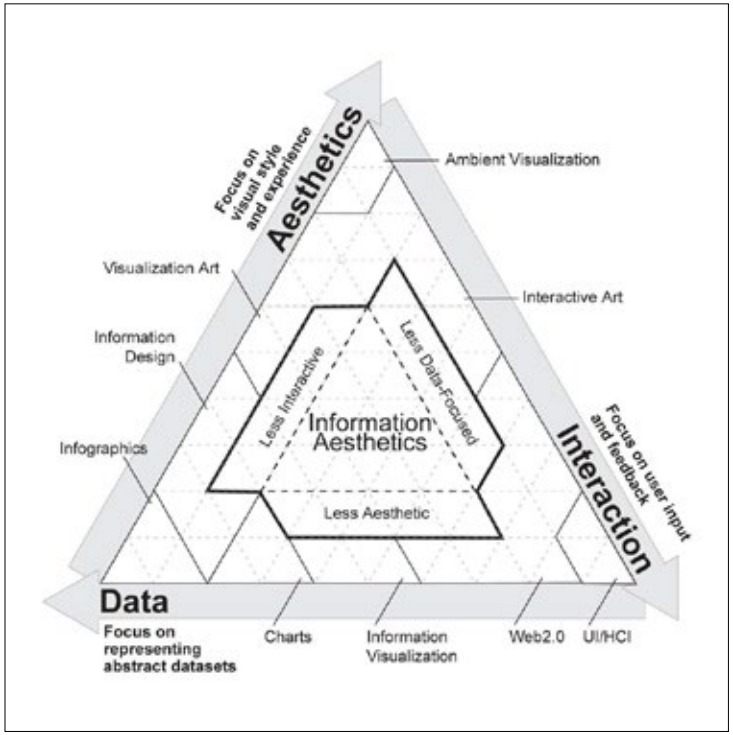
Paper: Andrea Lau and Andrew Vande Moere, Towards a Model of Information Aesthetics in Information Visualization [7]

The paper discusses a framework for positioning one's work in visualisation based on its desired effect. It helps in defining the mapping technique and

The data focus of a visualisation project. Based on whether the project is an interpretive one (that presents data in a stylised manner, where a pre-interpreted message is appropriate) or an inversible (where users are able to look at the visual and are able to tell what the underlying data points are) one, it plots the project on a triangle whose vertices are Data, Aesthetics and Interaction. The other factor to consider is whether the project aims at an intrinsic data focus (helping discover useful patterns by mapping data to visuals) or an extrinsic one (communicates the meaning underlying the dataset.

The paper describes extrinsic focus thus:

"These extrinsically-focused techniques are aimed towards visualization which are able to be appreciated and interpreted, and to invoke personal reflection… Such visualization techniques allow high-level goals to be fulfilled, such as understanding underlying meaning in the context of social and cultural issues."



The Domain Model of Information Aesthetics
Source: Towards a Model of Information Aesthetics in Information Visualization, Andrea Lau and Andrew Vande Moere (IEEE 2007)

Research

3. Case-studies

To understand and build upon conventions and effective strategies in presenting data with a specific narrative interest, the research focuses on interaction for information visualisations, types of data and their corresponding visualisation types.

This section discusses definitions, intents and techniques used in (interactive, where applicable) data visualisation through papers, books and case-studies.

TYPES OF INFORMATION THE PROJECT FOCUSES ON [8]

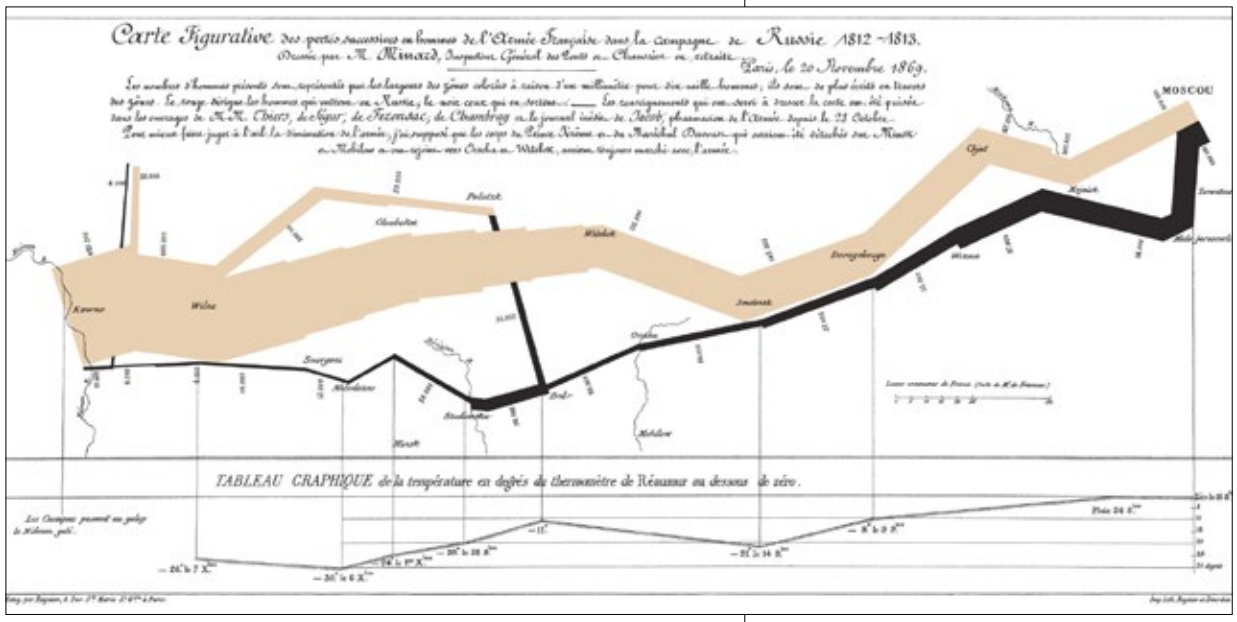
SPATIO-TEMPORAL INFORMATION

Defined as information that belong to both space and time, this is often about movement of objects (and people) over a territory over time. The depiction of this time dimension over a territory can be achieved through multiple maps, interactive tools and animations.

Case Study: Charles Joseph Minard's Maps [9]

Charles Joseph Minard's 1869 map on Napoleon's March to and from Russia (above) complements the spatio-temporal information of the soldiers moving to and from Russia with statistical information (temperatures the army contended with, represented as a line graph that matches with locations along the bottom line standing in for their way back from Russia) along the bottom.

While it is a map, most geographical information is eschewed for better communication, except for major features (that also play a role in the thinning of the ranks). Minard's other maps, for example, the one that deals with export quantities of cotton distorts geographical information to shift focus to the data being talked about, and makes for an image that is easier to comprehend.

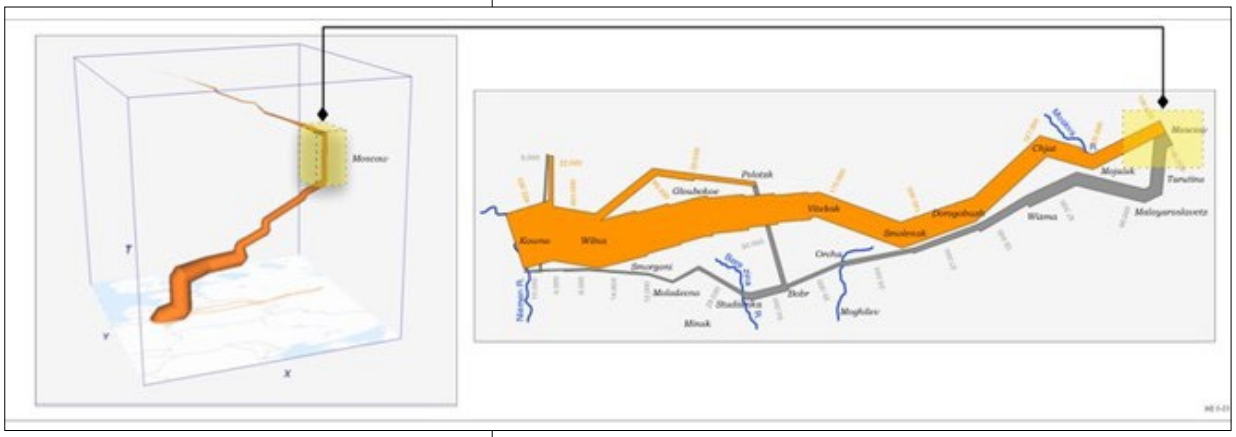


Minard's "Napoleon March to and from Russia, 1812-1813"
Source: commons.wikimedia.org/wiki/File:Minard.png

[8]: Referenced from:
Design for Information
Isabel Meirelles

Case Study: Menno-Jan Kraak's 2002 Recreation of An Interactive Version of the Minard's Map [10]

In Kraak's words, the effort "`tries to answer the question of how to design maps that tell about change.`" He looks at alternative ways of drawing the path (see image) adapting the map to a time-line, stretching or compressing periods of movement and stay, then moves on to three dimensional visualisations (a space-time cube) with time represented in the z axis. Here, movement and stay are immediately visible from suitable angles. The other visualisations deal with battles and victories, experimenting with ordering data and digging deeper into particular aspects of Napoleon's campaign.



Menno-Jan Kraak's 2012 recreation of Minard's map on a space-time cube. Notice how the halt at Moscow is visible. Source: Menno-Jan Kraak (2012) Projects: 1812 URL: www.itc.nl/personal/kraak/research/projects-1812.html

Relevance to the Project

Interactivity makes it possible to navigate and explore information in more ways, enabling the user with access to layers of it as and when a detailed look is needed.

Menno-Jan Kraak's 2012 recreation enumerating battles won and lost, time-line of the map and number of troops. Source: Menno-Jan Kraak (2012) Projects: 1812 URL: www.itc.nl/personal/kraak/research/projects-1812.html

TEXTUAL INFORMATION

Most textual information one comes across (objects, names and concepts) is nominal data. To visualise nominal data, it needs to be sequenced. Ordering or sequencing isn't inherent to nominal data, and we need to apply external conditions of how many, where, when, etc., to be able to visualise it.

Kinds of Visualisations of Textual Data

One of the ways of making sense of textual information is by visualising document concordances (occurrences of words within texts) and word frequencies for understanding language structures and patterns. (Quoted from Search User Interfaces [2009] by Marti Hearst. Available online at *http://searchuserinterfaces.com/book/sui_ch11_text_analysis_visualization.html)*[11]

Relevance to the Project

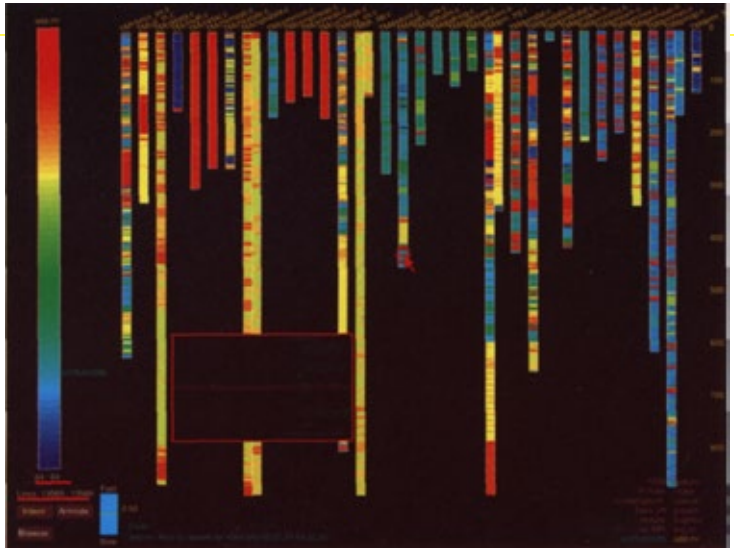
Mahatma Gandhi used gatherings at each stop on the way to Dandi to deliver speeches, and used these speeches to discuss topics close to his heart, including but not limited to salt taxes and independence.

A concordance focused data visualisation is a good way of seeing shifts in the major themes of his speeches over time, and read with other demographic information, or information included as trivia along with the word-occurrence data, can highlight how the March worked well as a vehicle for transforming the places and people it went through.

Paper: Graphically Displaying Text, Stephen G. Eick (1994) [12]

The paper discusses a representation of text as a block with each line representing a row. With the colour of each row referencing some statistics associated with it.

It talks about SeeSoft ™, a software tool used to generate such views.



A SeeSoft display showing code in colours that are tied to the age of each line.
Source: Stephen G. Eick (1994) Graphically Displaying Text, Journal of Computational and Graphical Statistics

Stephen G. Eick (1994) Graphically Displaying Text, Journal of Computational and Graphical Statistics, 3:2, 127-142
Source: www.tandfonline.com/doi/pdf/10.1080/10618600.1994.10474635

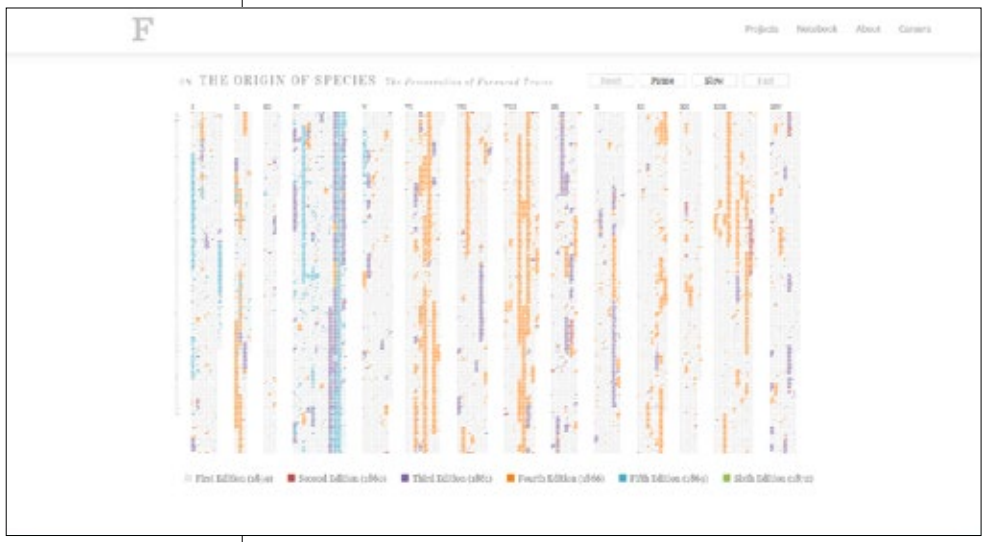
The Other Two Kinds of Visualisation of Textual Data
1: Visualising connections aimed at discovering new information
2: Visualisation of word relationships for literary and citation analysis

Source: Search User Interfaces [2009] by Marti Hearst. Available online at searchuserinterfaces.com/book/sui_ch11_text_analysis_visualization.html

Case Study: Traces by Ben Fry (2009) [13]

Presents an interactive overview of changes across time in Darwin's Origin of Species.

In Fry's words, "The idea that we can actually see change over time in a person's thinking is fascinating. Darwin scholars are of course familiar with this story, but here we can view it directly, both on a macro-level as it animates, or word-by-word as we examine pieces of the text more closely."



Screen-shot of Traces by Ben Fry, showing changes in editions of the text, arranged in chapters. The changes are highlighted in colours as they are animated. Source: fathom.info/traces

Relevance to the Project

Both *Traces* and *SeeSoft* allow for exploration of the original text along with the overview and connections. This provides some context to situate the basic visual information in, supplementing it. But at the same time, in the overview mode, both these visualisations depend on reducing the complexity of textual information by graphic means (employing shapes and colours to represent text) allowing easy detection of patterns and themes.

The chapter on text visualisations in *Design for Information* discusses challenges in representing text as typography, mainly that of wrongly assigning importance to longer words. It also discusses the importance of intelligent categorisation in manipulating textual data.

Goal Setting

What to Achieve What to Say

The stated goals of the projects evolved through the research process and finding datasets. From an interactive-object point of view, the goals are:

Control over level of detail

This references the concept of filtering from the Information Seeking Mantra discussion earlier. The person interacting with the visualisation should be able to filter out and focus on specific information sets. For example, she should be able to look at data of each speech in isolation at some level of the interaction, or at a higher level, look only at the speeches and not have to see the whole journey unfold.

Providing richer context

By putting previously disparate datasets together, the project makes possible an overview of the event that wasn't easily possible before. The speech data, for example, is never presented with the route data before, and the two are often looked at in their own silos.

Feelings via numbers

The project aspires to address this aspect of achieving qualities of a media-rich narrative just through numbers and related data. Parameters one could use remain (more or less) the same; shapes, lengths, colours, thickness, orientation, opacity, interactive elements and animation.

From a narrative point of view, the goal is to communicate:

Significance of the event

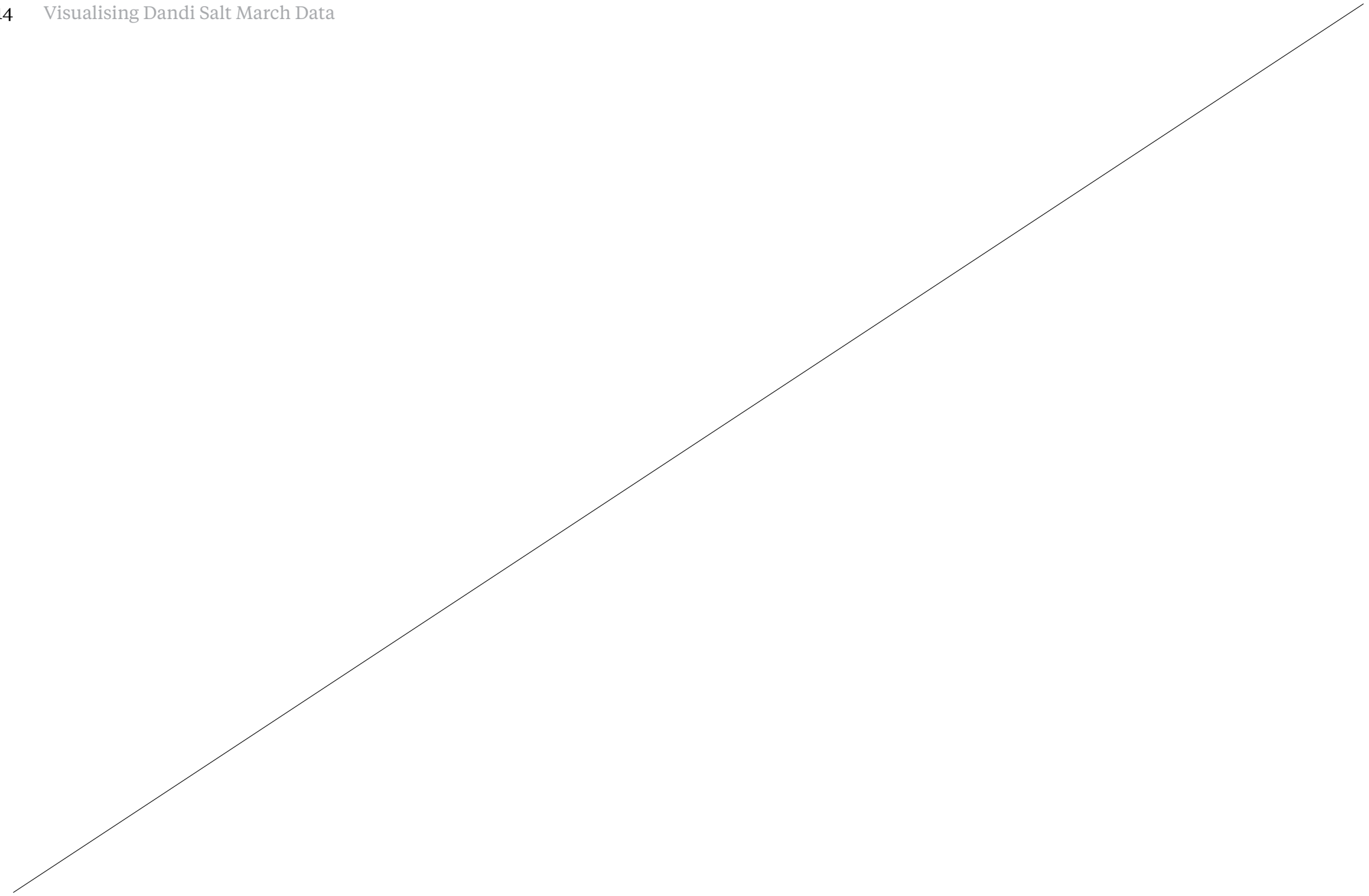
While the March per-se wasn't a success since it failed to realise a lot of the goals it set out with, it is significant in having risen the political consciousness of the nation. Khadi sales went up, foreign imports went down, and women came to take part the nationalist struggle. The British failed to foresee how much populist traction an issue like salt tax could generate and ended up with voices and actions against their malpractices that could no longer be brushed aside. While the success can't be measured by exacting criteria, it paved the way for similar actions all over the country, and worked as a test-bed for similar campaigns. Gandhi remarked that the March was "not designed to establish independence, but to arm the people with the power to do so."

The variety and involvement of social groups

The March did not see participation of communities like Muslims in numbers Gandhi expected, and the influence was limited to the middle classes to a large extent, the data on contributions show a good diversity of people having worked with the movement. In a sense, this was the proto mass movement, shifting the stage of action from the administrative centres "out into the countryside, where the real masses who needed education were."

The context, or answering the question, "why pick salt as the focus of the March?."

Most of these ideas borrow from the chapter *The Achievements and The Messages of the Salt March* from the Thomas Weber book, *On the Salt March*.

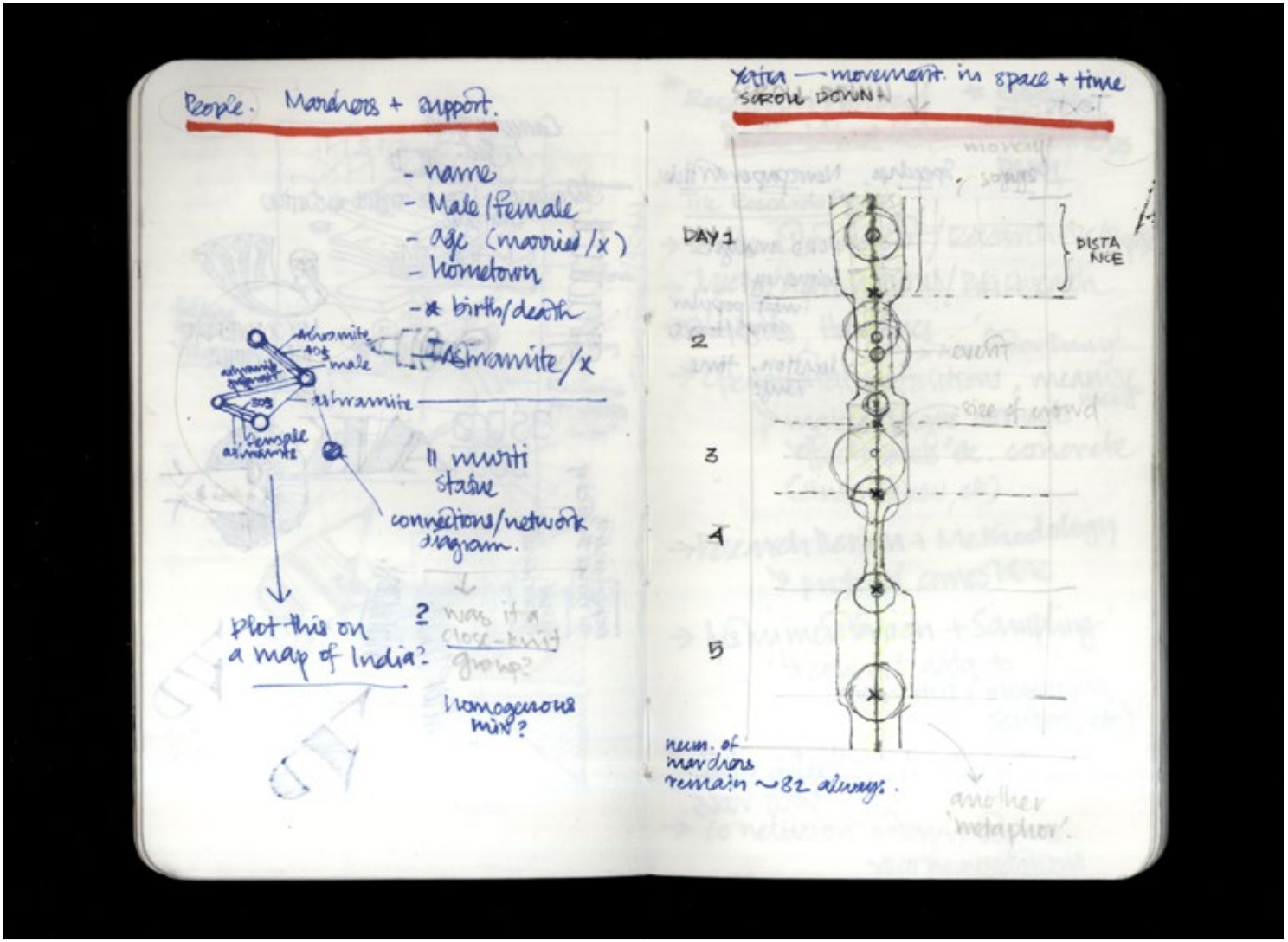


Design Approach

APPROACH

Desktop (Big-Display) Centric

A screen with enough real estate and a pointing device seemed to offer multiple potential ways of interaction as well as enough canvas space to accommodate complex visualisations. (According to StatCounter [14] Global Status, 93% of Indian internet [websites with their tracker] users come from desktop browsers, against 91% globally.) The project will aim to bring a comprehensive experience to desktop web browsers, which could later be displayed in museums, etc., as well. To make sure large tablet users are also able to browse the website fruitfully, interaction design norms from a tablet environment will be followed, allowing a lossless translation from the primary (desktop) environment.



Sketch of the time-line representation where the line thickness is governed by the crowd sizes and the route progresses vertically.

Initial Design Ideas

Focus on the Route Map

VERSION 1

A Linear Mapping

The visualisation takes cues from Minard's representation of troop numbers along the route (see literature review, case study). It also places the route as the central element in all of the visualisations (in the sense that all of it happens around the map).The thickness is governed by the crowd that is present at any point in time, while the nodes (represented by circles) reference halts along the way. The length between the nodes correspond to the distance travelled between them. Dotted lines over major nodes separate the whole route into days of journey. The attempt is to provide a normalised (directions are ignored) preview of the entire March to a user.

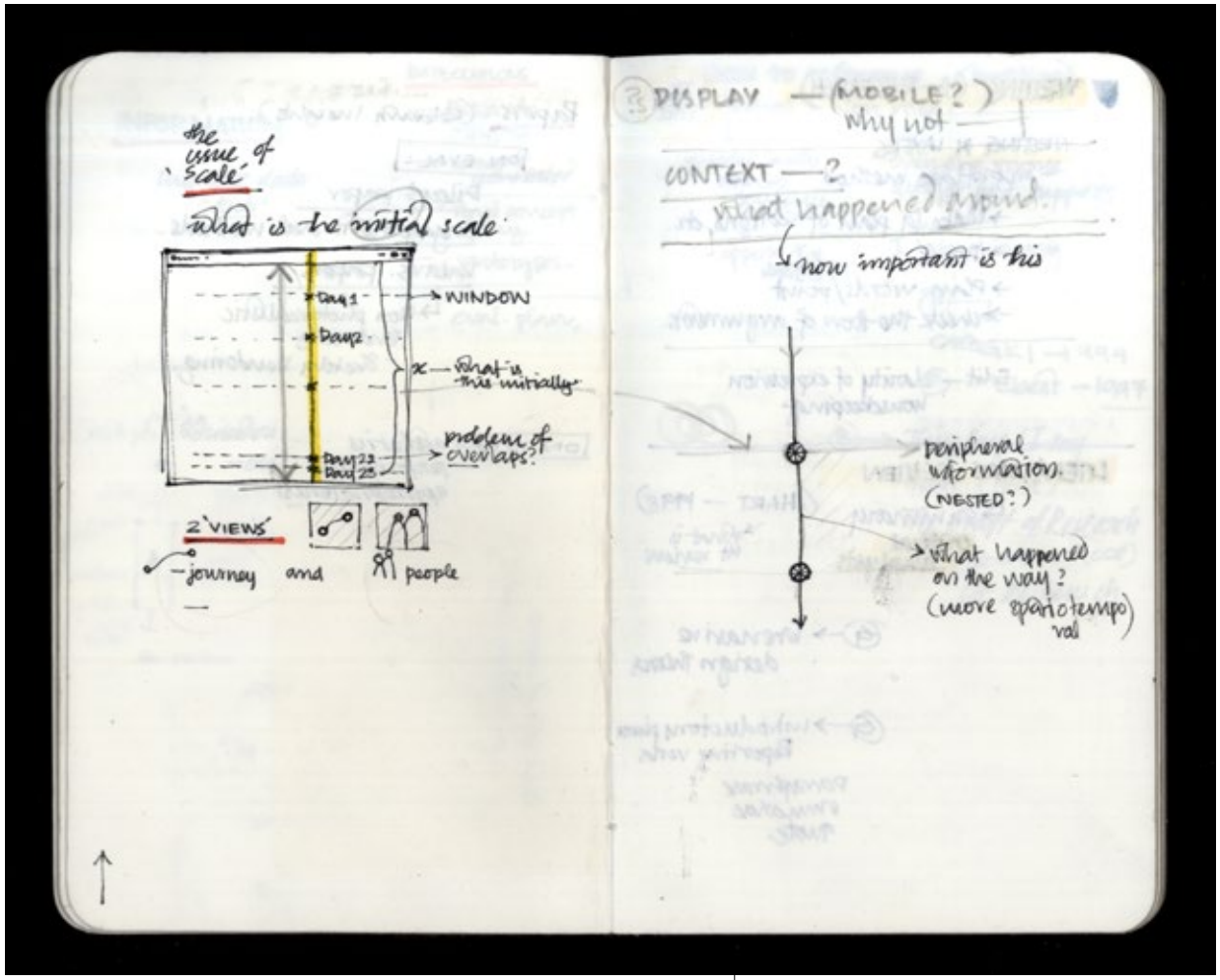
There are a number of interactions possible with this visualisation.

Details of Day-data

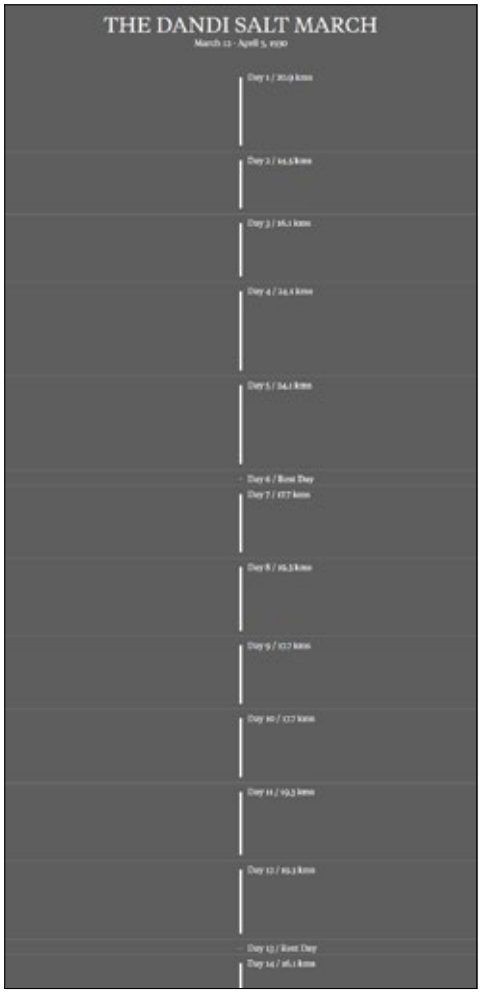
By clicking on the line segment joining two nodes, one is able to see the events that happened on the way. The nodes themselves, on clicking (or hovering over them)

Details of Places Where the Marchers Halted

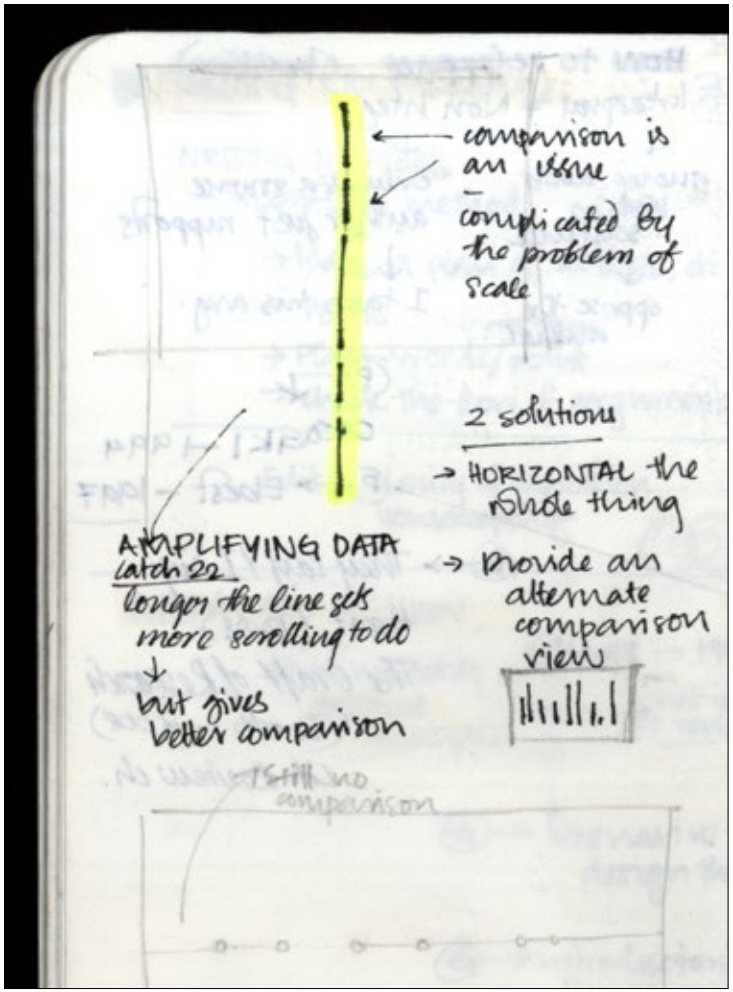
Clicking on the nodes present detailed information and playable media related to the place as a pop-up.



Sketching interactions with the time-line, and plotting areas where information goes.



Quick D3 prototype



Evaluating the vertical (straight) time-line. Listing potential solutions

Prototype

A static prototype was built with Data Driven Documents (D3) to test the feasibility of this idea. Day names were appended to each node, followed by kilometres travelled so far.

Limitations

The prototype (and discussions with faculty) highlighted basic issues with the visualisation direction. The first (and the severest) one was of scale. At any given moment, only a couple of nodes were visible on the screen, and all the peripheral, as well as layered information was hidden under a layer of interactions. This made for a unusable, emotionless overview. The problem couldn't be solved by normalising and shortening the distance values (line between nodes) since that takes away the comparability of distances from the visualisation. Overlaps also become a problem, with latter place names hiding the former ones. It also strips the route of any context a person may be able to arrive at, by eschewing map data (river crossings, cities, towns and village).

VERSION 2

The Zig-zagging Comparison Grid

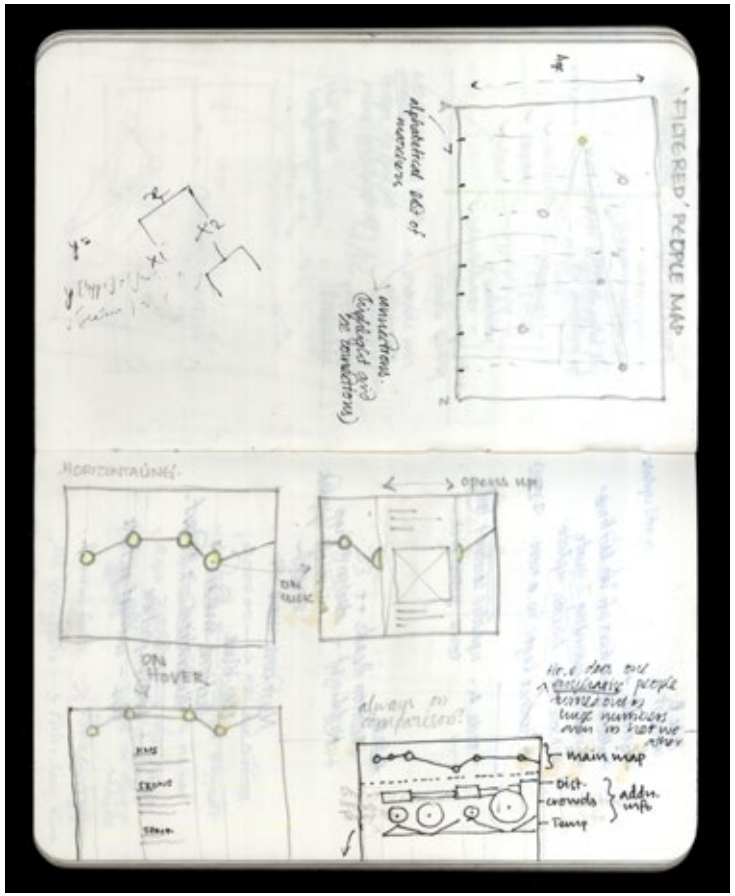
This version presents all the data on the x-axis divided into twenty five equal parts referencing the days of the March. The route itself forms a zigzag line on the top, where the distance travelled plots the nodes (standing in for halts) on the y axis. The route is now arranged horizontally and fits the screen initially. This enables an overview of the whole route and solves the problem of having to scroll too much in the first version.

All the other data (speeches, crowds, etc.) are placed on the corresponding day-lines, making it easy to compare these parameters to the route and places. (This is not much different from the Budget Speech Visualisation (Speaking Numbers) from Semester 1 at IDC. And a lot of Sugiura Kohei's information visualisations.)

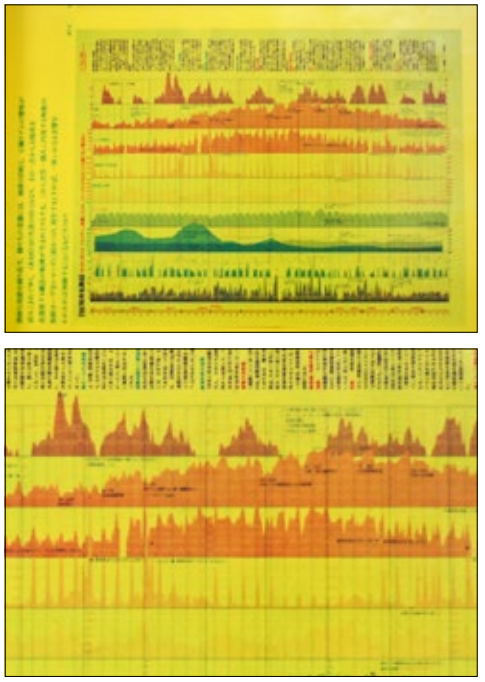
Interactions

Clicking the nodes expand them into two semi circles and displays information about the day in a rectangle in between the two. The x axis gets scaled to either sides to accommodate this expansion. The node closes when clicked outside, on the node itself or on a different node. This lets the user explore data at will, effectively zooming in and out of the details.

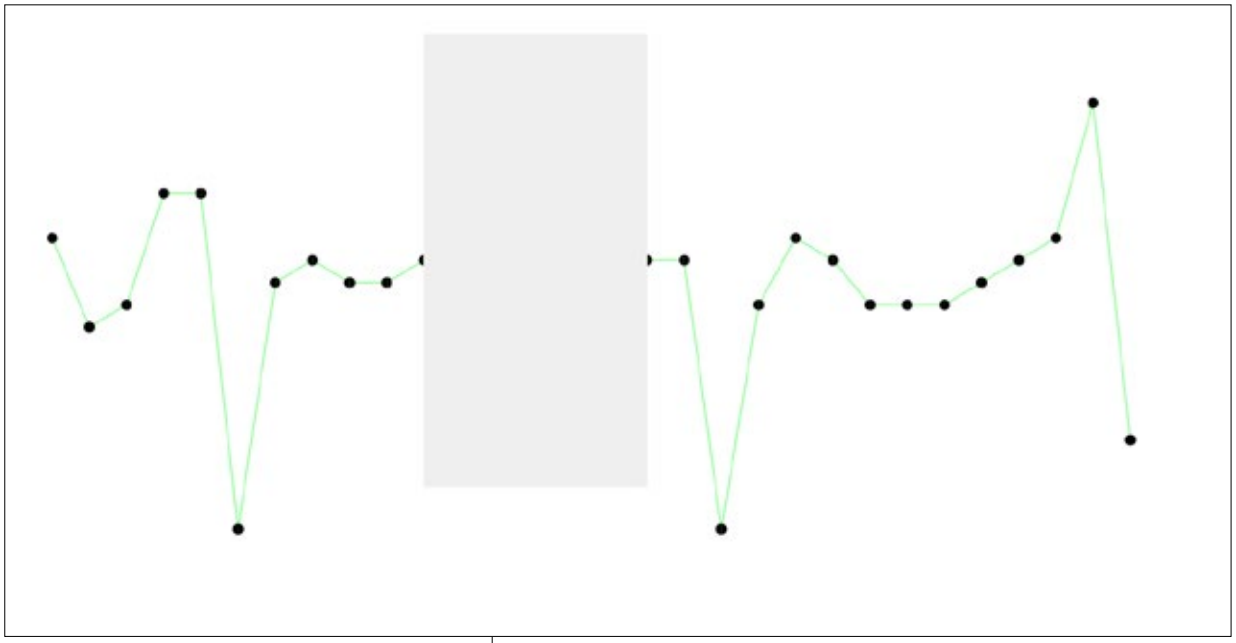
Clicking on the lines list events on the way as a scrollable list. (As opposed to the static pop-up in version 1.)

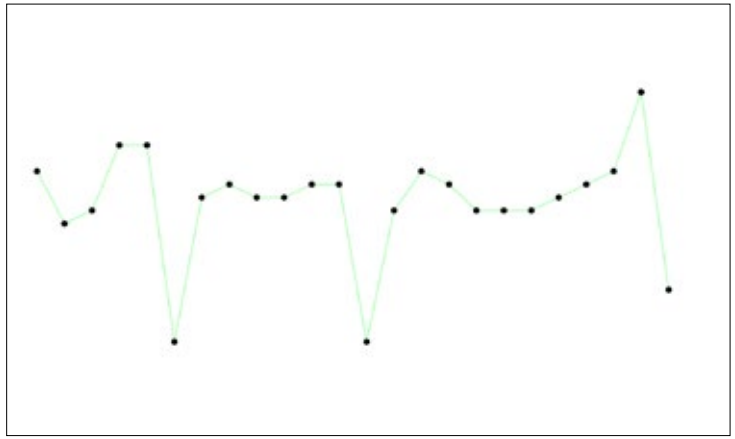


Initial sketches of the zigzag time-line treatment



Sugiura Kohei's work. Published in No. 1: A Bimonthly Review of Design, 1977 November [15]





D3 prototype with animated expansion on click
Top: After expansion
Right: Default state

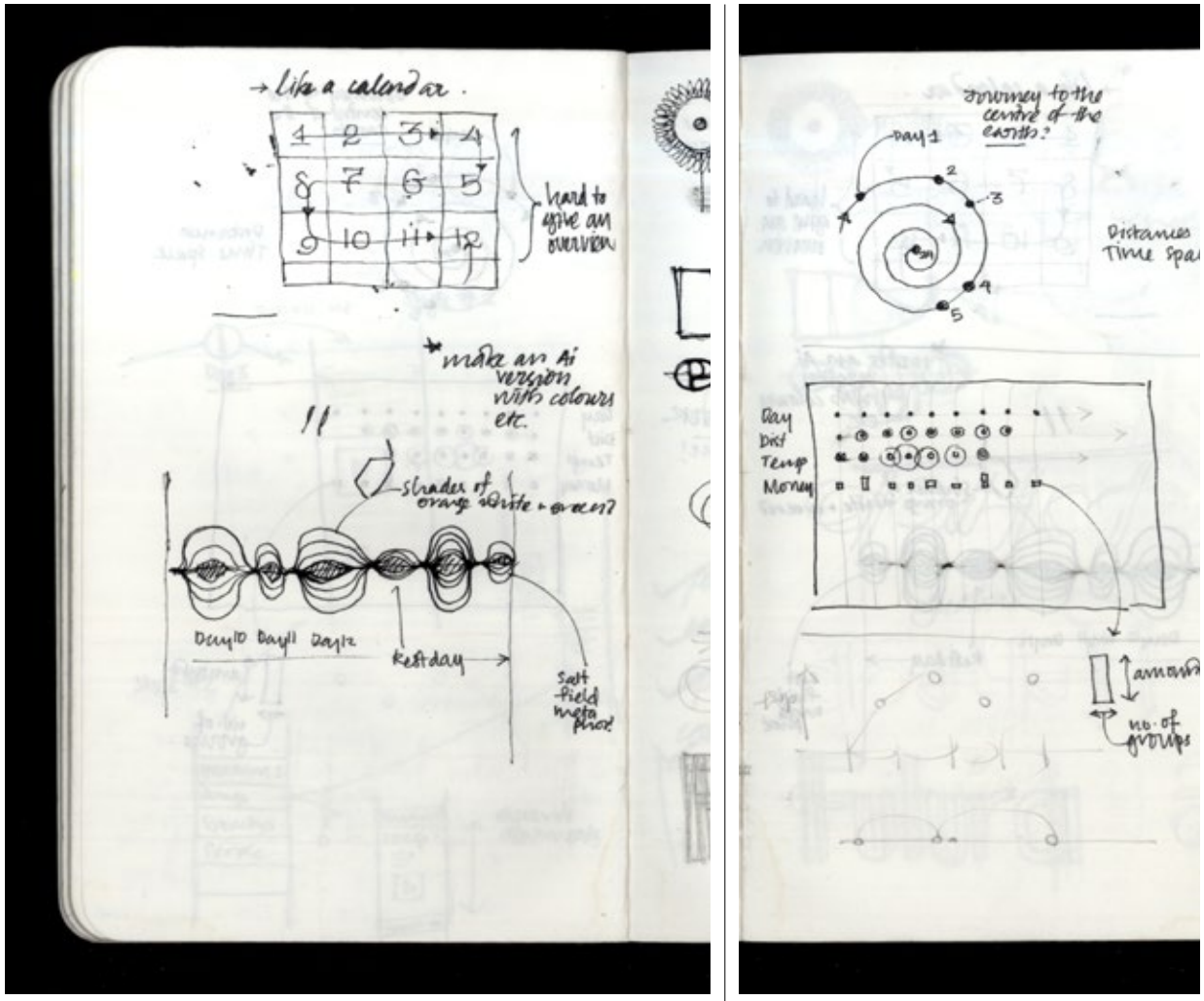
Limitations

While this solves the overview problem and builds up on the previous version's interactions, the emotional aspect of the March and a map based context is still missing. It also fails to capture the immensity of this undertaking in such a condensed visual form.

Explorations

A grid view was explored that references a calendar where each day is literally represented by the day on a calendar. On clicking, information pops up to fill adjacent grids. This version completely failed to capture the feel of the March either as a journey or as a significant event in the history of freedom struggle.

Alternative ways of representing the route as a spiral and as onion-peel shapes 9representing events in each day) over a time-line were explored and found inadequate in representing the data truthfully, with the least clutter and ease of recognition and navigation.



Alternate ways of looking at the time-line

Goal Setting

Considering the goals in terms of communication and interaction, and the available data, led to a basic information architecture for the project. It is important that the overall structure does justice to the 'story' of the event as well. This structure is then outlined in points, to consider while building the prototype.

Which Datasets to Use?

History of Salt Tax

A time-line that sets the context for *why* the March focused on salt, of all issues

Route Map

An overview of the March in space (and time)

Crowd Sizes

Looks at how popularity grew organically as the March progressed

Money Collected

Throws some light on the diversity of people who participated in the movement

Speeches

Looks at the March as a tool for spreading messages of civil disobedience, harmony, simple living, etc.

Extension of the March to Dharasana Salt Works

As a time-line of events and as a logical end result of the Salt March (Current historians see the March only as a prelude to the action at Dharasana, south of Dandi.)

Information Architecture and List of Interactions

The narrative is imagined as a story (article format) where there is a set flow in which the user encounters information as she scrolls through the page.

Project Title and Brief Introduction

History of salt tax

- Major events
- Prices, some in comparison to wages and income of a typical family

Route Map

- Overlaid on a static Google Map
- Night halts
- Mid-day halts
- Distances covered
- Actual path (line thickens on scroll)
- Crowds at major centres
- Trivia information on clicking each location
- On scroll, kilometres since start of the March
- On scroll, overview on where in Gujarat (location)
- On scroll, crowd sizes

Crowd sizes

- Total sizes
- Population of villages
- Women participants
- Time of day

Money collected

- Total amounts as a bar chart (horizontal)
- On click, each bar expands to show detail of who contributed how much

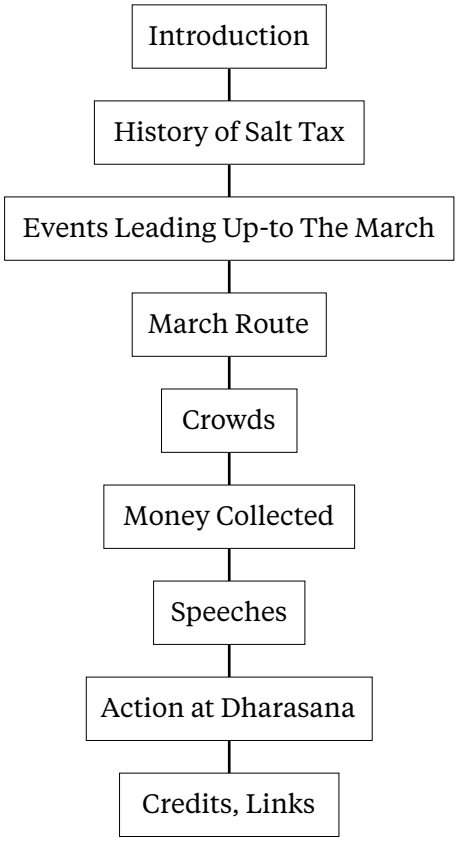
Speeches

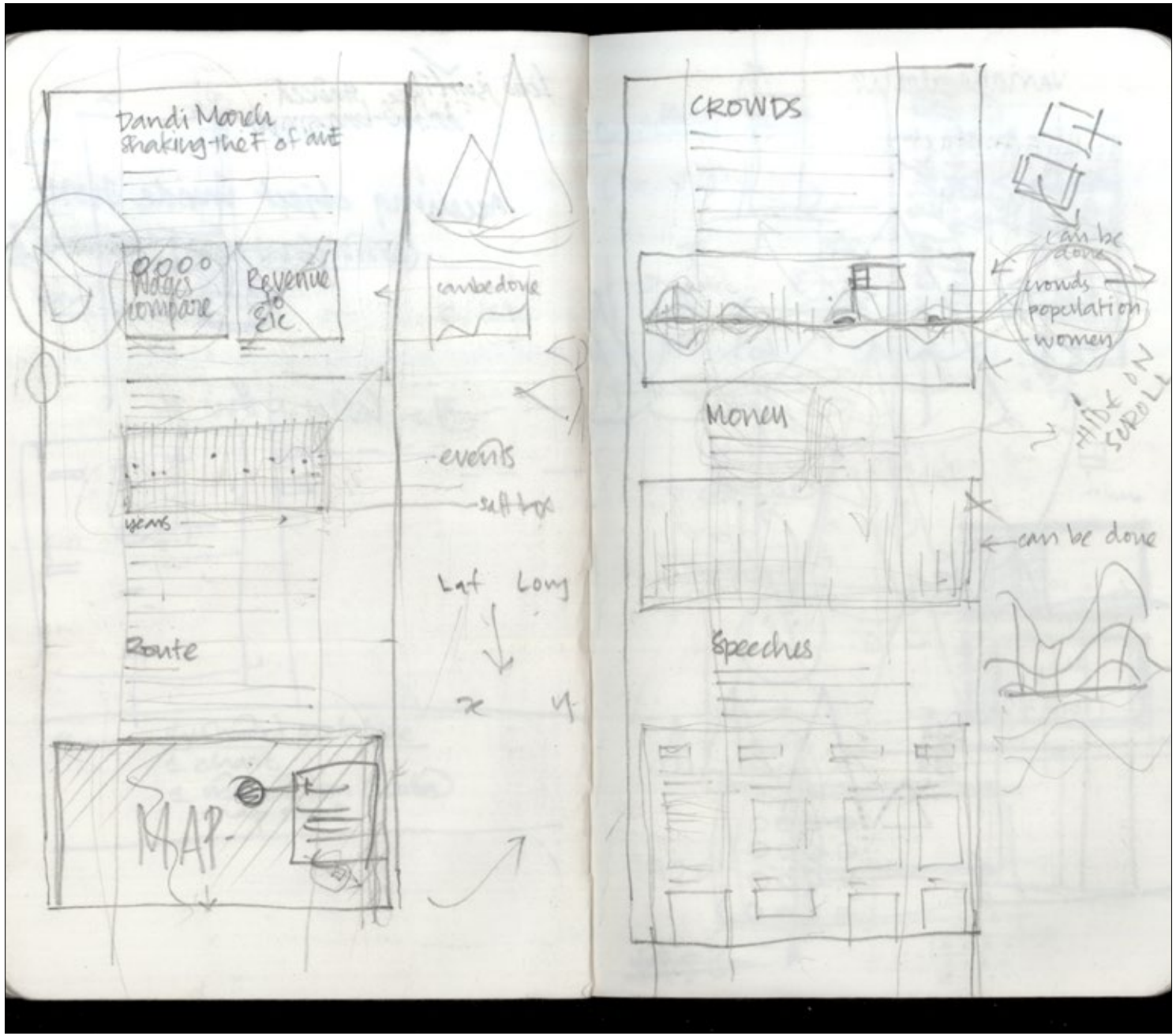
- Speech length
- Word frequency (6 groups of keywords)
- Word location in each speech (6 groups of keywords), referencing the variety of topics discussed and varying focus at each location.

Extension of the March to Dharasana salt works

- Logical conclusion
- Leadership shift
- Sustained efforts
- Gandhi is arrested, Sarojini Naidu takes over

Credits and Links to Resources, etc.





Initial sketch for the final design places elements on a page according to the information architecture

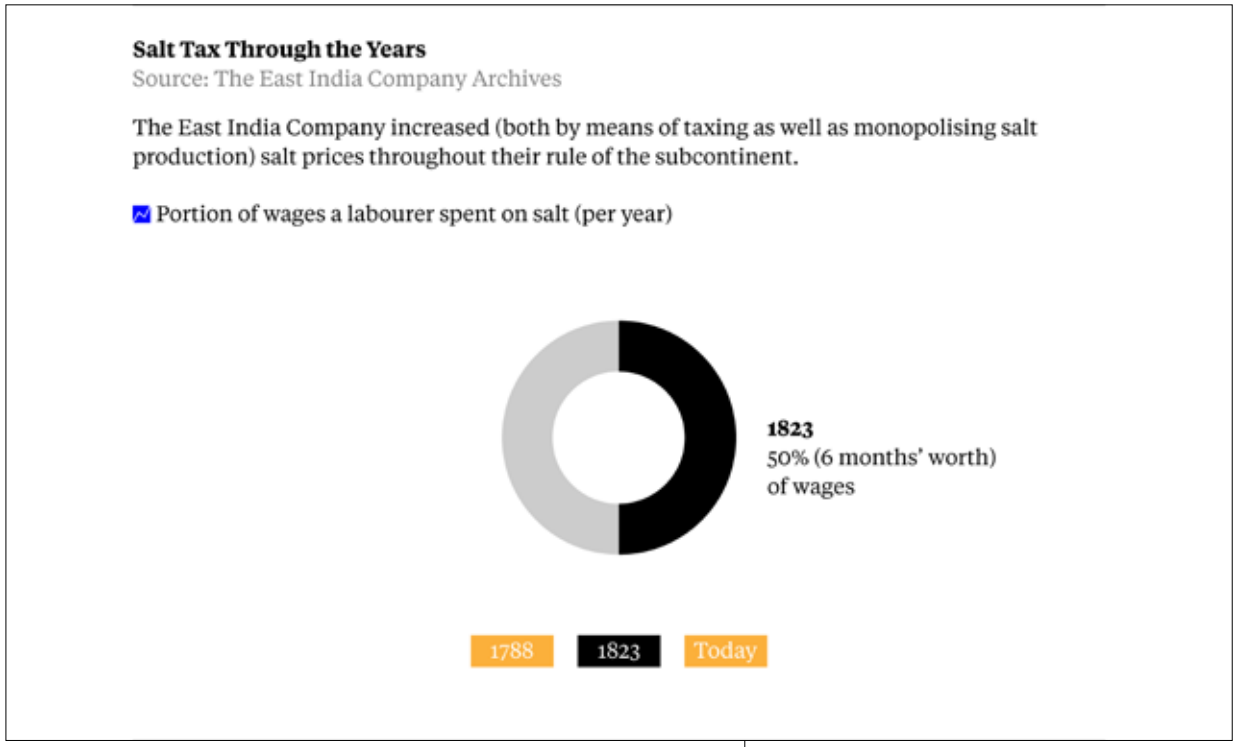
Design

Version 3, Final Concept: The Divided Approach

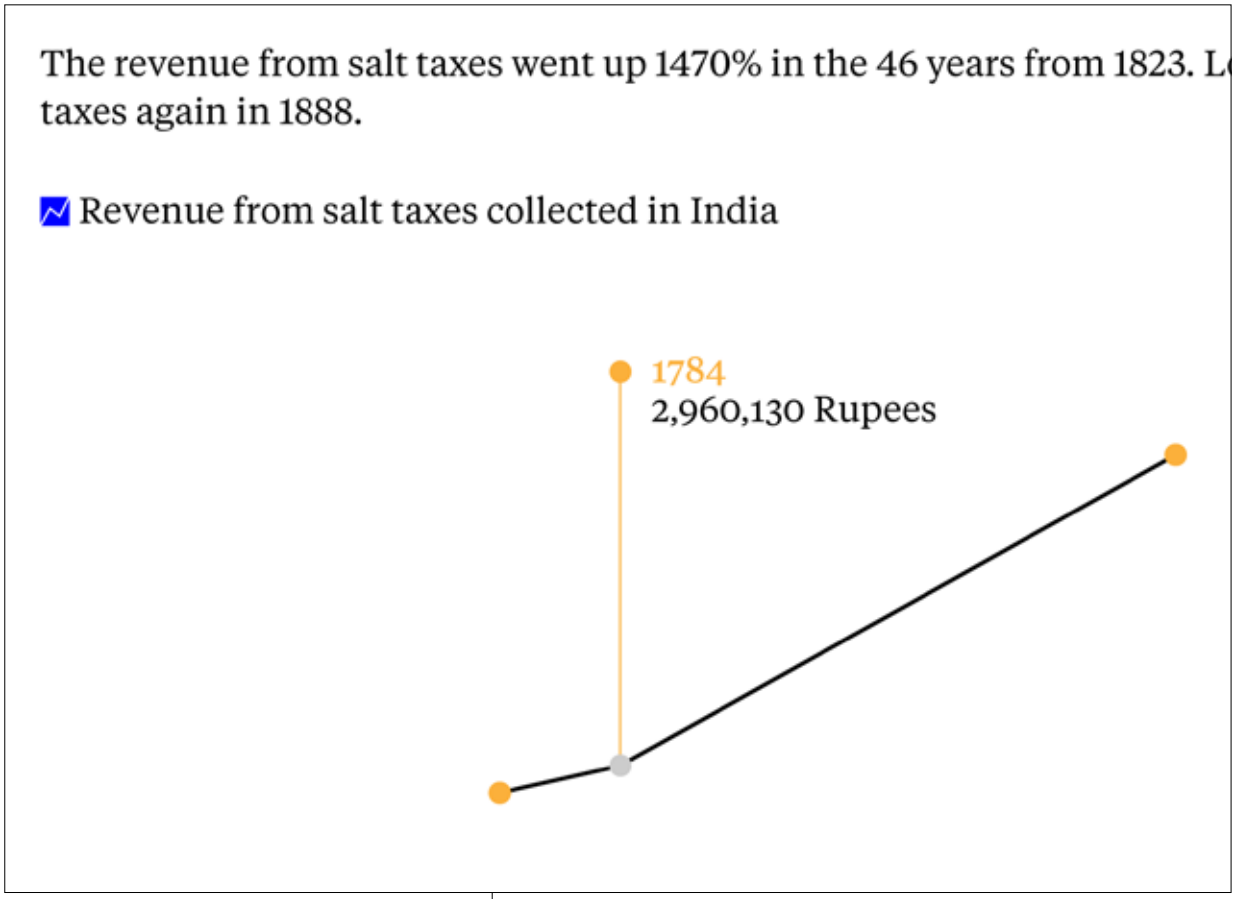
Version 3 looks at different datasets as standalone entities (brought together by the page real estate), concentrating, this time, on each, exploring possibilities in appropriately visualising it. This affords us an in-depth look at the full resolution of data, without compromising on having to stick to an equally divided twenty-five day grid-line.

1. Historical Perspective on Salt Prices

The first visualisation in the project, this works both as a context-setting exercise and help establish interaction norms. The one interaction rule for the project is that anything orange is actionable. The salt prices visualisation shows salt prices as a percentage of total income of a labourer in years 1788, 1823 and the equivalent today. Clicking on orange highlighted years animate the doughnut chart to show relevant information. The goal here is to establish an interaction pattern while highlighting the obscene amount of money people had to pay for edible salt (while a lot of it was naturally found in plenty around their homes).



Visualisation of the amount people spent on salt taxes.



Visualising revenue from salt taxes

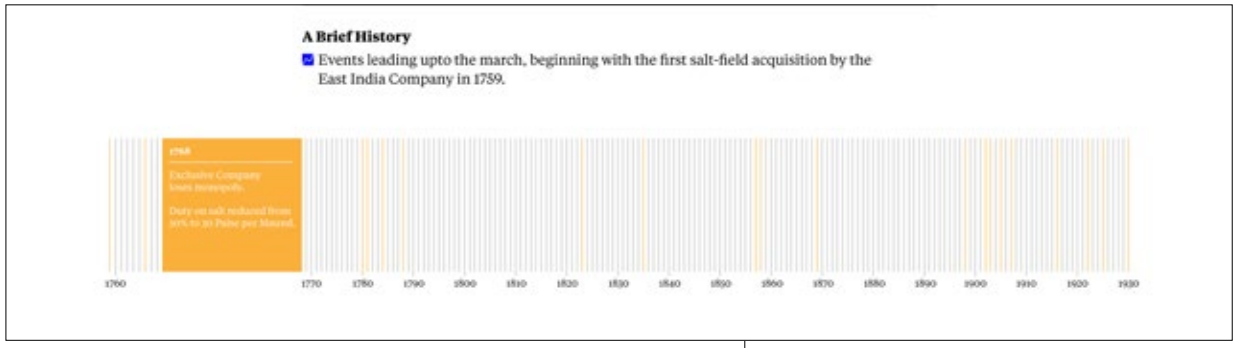
2. Historical Perspective on Revenue from Salt Taxes

This is a simple line graph showing the amount of money collected as salt taxes from India. With stricter observation of laws criminalising domestic salt production and generally higher taxes despite famines, etc., the East India Company (and later, British Government) saw ever larger sums from sale and taxation of salt. The graph continues the interaction norms established in the first visualisation, revealing other behaviours (animated pop up of information on click) to be used across the page.

3. Time-line of the History of Salt Taxes, Up-to the Salt March

A time-line that follows the conventions established by the first two visualisations. Here, the orange lines (each year is represented by a line) are highlighted on hover and expanded to reveal (using the same functionality as Version 2 nodes) information in a rectangle. This seems natural, since the line could potentially be drawn over a plane to get a rectangle. It works better with this shape than the semicircles.

The rectangle reveals day/date and relevant description of what happened in that particular year.



Visualising the history of salt taxes and developments that led to the March
Top: overview; Bottom: detail

Details of two route map interactions
Top: thickening the line on scroll
Bottom: pop-up information at every halt-point

4. Visualising the March Route

Unlike the previous versions where the actual geographical information was eschewed for a simplified and normalised visualisation, this version embraces the context-giving qualities of a map to situate the route in appropriate physical reality. Bridges, towns and roads used and unused are easy to find, as is comparing distances in a natural sense. As the user scrolls, the route line thickens, while two counters below update information on distance travelled and an overview of where in Gujarat the current position is. The additional datasets also offset some monotony of the long scroll (which is necessary to communicate the serious effort of the March as well as provide some necessary detail on how the decisions of which route to take were made. (For example, Gandhi chooses to visit suburbs and less populated areas often.) The map is a current one, so there is an implicit comparison of times as well. The nodes remain click-able, and reveal fine-grained information about the place visited as well as links to media and other relevant material.

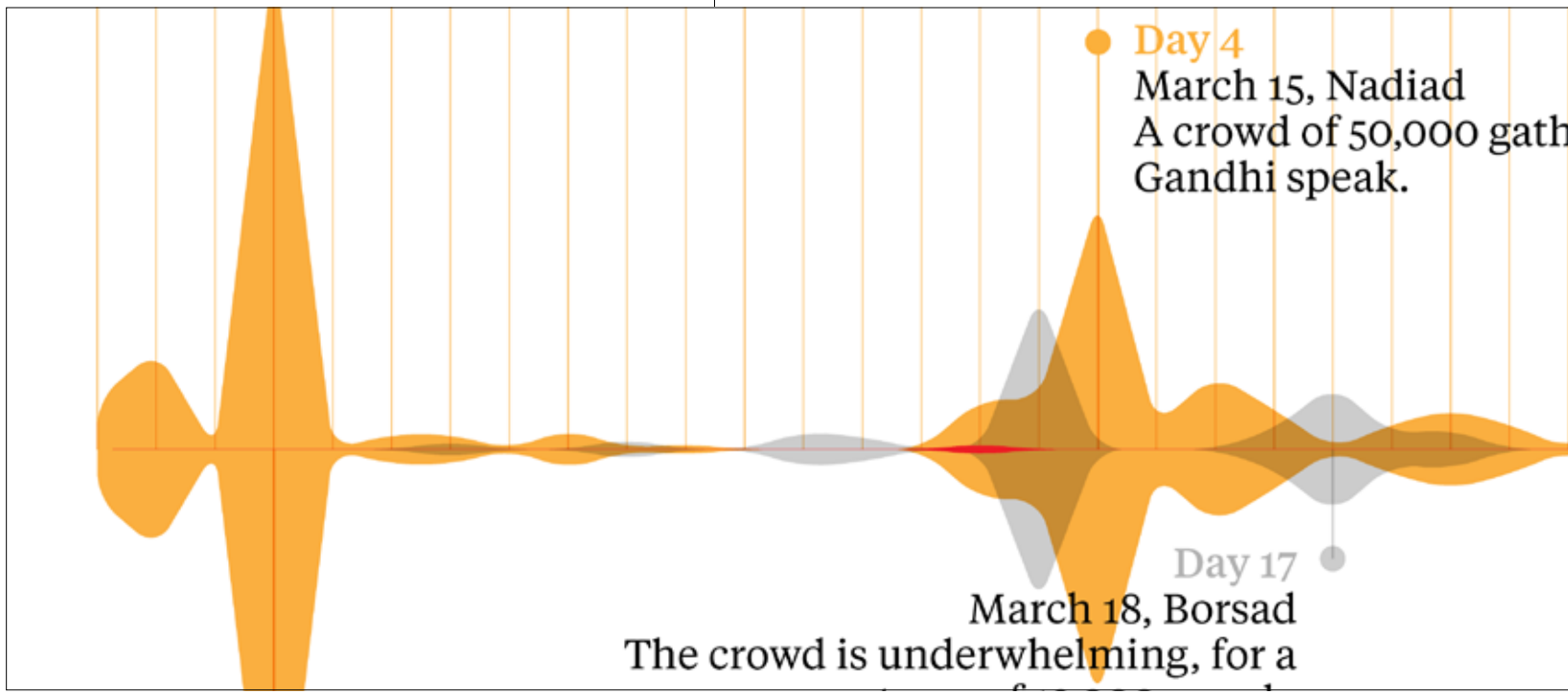
The map itself is downloaded in multiple parts (ensuring good resolution) from Google Earth Pro, and then stitched together.

Screen-shot of the route map visualisation

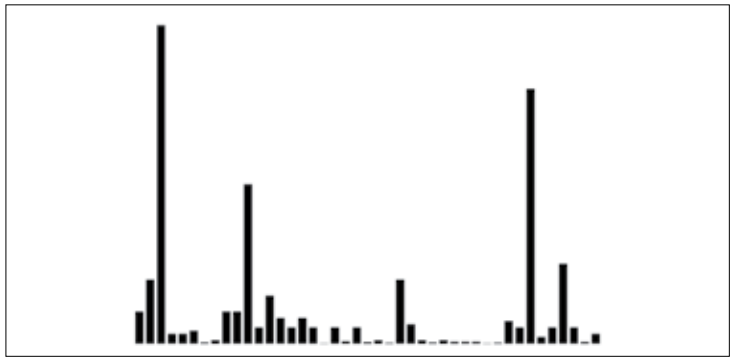
5. Crowds

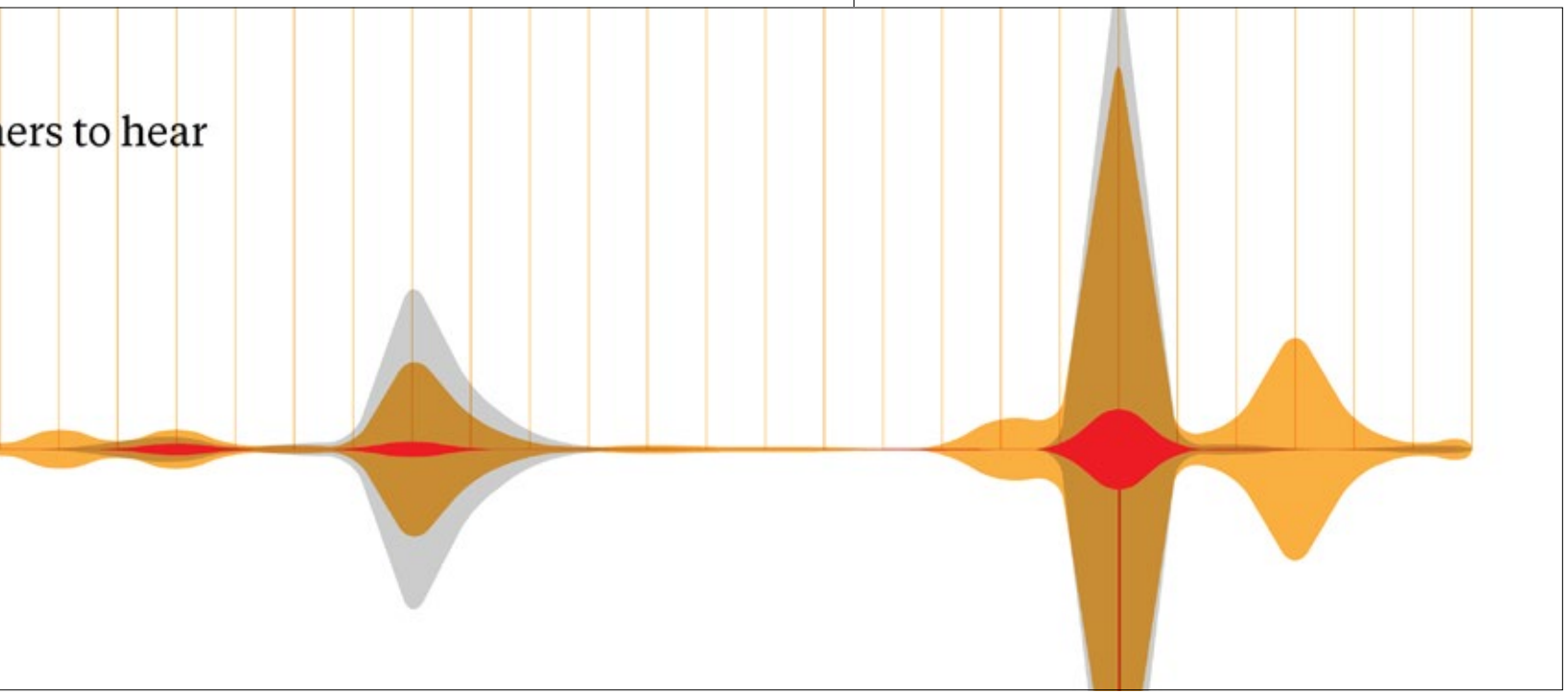
In order to visualise the crowds along the route attending meetings, multiple approaches were looked at. The main concern was whether a simple bar chart is enough (read appropriate) to talk about these numbers. Circles in conjunction with a bar chart, for circles seem to represent crowds better than bars, was also tried. These failed to capture the fact that the crowds rarely completely dispersed and failed to give the feeling of continuity to the journey. It failed to capture the feel of the event.

The final visualisation is multiple stream-graphs (smoothed area charts) over-imposed with enough transparency to observe overlaps. This ensures that reading the trends in crowds attending the speeches and meetings is made simpler. The transparency makes the data more truthful, since one can now imagine the number of women, for example, to be a subset of total crowd size. Places where numbers weren't reported (instead mentioned as very large, etc.) have nothing to show in the y axis, but the stream-graph ensures these aren't visually in-congruent.

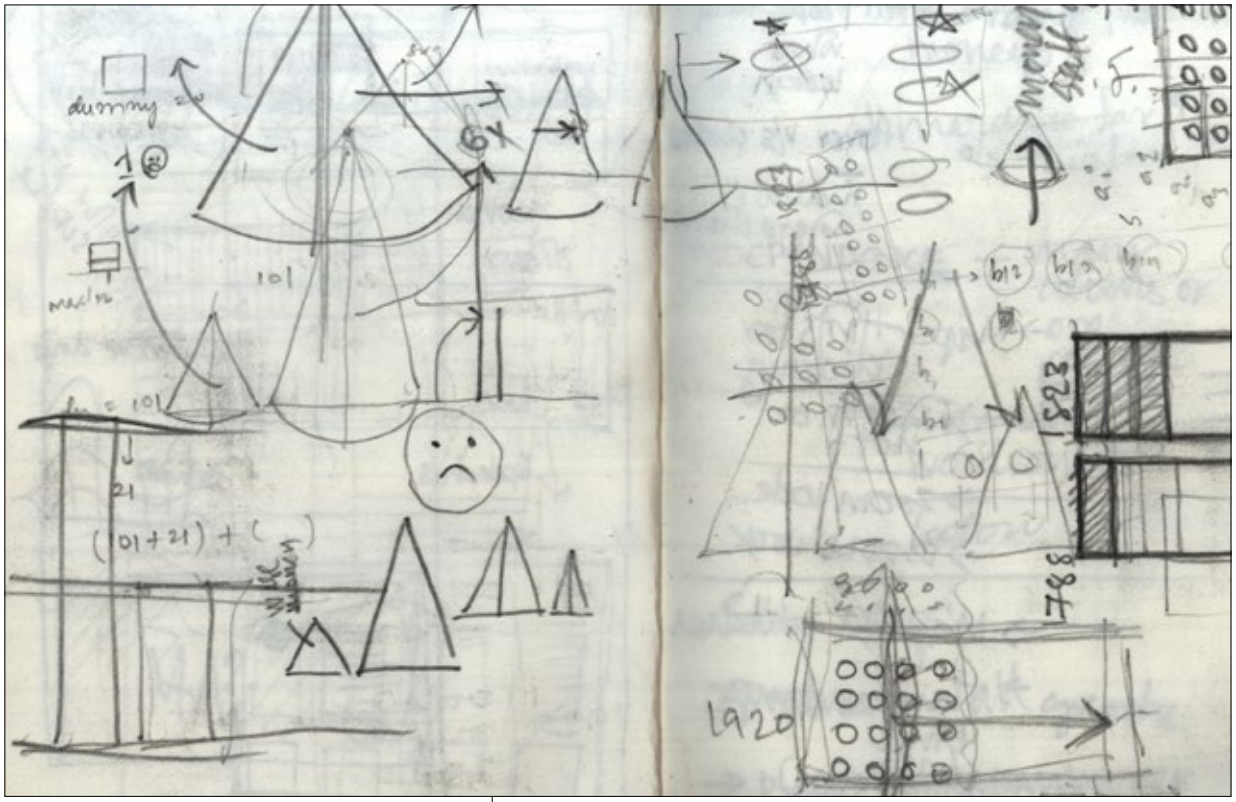


Interactions follow the set pattern again, with orange lines guiding wherever information pop-ups are available. A set of values which are not to be missed, are mentioned below the central axis, and are left “on” permanently. These are non-interactive.





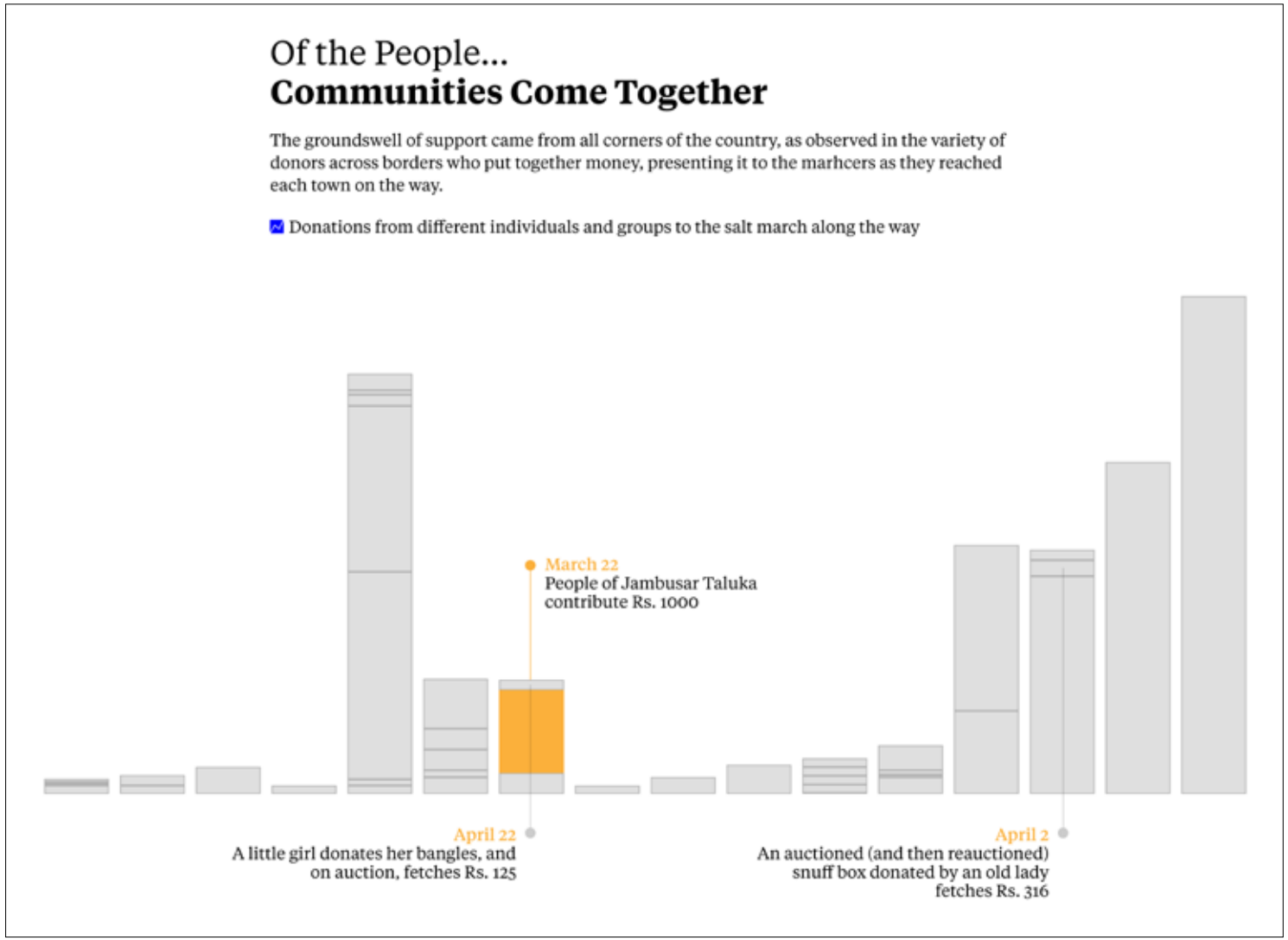
Top: Crowds data visualised as a bar graph fails to convey the continuous nature of the data
Bottom: Detail of the crowds data visualisation



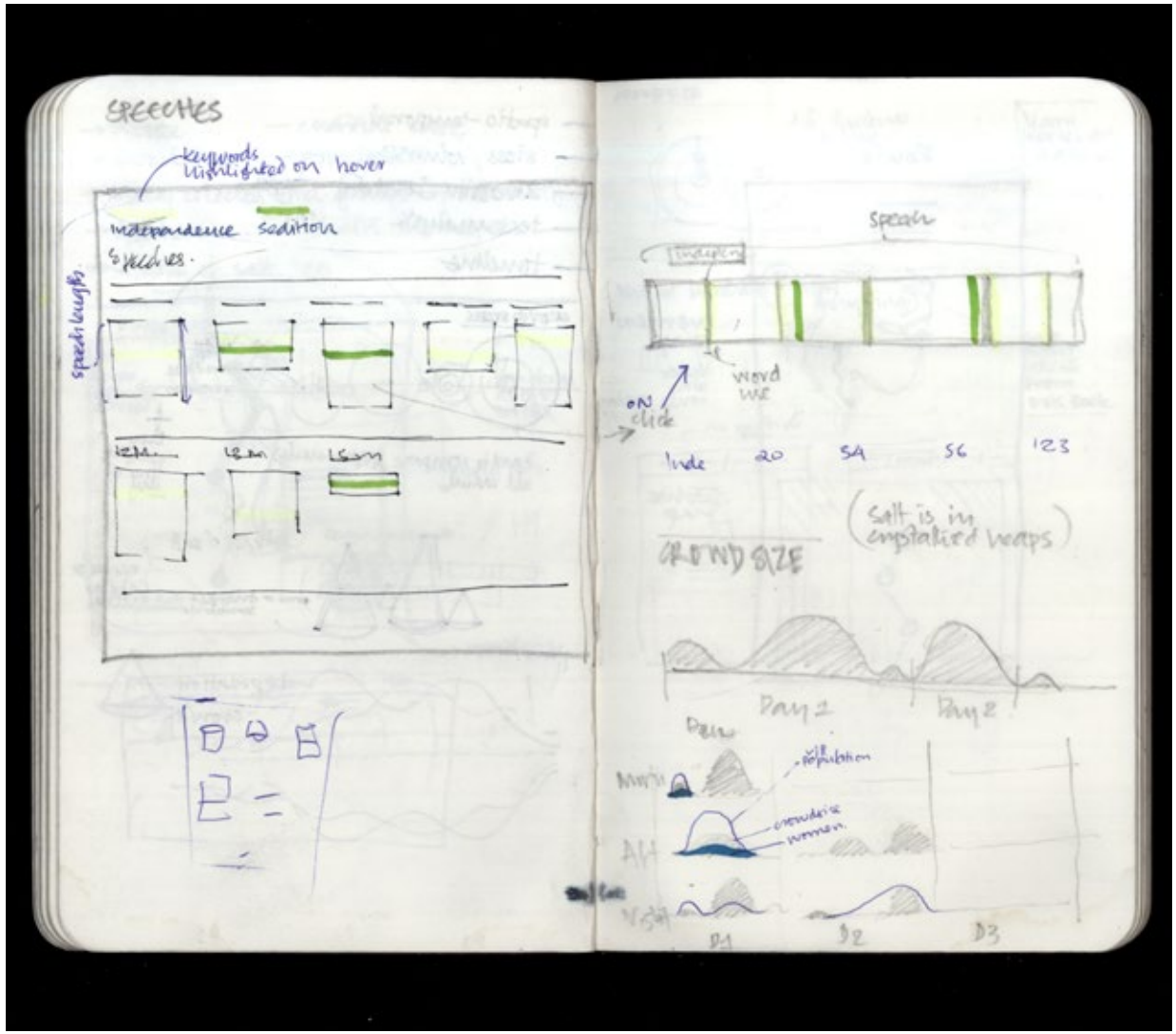
Initial sketches for the money-collected data visualisation. Notice the use of a heap of salt metaphor.

6. Money Collected During the March

The money collected came from a variety of sources showing the diversity of communities and groups supporting the March. For this reason, this data is an important indication of popular support. The stacked bar chart breaks down contributions into days of the March, and further down into the different contributors as one clicks the relevant area of each stack. Here too, very important information (crucial in communicating the diversity) is mentioned below the x axis, permanently.



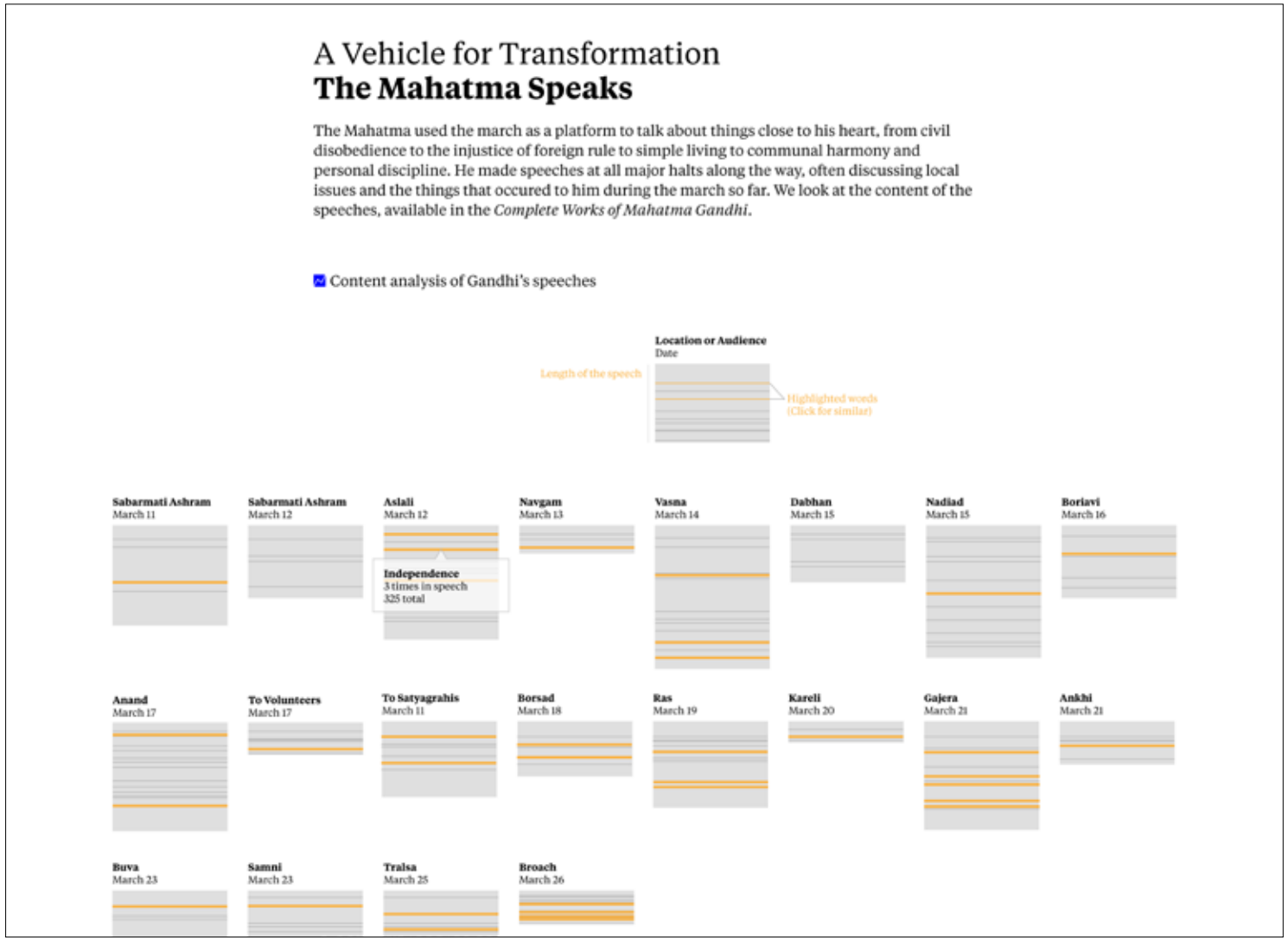
Stacked bars to visualise money collected each day. Important details are presented in an "always on" mode at the base.



7. Gandhi's Speeches During the March

The speech data visualisation takes cues from the case studies and simplifies them. With each speech represented by a grey rectangle (height corresponding to the length of the speech, counted in words) arranged in a grid of such rectangles. Nine groups of words are searched and indexed in each of these speeches, with a thin line representing them. The groups of words were chosen after reading through the speeches and Thomas Weber's account of each day, mentioning specific events that influenced these speeches. On clicking the line, it highlights all instances of that word across all the speeches. This reveals the gist of each speech visually, looking at the multitude of issues Gandhi talked about. He saw the March as a vehicle for social transformation rather than a political tool, and used these occasions to speak his heart about issues plaguing the then Indian society. The click also overlays text that tells the user how many times the clicked on word was used in all the speeches, and in that particular speech.

Sketches and alternate visualisations for the speech data



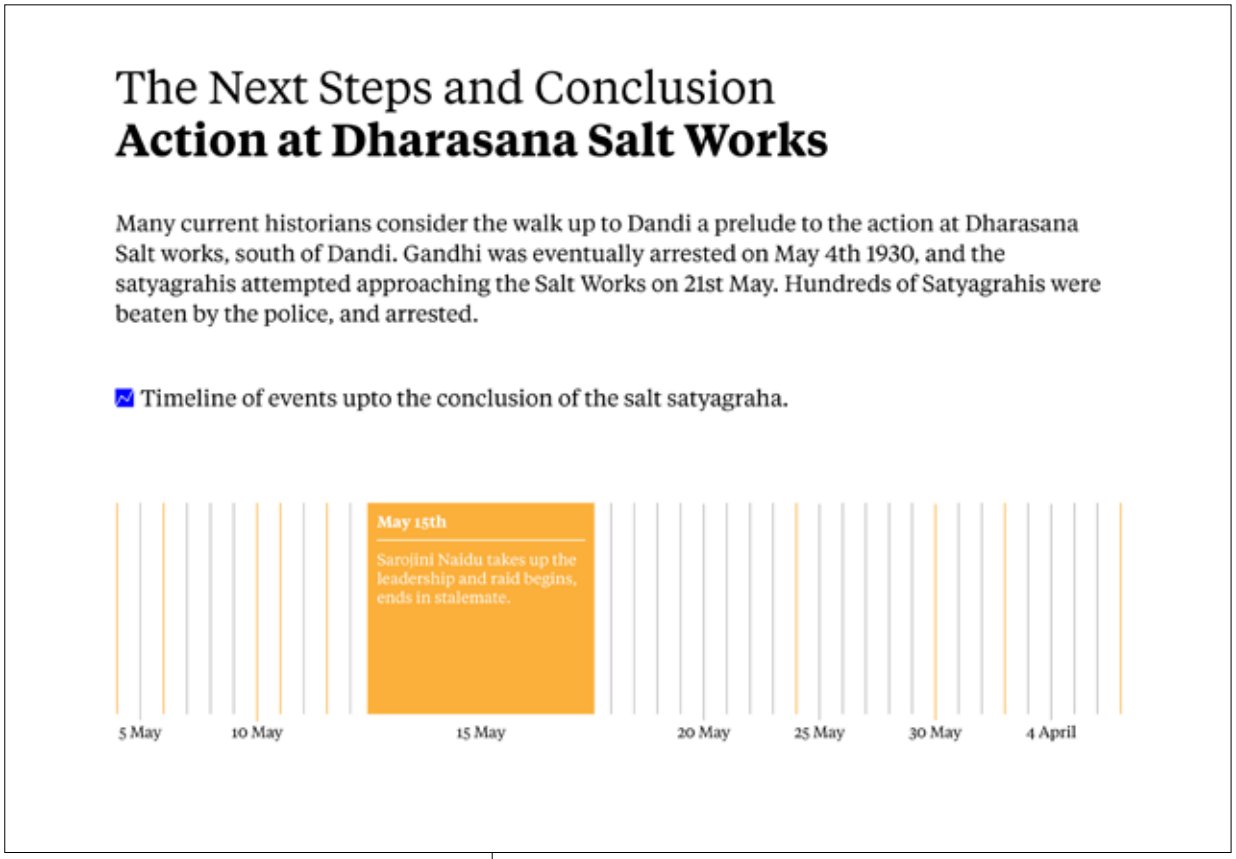
The Nine Groups of Keywords

- Salt, Tax
- Disobedience, Struggle
- Government, British (Common label: Government)
- Unity, Unite (Common label: unity)
- Swaraj, Independence, Independent (Common label: independence)
- Khadi
- Faith, God
- Resign, Volunteer
- Women, Woman, Sister (Common label: women), Poor, Antyaja

Limitation

To ensure some legibility, a certain minimum width for each speech rectangle was necessary. This makes it impossible to have a complete overview on shorter screen heights. One has to scroll and potentially lose the highlighted word in such cases.

Final visualisation grid with one of the words highlighted.



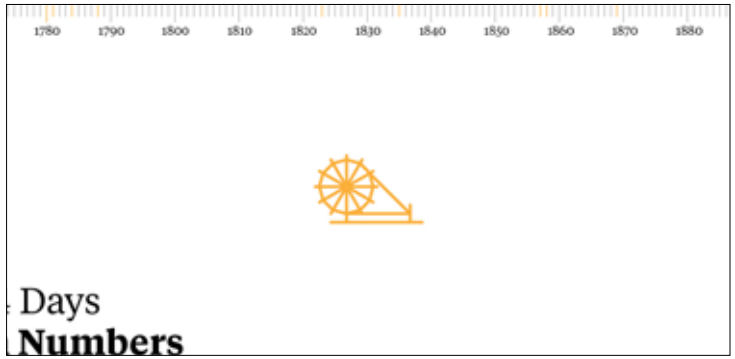
Visualising the events past Dandi in a time-line

8. Time-line of Events Leading Up-to Dharasana Action

This follows the same interaction behaviour as the first time-line in the page, bringing the visualisation to a logical conclusion. It details the events that followed the breaking of the salt law at Dandi. This is when Gandhi is arrested and leaders including Sarojini Naidu takes over the satyagraha, bringing it to Dharasana, south of Dandi.

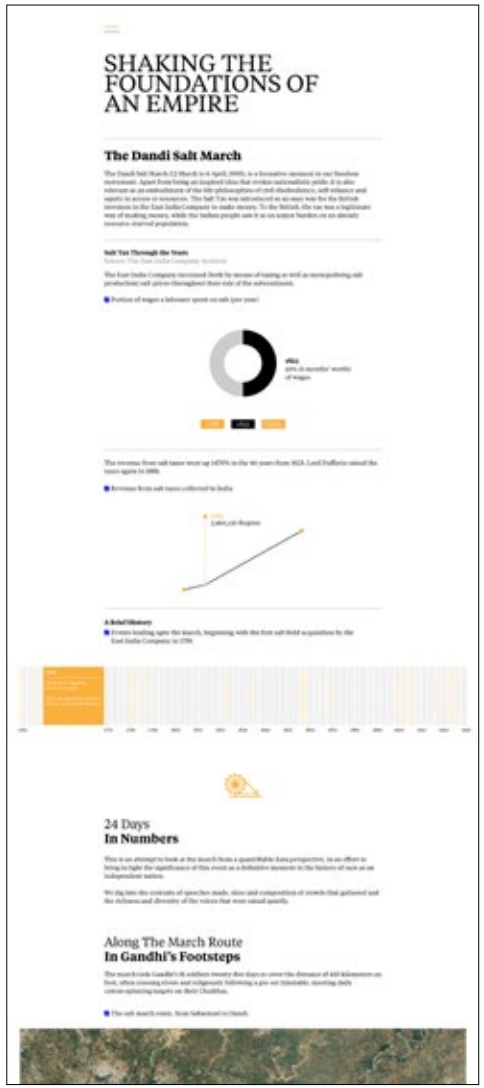
Details

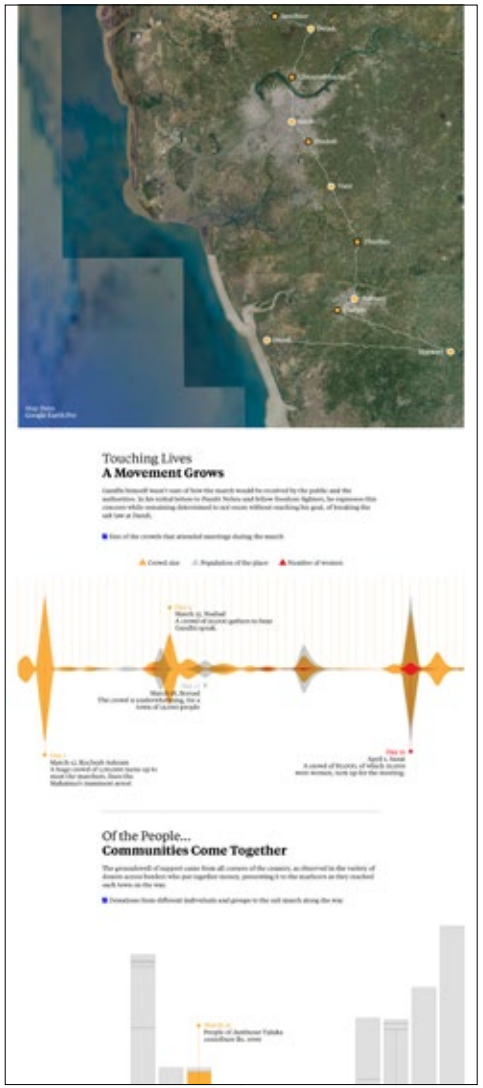
The page is populated with animated elements referencing Mahatma Gandhi's life and the March in particular. These are used as content-dividers and for visual interest.

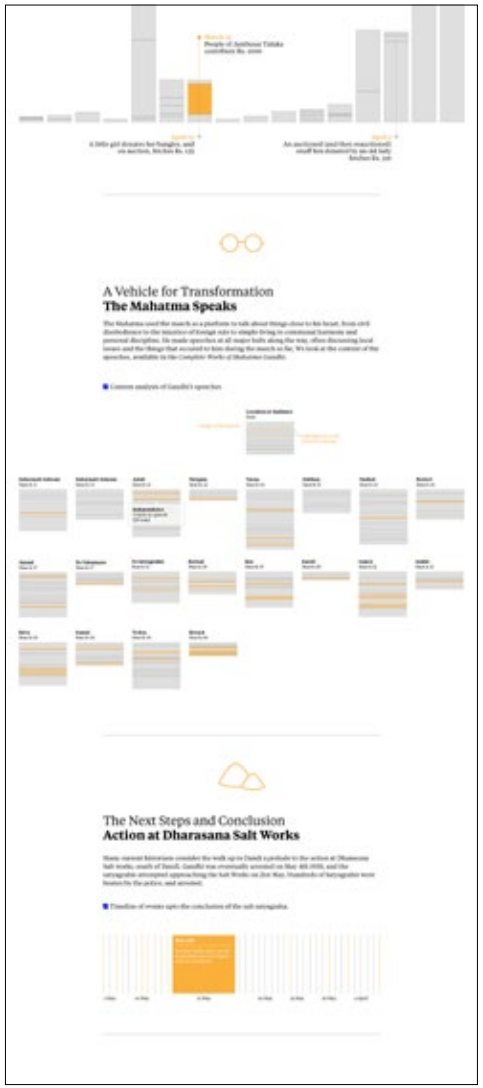


Each graph is preceded by a blue icon denoting the visualisation, followed by a precise description for faster comprehension (if the people skip reading lengthier text).

↓ *Overview of the project website*







Evaluation

We assessed how the product fared in terms of fulfilling its goals of information accessibility, engagement and the aim of expressing feelings through numbers. We evaluated the visualisation on the following parameters.

A: Performance

Task Analysis + Think Aloud

We used search and retrieval tasks (asking for specific data to be read from the visualisation, and conclusions to be inferred by comparing) and timing them. We also marked them as successful and futile.

We used the following questions, formulated accoring to types of data to look for. and connections to be made.

1- Find the largest sum of money contributed by a single group/person. (When, where and who?)
Question 1 is the most direct one, where the answer is found from visualisations with the least effort. This also requires a basic bar-graph size comparison and hovering for details.

2- Where did the marchers spend the night after leaving
This requires knowledge of the sequential nature of the map visualisation and having used the click-for-details function in the map.

3- What, do you think, were the contents of Gandhi's speech at Bhatgam (March 29)
An advanced task, this checks whether the person is able to build a conceptual model that lets him interpret the speech visualisation. In turn, it checks if the visualisation affords such model-building.

4- When was Gandhi Arrested?
5- Who takes up leadership after?
Questions 4 and 5 check if the overall story telling nature of the visualisation website is apparent. The arrest, in the order of things, occurs towards the end, and is shown in the last visualisation.

Person ID	Question / Score				
	1	2	3	4	5
P 1	1	2	3	2	1
P 2	1	3	2	2	1
P 3	1	1	2	4	1
P 4	3	2	1	2	1
P 5	1	2	4	2	1
P 6	1	1	1	2	1
P 7	1	2	1	1	1
Average Score	1.286	1.857	2	2.143	1

Key to Scores
1 Right answer, expected route
2 Right answer, takes time
3 Right answer, unexpected route
4 Confused, asks for suggestions
5 Failure

Analysis of Results

We can claim that at a fundamental level, the visualisation works in conveying data effectively and that the people viewing them are able to build effective conceptual models after some effort and familiarity. The linear narrative aspect is almost immediately apparent, while the information structuring takes some time to get used to. Text is something most people tended to ignore till the tasks were introduced. Overall, the product can be deemed to fulfil functional requirements.

B: Engagement

We asked people semi-structured questions based on observations from the task analysis, looking at what worked and what did not. We also let them describe decisions when answers differed from what we expected. For example, we asked people 'What do you think would've been more appropriate?' and 'Why did you end up clicking there and not here?' in response to their actions while finding specific data we requested.

We also evaluated appropriateness of graphic elements, transitions, etc. with a Likert scale and qualitative evaluation with unstructured questions. We used offline interviews and an oline form with likert scales. The results below indicate mostly favourable responses.

Analysis of Results

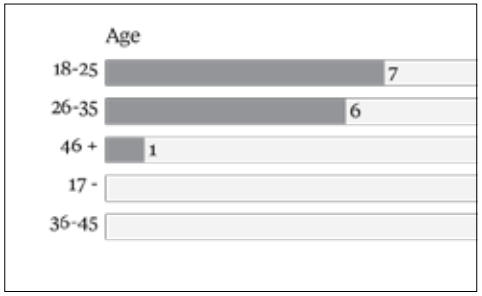
We may claim, from responses to style and content related questions that the website manages to distil and present the spirit of the march to a considerable extent. Improvements were suggested in adding images and more fine-grained data to make a better argument for appropriateness and achieving that 'feeling through numbers' goal we started off with.

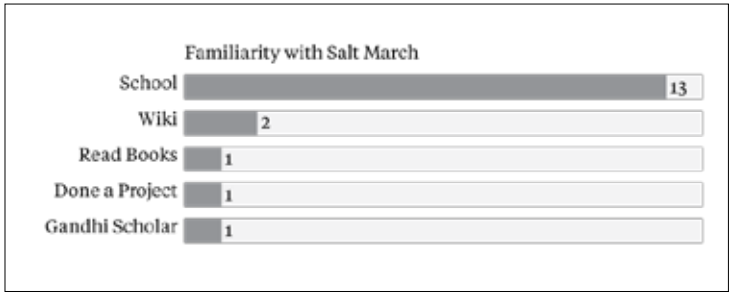
C: Usage Statistics and Comments

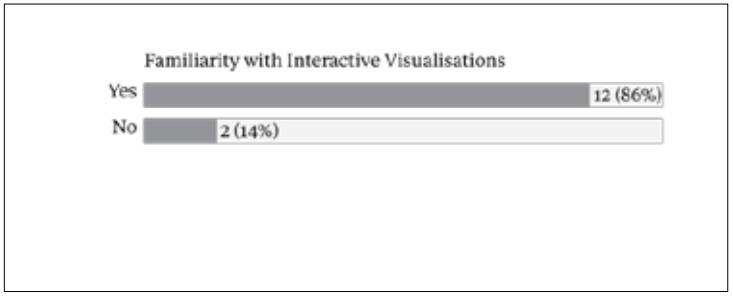
Usage statistics were measured from the webpage itself. We logged the duration of visit, exit links, absence, return to page, and a mouse movement and click heatmap over each page.

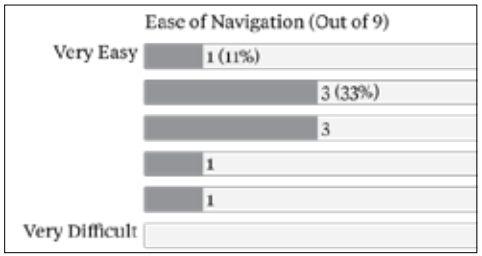
Analysis of Web Statistics

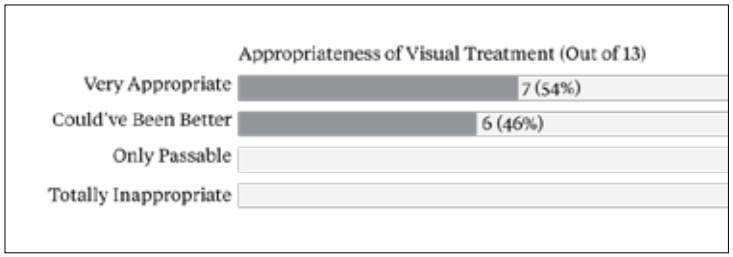
The results show promise; people spent outwards of four minutes on the page at stretch and clicked through most interactive parts of the visualisation. The orange-is-interactive strategy was found to be very effective, while a mix of hover and click for interactions did not work the way we expected. It was confusing in its inconsistency.

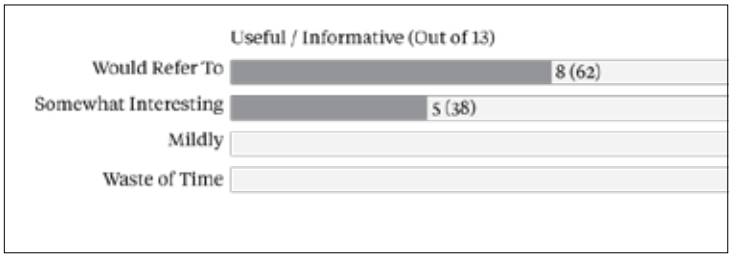












What Next

Feedback and Improvements

The embedded page analytics tools and comment forms continue gathering data on people's involvement and interaction with the project. This also generates suggestions for improving datasets and the experience. A longer-term evaluation and enhancement of the project is proposed, as well as sustained research on obtaining more fine-grained data without as many gaps.

Time and technology constraints have led us to cut down on implementing features we wished to. The product is open enough for future improvements and adding of richer data.

Widening the Reach

Versions in multiple languages and cross-device compatibility are logical next steps in improving reach. For the visualisations to work on multiple devices, the following approaches could be considered:

→ Changing the orientation of visualisation to suit narrower, taller displays. (Mobile phones)
→ Media queries to load a different data-set driven visualisation, where there is a hand-picked, limited dataset
→ Slide-able visualisations, where a central fixed point activates hover and click behaviour, not unlike a scrolling wheel selection metaphor.

More Datasets

The page can be updated to include more in-page rich media in a deeper layer of the interface. (So that it remains a data-centric story, but enables people using it to explore each point in rich detail.)

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