Mass Migration During COVID-19:

Storytelling through Data

Guided By:

Prof. Ravi Pooviah

Submitted By:

Kuldeep Singh Rathod
176330001
Interaction Design

Approval Sheet

The Interaction Design Project "Mass Migration during COVID-19 19: Storytelling through Data" by Kuldeep Singh Rathod (Roll Number: 176330001) was made in partial fulfillment of Master in Design Degree in Interaction Design at IDC School of Design, Indian Institute of Technology, Bombay.

Guide

Chairperson

Internal Examiner

External Examiner

Declaration

I hereby declare that the project “Mass Migration during COVID-19 19: Storytelling through Data” was carried out by me under the guidance of Prof. Ravi Pooviah at IDC School of Design, Indian Institute of Technology, Bombay, India.

The visualizations made are based on data collected through online publications. All the resources used or referred are cited and acknowledged.

Kuldeep Singh Rathod
176330001, Interaction Design
IDC School Of Design,
Indian Institute of Technology, Bombay.

December, 2020

Acknowledgement

I would like to offer my sincere gratitude to Prof. Ravi Pooviah for his guidance, support and contributions. I am also thankful to the Interaction Design faculty, Prof. Venkatesh Rajamanickam, Prof. Pramod Khambete, Prof. Vivek Kant for their suggestions and help.

I am thankful to my brother and wife who helped me in data collection and kept me going throughout the project.

Kuldeep Singh Rathod
176330001

Index

1. Abstract

The emergence of COVID-19 has been the biggest challenge faced by health and economic infrastructure in the 21st century. India had taken measures to curb down the loss of life but the socio economic crisis has mostly hit migrant workers who make the backbone of Indian economy. Migrant population already faces a lot of challenges due to lack of proper documentation. This sudden loss of income added difficulties in their survival. Billions of workers lost their jobs and with no income and savings, it became impossible to survive in cities. Many of them attempted to walk back home only to get stuffed into quarantine centres and shelters arranged by various state governments as a last minute response to the scenario.
This project was about understanding the plight of the migrants by looking at available data. An attempt was made to collect, curate and present data related to migration. The final product is an interactive web based infographic. The user can go through various visualizations in the infographic to derive insights and develop their own understanding of the events.

2. Introduction

The COVID-19 Pandemic is unarguably the most severe public health challenge that the world had to face in the current century. Irrespective of species, geography or status COVID-19 has touched everyone's life.

2.1 Inception of COVID-19

COVID-19 has claimed millions of lives across the world and is still counting. The spread of this deadly virus from its first epicentre Wuhan can be attributed with the mobility of people across the world. Although the mortality rate observed in COVID-19 affected patients is low yet the situation is testing for countries with advanced health infrastructures. For developing nations like India, where medical facilities are critically inadequate, coronavirus is overwhelming the whole nation.

Many of the Medical Institutions have been suggesting to observe social distancing and advocating country -wide lockdowns to contain the spread. But these are all interim measures to give time for building medical capacity. With lockdown, the main aim is to minimise the loss of life but this can also be crippling for developing countries economically.

2.2 Government response

India responded to COVID-19 with a 21 day lockdown which started from 23rd March 2019. With suspension of international flights and sealing neighbouring borders, possibilities of importing the virus into the country were subsided. Within the country, all the public transportation services were put on halt with restraints on inter-state movement as well. Additionally all the factories, educational institutes, entertainment services were barred only allowing flow of essential services.

Government kept extending the lockdown to contain the pandemic in India. But it exposed the population to occupational vulnerabilities. We are a low to middle income population country where the majority still feeds on hand to mouth basis everyday. This massive informal workforce became the most vulnerable.

2.3 Effect on migrant population

The International Labour Organization (ILO) predicted that due to the pandemic and the lockdown, about 400 million workers would be poverty-stricken.[1] Most of these workers are migrants who have either come for work from within the state (IInternal Migrant) or different states (External Migrant). As per 2011 census the total number of internal migrants comes out to be 326 million which is nearly 30% population. With limited access to health care, sudden loss of income and away from home, they were hit the most. Although the government tried to provide them with food, but with lack of identity and residence proofs, it is difficult to avail these schemes.

2.4 The vulnerability of migrant workers

Migration is considered to be a negative phenomenon because of the fact that it over stretches urban zones, takes away productive members from rural areas, leads to exploitation of labour in the informal sector and most importantly it is a cause of administrative headaches[4]. Due to this the governments are usually hostile towards migrants. This leads to them living in miserable conditions with poor access to basic necessities like water, sanitization and electricity. They also have to face constant threat of eviction, police harassment, disease and abuse [2]. On top of being poor they also have to carry the burden of being away from home. All these factors make migrants more vulnerable to the direct and indirect effects of COVID-19.

Government's plan of a two month long country-wide lockdown was arguably an effective strategy to contain the effects of pandemic. Albeit the implementation could have been planned better. The surprising nature of the announcement led to problems related to food, income, shelter, fear of infection and anxiety. This resulted in what is known to be the second largest reverse migration in the history of India.

2.5 Problems faced by migrants in the journey

The lockdown led to suspension of all modes of public transportation between states which forced people to span hundreds of kilometers by hitch hiking or in worst cases on foot. Many migrants lost their lives either because of the difficult journey, mishaps,

hunger or comorbidity. Those who somehow managed to reach their natives place were also not welcomed and put into quarantine centres as they were seen as potential carriers of infection. In one instance, some migrants were also showered with chemicals on the road by local administration.[3]

3. Objectives

This pandemic has affected all our lives and is the reason for the 2nd largest reverse migration in our nation's history since Independence. Hence it demands a look back. The major objectives through this project are to:

1. Identify, Collect and document data related to identified domain (migration) from within India.
2. Design a data driven narrative for the easy consumption of the collected data.

4. Process

The project started with a much broader scope where the exact domain of affected areas from COVID-19 had not been identified. Hence the first step was to find focus by collect data, which was conducted in following three phases:

Phase 0: Identification of domains
Phase 1: Gathering coarse data.
Phase 2: Timeline creation.

4.1 Phase 0

The prime objective of this phase was to identify domain(s) for the project. I started by listing down some potential domains along with some hypothetical topics related to them, over a brainstorming session. The motive behind this exercise was to set up some ground work for starting data search. The list can be seen in Table 4.1(a)

Domain	Topics
Education	Results of different classes in different boards
	Different entrance exams change
	Upcoming startups in this domain
Migration	How many people migrated
	Government appointed vehicles for migration
	People walking on the roads
	Incident in Mumbai when people gathered outside railway station
	People in delhi gathered outside bus stand
	Celebrities arranged vehicles for migration
	Requests logged for passes
Transportation	Train cancellation schedule
	Road blocks
	change in fares
	How protocols have changed overtime
	Airline schedules
Emergency services	services categorised under this
	Permission and schedule
	HOw they operated during different phases of lockdowns in different regions

	Doctors and policemen getting infected
Change in customer behaviour	Rise in online sales
	People panicked shopped
	Changing prices of commodities
	Rise in home delivery apps
Economy / Businesses	The businesses that thrived in COVID-19 times
	The businesses that had to change their operations because of corona
Events and celebrations post COVID-19	Festivals and how the celebrations were affected
	Few celebrations that led to the spread of COVID-19
	Cancelled and. postponed events
	Change in celebrations
Hospitals and other medical infrastructure	Required hospitals vs available hospitals
	Identified cases vs daily test limit vs available beds
	Costs of COVID-19 treatments in various hospitals
	Quality of treatment in Government hospitals
	People getting infected because
	of hospitalization
Quarantine	Different quarantine centres appointed by gov
	Hotels and guest houses converted into quarantine centres
	Centres for migrants vs centres for air passengers
	Colleges and convention centres converted into quarantine centres
	Myths around quarantine centres
Donations	Donations made by individuals
	How many donations accounts were set up by central and state governments?
	Estimate of how much was collected vs how much was spent?

Table 4.1(a) : List of domains and topics created through brainstorming.

Post the creation of this list data collection was started for the identified topics under these domains. A random order was followed. Some of the interesting data found during this phase is mentioned below:

Report on bonded labour in six districts of Gujarat
Dr Misha Vyas (Asst. Prof at Mahatma Gandhi Labour Institute)

Non-Virus deaths during COVID-19
Thejesh GN

An API to fetch running status of Shramik trains appointed by the government.
erail.in

Skill Map created by UP government for 23.5 Lakh home returning workers.
The Print

After understanding the scale of the project with respect to the available timeline and looking at the availability of data I decided to focus my research on only two domains: Migration and Transportation.

4.2 Update Scope

The focus of the project would be on the mass migration that happened during the COVID-19 period in India. To be more specific i would be looking at the event happened post 23rd March (first Janta Curfew), covering up the durations of all 4 lockdown periods and the initial unlock periods (depending on the data availability)

4.3 Phase 1

This phase comprises collection of coarse data from the internet. The objective is to create a data pool that can be utilised to extract important items for the timeline. Following format was decided to log the identified sources.

Title
Title of the publication explaining the content

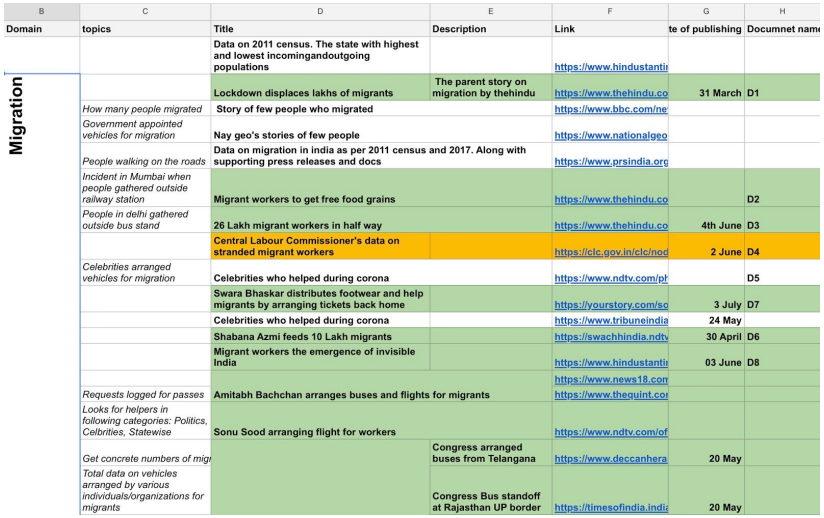
Description
Detail of additional contents in the publication

Link
Source link to the publication

Date of publishing

To help align documents in timeline.

The searching process was started by first utilizing the atomic terms like migration, transportation, workers etc along with COVID-19 and INDIA (for context). Then continuing by going deeper based on the results from the first two pages and then branching the further searches from there. A snippet of the running sheet can be seen in Fig 4.3(a). The collected data can be found in Appendix 1 .



B	C	D	E	F	G	H
Domain	topics	Title	Description	Link	te of publishing	Documnet name
		Data on 2011 census. The state with highest and lowest incomingandoutgoing populations		https://www.hindustantir		
Migration		Lockdown displaces lakhs of migrants	The parent story on migration by thehindu	https://www.thehindu.co	31 March	D1
	How many people migrated	Story of few people who migrated		https://www.bbc.com/ne		
	Government appointed vehicles for migration	Nay geo's stories of few people		https://www.nationalgeo		
	People walking on the roads	Data on migration in india as per 2011 census and 2017. Along with supporting press releases and docs		https://www.prsindia.org		
	Incident in Mumbai when people gathered outside railway station	Migrant workers to get free food grains		https://www.thehindu.co		D2
	People in delhi gathered outside bus stand	26 Lakh migrant workers in half way		https://www.thehindu.co	4th June	D3
		Central Labour Commissioner's data on stranded migrant workers		https://clc.gov.in/clc/nod	2 June	D4
	Celebrities arranged vehicles for migration	Celebrities who helped during corona		https://www.ndtv.com/ph		D5
		Swara Bhaskar distributes footwear and help migrants by arranging tickets back home		https://yourstory.com/so	3 July	D7
		Celebrities who helped during corona		https://www.tribuneindia	24 May	
		Shabana Azmi feeds 10 Lakh migrants		https://swachhindia.ndtv	30 April	D6
		Migrant workers the emergence of invisible India		https://www.hindustantir	03 June	D8
				https://www.news18.com		
	Requests logged for passes	Amitabh Bachchan arranges buses and flights for migrants		https://www.thequint.cor		
	Looks for helpers in following categories: Politics, Celbrities, Statewise	Sonu Sood arranging flight for workers		https://www.ndtv.com/of		
	Get concrete numbers of migr		Congress arranged buses from Telangana	https://www.deccanhera	20 May	
	Total data on vehicles arranged by various individuals/organizations for migrants		Congress Bus standoff at Rajasthan UP border	https://timesofindia.indi	20 May	

Fig 4.3(a): structure of coarse data collected in phase 1

The collection in this phase was further divided into two levels: country level and state level. This was done to provide a better structure for the information. Also the data available for different regions varied according to the migrant population they had.
Hence it was decided to further limit the scope to the following regions as they have the maximum inflow/outflow of migrants as per 2011 census [5].

1. Uttar Pradesh
2. Bihar
3. Maharashtra
4. Gujarat
5. Karnataka
6. Delhi
7. West Bengal
8. Odisha
9. Rajasthan

4.4 Phase 2

This is the step of data extraction. Each of the documents enlisted in phase 1 are marked for two types of items:

1. Important timeline events and details related to them.
2. Links to more relevant publications for phase 1.

Initially the identifiers for items in the timeline were only Date, Region and associated community. But after getting some data the need for an additional categorization of items was identified. Therefore an additional column of data-type was added. The current timeline follows the following format. A snippet of the actual sheet can be seen in Fig 4.4(a). The data can be found in Appendix 1.

Date

Date of event

Data-Type

To segregate the points

Associated Region

City/ State

Associated Community

Cohorts, linking to other states

Content

Summary of the data point

Continuation queries

Additional questions that can be researched upon

Media link

pictures/ videos etc.

Source

Publication link and date

Date	Data-type	Sub-type	Associated region	Associated Community	Content	Details	Additional questions	Media Link	Source	Source Link	Date published	
22 March	Lockdown				A 14 hour voluntary lockdown called janta curfew was observed in India.	SO far India had reported 360 cases and tested a total of 16021. The TPR(tes positive rate) was around 2.2%				https://thewire.in/covid-19-india-		
	Announcemn	Trains			Indian railways decides to stop all passenger trains from midnight							
	Announcemn				Prime minister announces 21 day lockdown	lockdown was imposed till 14th April						
	Announcemn				Stay home, stay safe became the slogan to fight corona							
23 March	Miscellenou				Banelly migrants given bath with disinfectants				The hindu	https://www.thehindu.com/news/	31 March	D1
9 April				Medical workers	Sonu Sood opens up his Juhu Hotel to accommodate medical workers.					https://economictimes.indiatime	28 May	D5
11 April			Surat, Gujarat		More than 1000 workers came out late night on streets demanding for salaries and a way back home.	Most of them worked in power loom textile factories. Majority belongs to Odisha				https://www.thehindu.com/news	11 April	
14 April					Lockdown extended till May 3							
15 April			Hyderabad		a team from TISS developed a 35-item schedule as a google form to capture socio-demographic profile, economic and current health status, needs and requirements.	Till May 1, 8,235 individuals have been interviewed across nine police station limits.	Get this data by contacting TISS			https://www.thehindu.com/news	1 May	
22 April			Azamgarh, UP		Shabana Azmi led NGO called Mijwan Welfare society(girl child empowerment) prepared 10,000 masks and distributed for free in Mijwan village of Azamgarh along with food grains, oil and soap.							
27 April	overview		21 states and 1 UT		Shabana Azmi Partnered with Action Aid India were able to reach more than 10lakh individuals, across 172 districts in 21 states and 1 UT.They provided dry ration, cooked meals and sanitary products.		Which cities? Districts? Check NGO websites for more details			https://swachhindia.ndtv.com/co	30 April	D6
					Chef Vikas Khanna with NDRPH2 and Ms. Azmi were able to distribute 200 quintals of dry rations across 50 cities all over india							
28 April			Surat Gujarat		Thousands of workers in Kaswasla region came out on road demanding that they be allowed to go home.	Several vehicles were damaged and glass windows shattered by stones.				https://www.thehindu.com/news	28 April	
			Surat Gujarat		Workers protested on railway tracks in Dindoli					https://indianexpress.com/article	28 April	
29 April					Union government Ed instructed states and UTs to facilitate inter state movement of the stranded people.					https://www.theweek.in/news/in	29 April	

Fig 4.4(a): Snippet of the structure of the timeline sheet.

The data types identified from the recorded items are as follows:

Overview/Analysis

Data related to a longer timespan

Movement

Data related to actual migration of people. Medium, origin, destination etc

Rule / Policy

New or updated rules/policies.Lockdown status, border sealing etc.

Announcements

Related to items in future. This can be marked as the beginning/end of all other data-types

Service Introduction

Helpline services, quarantine facilities etc.

Donations

To assist travel or survival

Miscellaneous

Accidents, protests, political clash etc.

4.5 Additional Data

Information validation is a very crucial part of this phase as the authenticity of the data in various sources is debatable. So to do a minor validation the overview documents are used to cross verify data from other sources. In case of a mismatch or conflicting data from different sources, the data is looked upon in few more sources and the data as per the majority is recorded.
While collecting the data for the timeline one more type of data was identified, different stories of migrant workers. The stories varied in granularity. Some were very elaborate in terms of information whereas some only had very basic information. Irrespective of this, I logged all of these stories in a separate table (see Appendix 1). Looking at the data from elaborate stories i decided to log in four parts: identifier, onward journey detail and backward journey details. To be precise the data was logged in the following structure:

Name and Age

Of a single person or a group

Migrated From
State of Origin

Migrated To
City/ State

Duration of Stay
In the city migrated to

Occupation/Skillset
Summary of the data point

Date of leaving
Start of Journey back home

Medium of Journey
Rail/Road/Air

Date of Arrival
Publication link and date

Medium of Arrival
Publication link and date

Date of return
From home to the migrated city

Medium of return
Rail/Road/Air

Important events of Journey (with Date)

Context
History of the migrant, reason for the journey etc.

Statements
By/for the migrant.

Source
Link

Date of Publishing
For aligning with the timeline

Since all the stories came from publications, most of them had some or the other media (image/video) attached to them. This could also be used in the final solution as visual media is more effective than plain text. Overall there were three types of stories.

1. Story of Bravery/Courage: All of these stories had a happy ending where the migrants complete their journey irrespective of hardships

and reach home safely. The journey in these stories usually consists of helpies who assisted the migrants in their journey.

2. Stories with tragedy: These are the stories which have a sad ending, mostly culminating in casualties.
3. Stories with a return Journey: These stories are about people who travelled back to these cities after reaching home.

4.6 Understanding data points

It is crucial to understand various elements of each data point to be able to identify the correct medium with effective encodings for the data. The Data collected under timeline dataset (see Appendix 1) had four types of elements as shown in fig 4.6(a)

Fig 4.6(a): Elements in timeline data item

Similarly the data points in stories had the following four elements as shown in fig 4.6(b)

Fig 4.6(b): Elements in story data item

4.7 Irrelevant Data

In the process a lot of extra data was collected which could not be used in the project as it fell out of scope. Mentioning some of the data:

1. **Special trains run by government:**
   This was done by scraping multiple railway info websites in the hope of linking it with migration. Later it was realised that this list was different from the Shramik trains that were run specially for stranded migrants.

2. **Newsletter by MOHFW (Ministry of Health and Family Welfare)**
   These posters contained weekly updates on activities and events undertaken by the Gov of India along with the status of COVID-19 infections.

5. Ideation

Ideation was also done keeping in mind the two datasets. Hence the ideas can also be chunked under similar categories.

1. **Overview:** These ideas utilise data related to migration from the timeline to give an overview of the complete(limited by the available dat) migration over the decided timespan.
2. **Stories:** These ideas are related to presentation of the recorded stories in a way which generates empathy for the migrants.

5.1 Idea 1

Overview

Taking inspiration from Hans Rosling's animated bubble chart, where he draws insights by mapping average life expectancy of various countries with respect to average per capita income on 200 years of data. I decided to present the migration data with a similar timeline which allows the user to do two things:

1. View the entire change happening in a flow.
2. Jump to a particular point in time and see the details pertaining to that particular time.

Details:

Since migration is a geographical phenomenon and the available data is also segregated location wise. I decided to use the map of India as the base map. Other data that we have regarding migration consists of:

1. Number of migrants available in each state.
2. Numbers of migrants flowing back to home states.
3. Medium of transport of migrant workers.
    a. Air
    b. Rail
    c. Road: bus, on foot, personal vehicle etc.

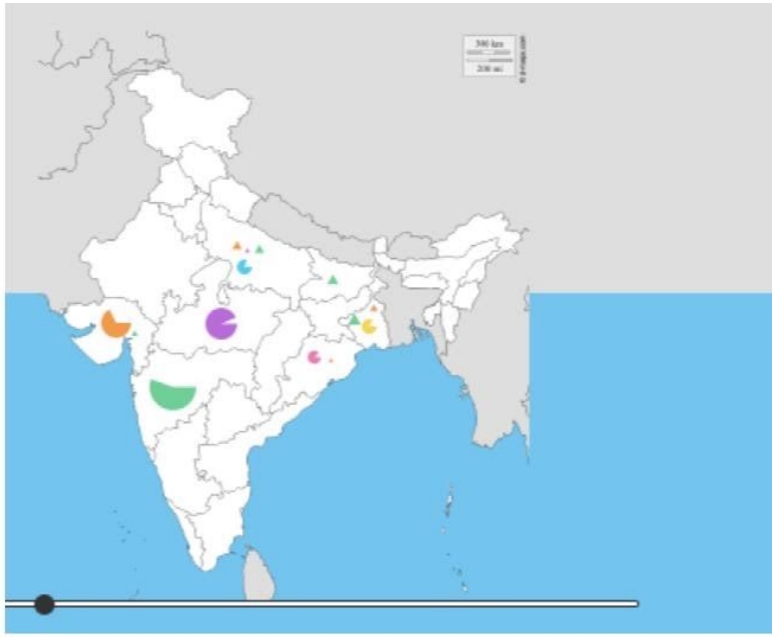


Fig 5.1(a): Migration data plotted on map of India

Encoding

a. Each of the states (selected 9 states) can be allotted a unique color to keep track of people flowing out of the state .
b. The migrant population within each state can be represented by using a circle colored with the state's color. The radius could signify the count of migrants.
c. The outgoing population can be shown as a pie removed from the circle. This way we would be able to see two pieces of information in one element.
d. Incoming population can be represented using a different shape(let's say Triangle) but with the color of the state of origin. The size of the shape can again be related to the number.

Each state can be made clickable to give more information on the data at any point of time. The details can either be shown as a popup or in a side panel. The detail could comprise of the following information:

1. Total count of migrants in the state.
2. Count and breakdown of migrants moving out of state.
3. Count and breakdown of inflow.
4. Details about the medium of travel of inflow and outflow.

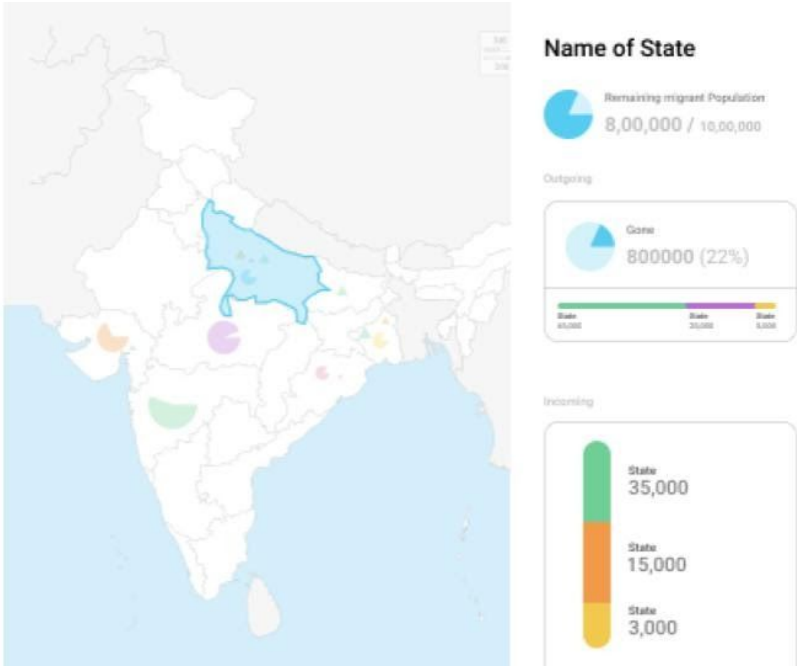


Fig 5.1(b): Detail of migration for a state

Evaluation of Idea:

1. Not able to make use of two out of four elements(migrant and personage) from timeline data.
2. Too much emphasis on the states
3. What to do with the states apart from the 9 selected states?

5.2 Idea 2

Overview

This is a slight variation of the previous idea with focus taken away from the unnecessary information on the map. Instead, the four lockdowns have been used as a base map for the viz as shown in fig 5.2(a).

Fig 5.2(a): Four lockdown periods

All the four lockdows are first imagined on a linear timeline. Then the span of each lockdown is rotated to around the same centre providing a set of four concentric rings, fig 5.2(b). Now these rings can act as a donut chart showing the distribution of migrant population amongst the selected states.

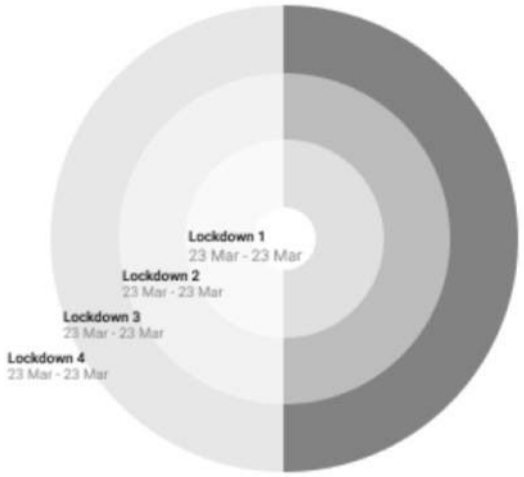


Fig 5.2(b): Four lockdown periods as concentric circles

Details

The data related to current day or week can be shown outside the circle in the form of radial bars for easy comparison, fig 5.2 (c). The user can hover over any piece of the viz to get details.

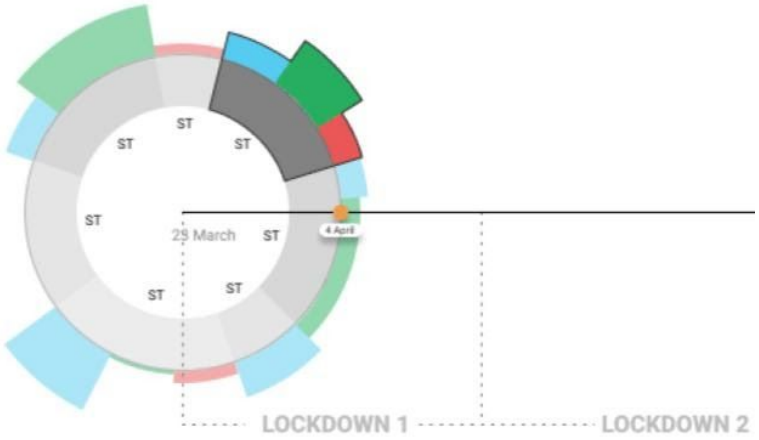


Fig 5.2(c): Data plotted on lockdown 1

Evaluation of the idea

1. Can only show one sided migration (inflow or outflow)
2. It is difficult to compare values in a donut chart because of the lack of a common sale.
3. Radial bars may create confusion because of changes along two dimensions (length and area)
4. Again the latter two data elements were not utilized

5.3 Idea 3

Stories

Presenting all the available stories to the user in the form of floating cards containing pictures and some information about a migrant, as shown in fig 5.3 (a). Users can click on any of the cards and go through the story in detail. The stories in this idea are communicated in form of timeline and pathway supported by actual docs from publications and media.

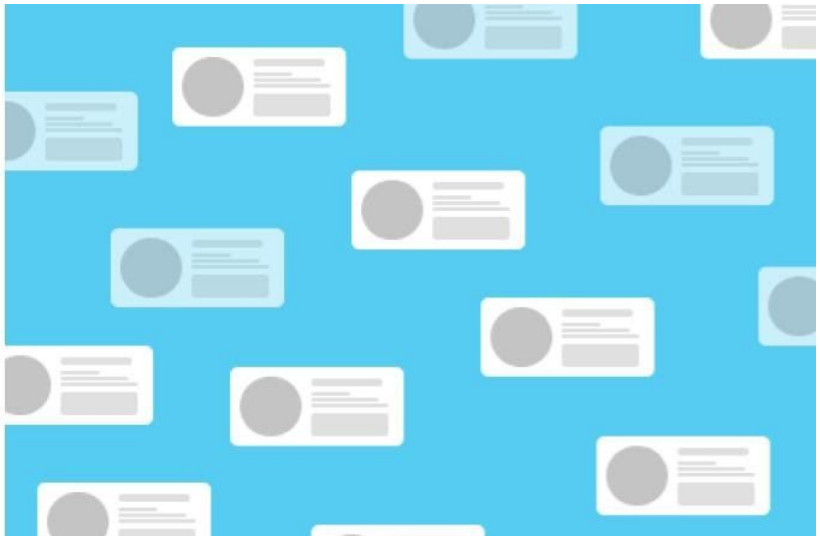


Fig 5.3(a): stories as floating cards

In the detail page (fig 5.3b) the panel on the left contains info about the migrants and a timeline about the journey, which is linked to the map on the right which shows important information in the form of icons. The bottom panel consists of a preview of original publication or other snippet form social media supporting the story.

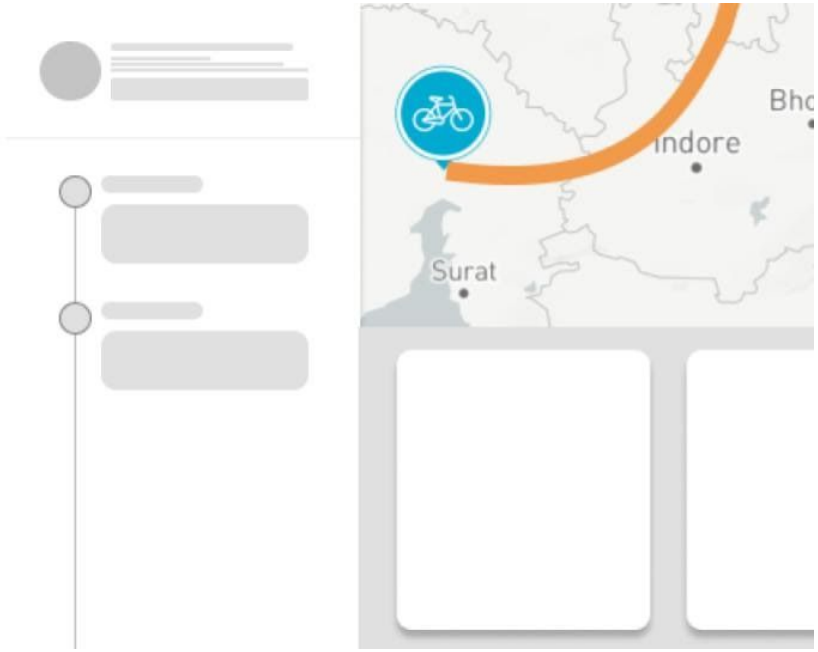


Fig 5.3(b): Detail of each story

Evaluation

1. Prime focus on reading.
2. The starting screen is overwhelming
3. No connection with the overview data would be possible

5.4 Idea 4

Stories

Fig 5.4(a): Digital representation of journey

This is another variation for the preview experience of a story. Where all the events are mapped on a horizontal timeline where a character representing the migrant would walk as you scroll(horizontal), shown in fig 5.4(a). And all the important events would be showcased using props on the path which will have popups containing text/image/video regarding the event. Props can also be used to show more context like the state or region of the event. Because there is a character representation of the migrant we can provide more details like:

1. Relevant clothing as per the persona of the migrant.
2. Medium of transportation
3. Emotions and states of the human body.

Evaluation

1. Too much illustration work required.
2. Better connect with the user.
3. More information can be delivered to the user.

5.5 Idea 5

Stories

Fig 5.5(a): Detail of each story

This is a slight variation of the story(fig 5.5a) where the user enacts as a migrant. He/she creates his/her own persona by providing details like, occupation, age, origin and date of movement. They can also pick from existing templates of personas(which can be linked to existing stories). Custom journeys can be generated for each user by utilizing data from both the datasets. Multiple choices can be presented to the user at different stages to make them feel in control. Hence better involvement in the journey.

Evaluation

1. Better taskeway for user
2. More chances of empathising with the migrants
3. Development would require more time
4. A lot of data points would be required

5.6 Idea 6

Edge Bundling

The focus here is kept on events related to two or more states. It can be migration, negotiation, border status or any other event within the states. All the (selected) states would be lined up on the circumference of the circle. Every event would be shown in the form of an arc inside the circle, starting and ending on a state. Various types of events would be color coded and their respective lines would be shown in that particular color. To add the element of time the starting and ending points of these events can further be sorted in order of time on the arc. Depending on the granularity of data available the time scale can be defined ranging from lockdown - week - day. For interactivity this scale can be shown in the form of arcs in an offsetted circle outside the previous circle.

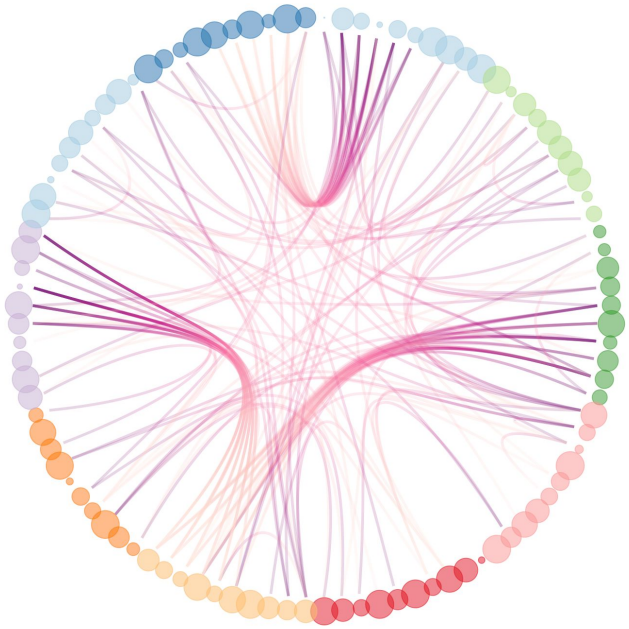


Fig 5.6(a): Edge Bundling example
(https://www.r-graph-gallery.com/310-custom-hierarchical-edge-bundling_files/figure-html/unnamed-chunk-3-3.png)

Evaluation

1. Only state to state connection data can be visualised
2. The only way of encoding data in the links is to play with color, stroke width.
3. Data with only one node cannot be represented

6. Final Design

For a complete experience we need a much elaborate plan consisting of elements from the above ideas. Hence it was decided to utilize bits from the above ideas to present a more engaging and informative narrative. Hence the following flow for the final prototype was decided as:

1. Introduction
2. Timeline
3. Stories

6.1 Introduction

This section would act like an onboarding experience where the user would get a briefing about the whole migrant scenario. The biggest challenge in this section is to decide the right amount of information that needs to be provided to the user for setting up the right context and expectations.
For this a small card sorting exercise was done where the following pieces of facts were written on separate cards and then various orders of the information were explored.

- Bharat Band
- Lockdown 1
- Lockdown 2
- Lockdown 3
- Lockdown 4
- First COVID-19 case in India
- Request for Shramik Train by Kerala govt
- Central government announces Shramik Trains
- What is a shramik train
- Stats on migrant population in India
- People who were affected
- What all was closed in Lockdown
- Passes required for interstate movement
- Quarantine centres
- Why did people start moving?
- Scale of Migration

Post this step the trimming process was conducted. This was done to make the introduction section as small as possible. In this exercise each card(starting from top) was removed one by one and then the remaining flow of information was analysed. If the flow felt incomplete or a sudden bump was noticed, the card was put back otherwise it was removed.

The order of cards remaining after the trimming process has been shown below along with the text to be used.

1. Announcement of Lockdown
   To curb down the apocalyptic projections of COVID-1919 PM Modi announced a nationwide lockdown on 24 March
2. Meaning of Lockdown
   21 day lockdown limited the movement of 1.3 billion people in an instant
3. Effects of Lockdown
   All the essential services were suspended. (transportation, education, leisure, industrial etc)

   This upended the lives of millions of people living Hand-to-mouth. Millions of daily wage workers were thrown out of work
   About 139 million of these are engaged in the informal economy and mostly migrated from other states.
4. What led to Migration
   With no work and money, they could not sustain through the high living costs of the big cities. The only choice left with them was to Go home.
5. Scale of Migration
   India witnessed what is known to be the second largest reverse migration since independence
6. Extension of Lockdown & Subsequent phases
   With an uncertain future, workers left behind were already panicked. Then came the second lockdown.
   The lockdown wave went on and the government introduced 4 lockdowns in total, stopping the country for 69 days.
7. Announcement of Shramik trains
   The government only started Shramik trains on 1May, 37 days after the first lockdown was announced
8. Stats of Shramik trains
   Till 16 June it is supposed to have transported 5.8 million migrants out of 139 million

The next step was to define the medium for portraying this information. A lot of iterations were done to finalise a medium, as shown in fig. 6.1(a)

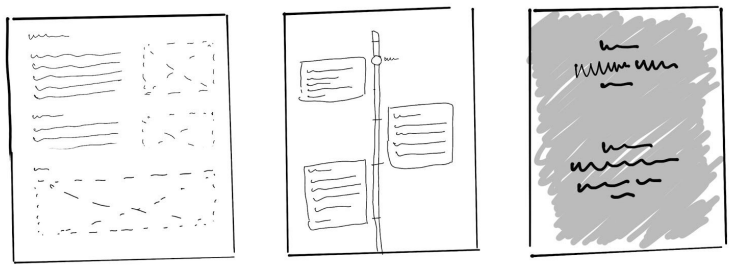


Fig 6.1 (a): Iterations tried for introduction section

Finally it was decided to use a long vertical scroll with SVG line illustrations that animate on scroll. This was done because of the following reasons:

1. Line illustrations are light and do not take away too much attention while delivering the required information.
2. The animating lines on scroll would maintain the flow of the user while keeping the experience interesting because of the revealing effect.
3. This way it would be possible to convey the information with minimum text.

Details about information section

To provide a better hook in the beginning I decided to start with a video clipping from PM Narendra Modi's announcement of lockdown 1.0 on 23rd March 2020. As shown in fig 6.1 (b) & fig 6.1 (c)

Fig 6.1(b): Screenshot of starting video from final website

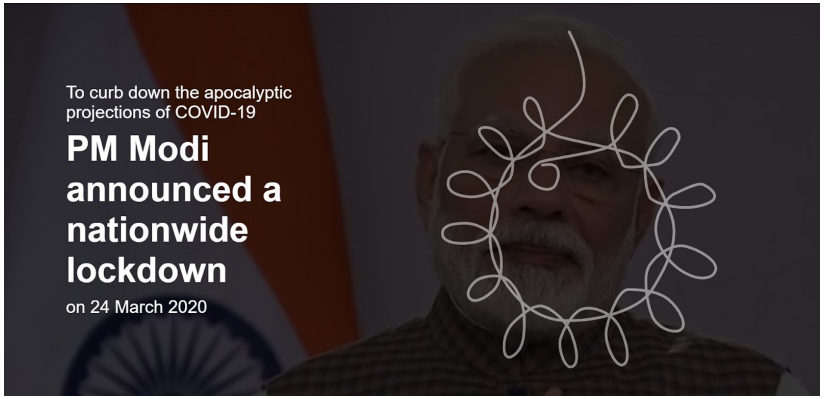
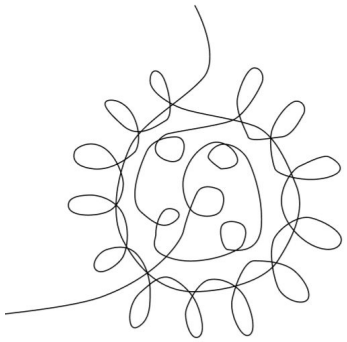


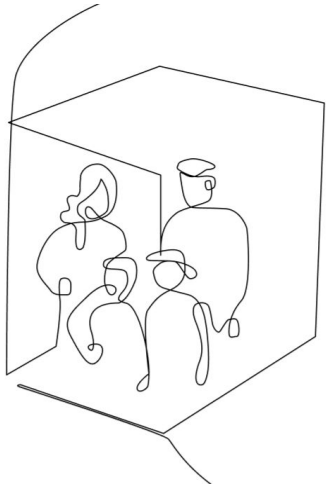
Fig 6.1(c): Screenshot of first row from final website

Finalising the illustration for each section:

1. Announcement of Lockdown



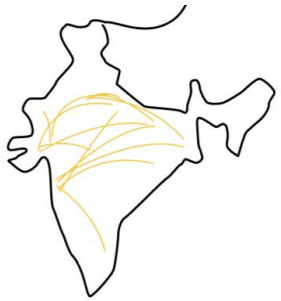
2. Meaning of lockdown



3. Effects of Lockdown

4. What led to migration

5. Scale of Migration



6. Extension of lockdown and subsequent phases

7. Announcement of Shramik Trains

6.2 The Timeline

This area would consist of a visualization for depicting the following events across the lockdown timeline.

1. Movement of people across states via shramik trains
2. Important events

a. Various clashes between public and police
b. Political clashes
c. Important announcements

3. Stories of journey of migrants
4. Deaths of migrant workers

For accomplishing this it was decided to mix and match the various visualizations explored during ideation.

Version 1:

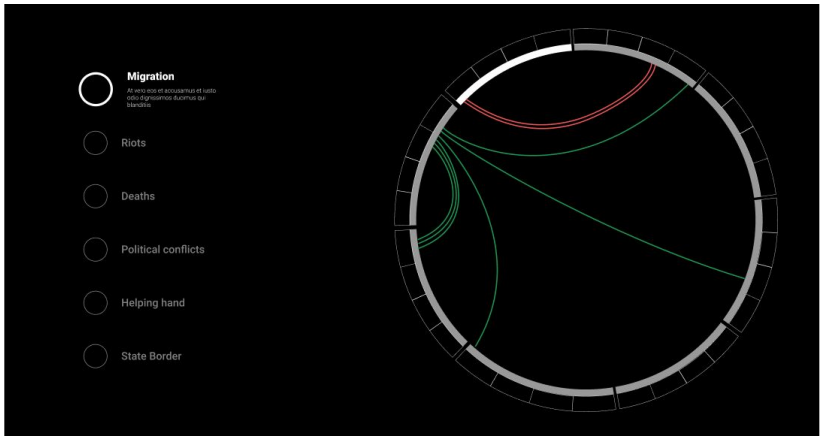


Fig 6.2 (a): Low fidelity mock of version 1 of timeline

In this a basic edge bundling diagram was visualized with each edge representing a state and various migrant movements and activities would be shown using links which would be color coded. A navigation in the left would be provided on click of which, the links belonging to that type would be highlighted.

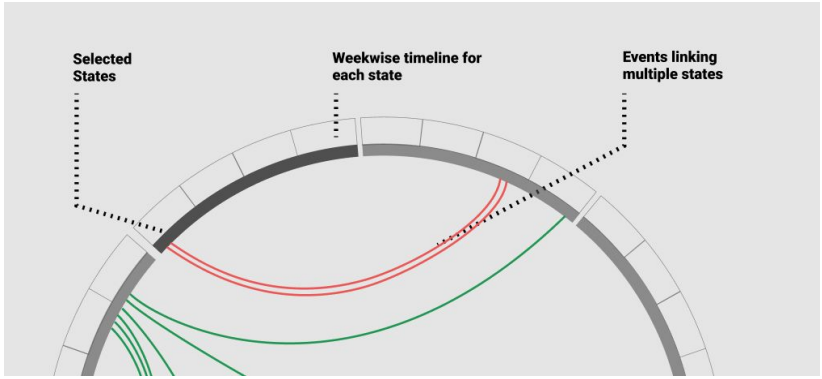


Fig 6.2 (b): details of the edge bundling diagram.

The major problem with this was that the events which were only linked to one state could not be shown. Moreover to interact with the stories user would have to hover or click on the links which is a difficult task.

Version2:

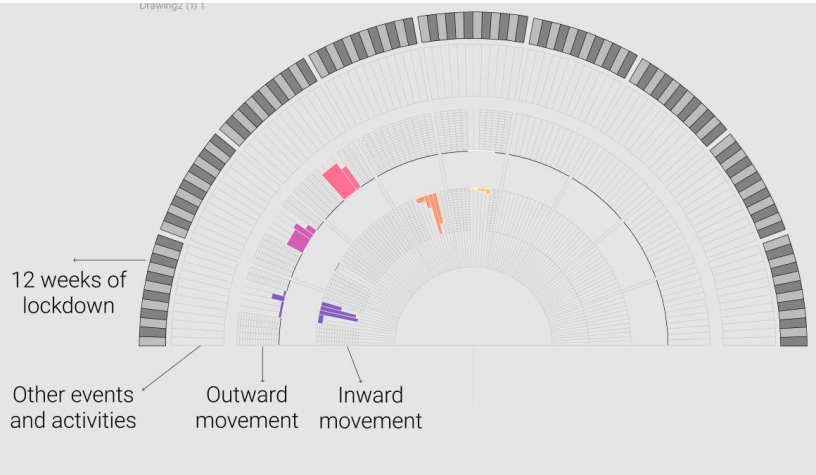


Fig 6.2 (c) : Low fidelity mock of version 2 of timeline

In this version two extra radial bar charts were added concentrically with the timeline. Looking at the granularity of the data the lockdown timeline (24 March- 14 June) was taken in the form of 12 weeks and colored alternatively for legibility. All the other activities and stories were to be depicted in the area between timeline and bar charts.
Moreover the complete shaped was transformed form a circle to a semicircle to provide more screen coverage area and hence legibility

This variant had the following problems

1. The space between the concentric charts was too less to depict the stories and events.
2. A semicircular chart reduces the angle available to each state.

Version 3

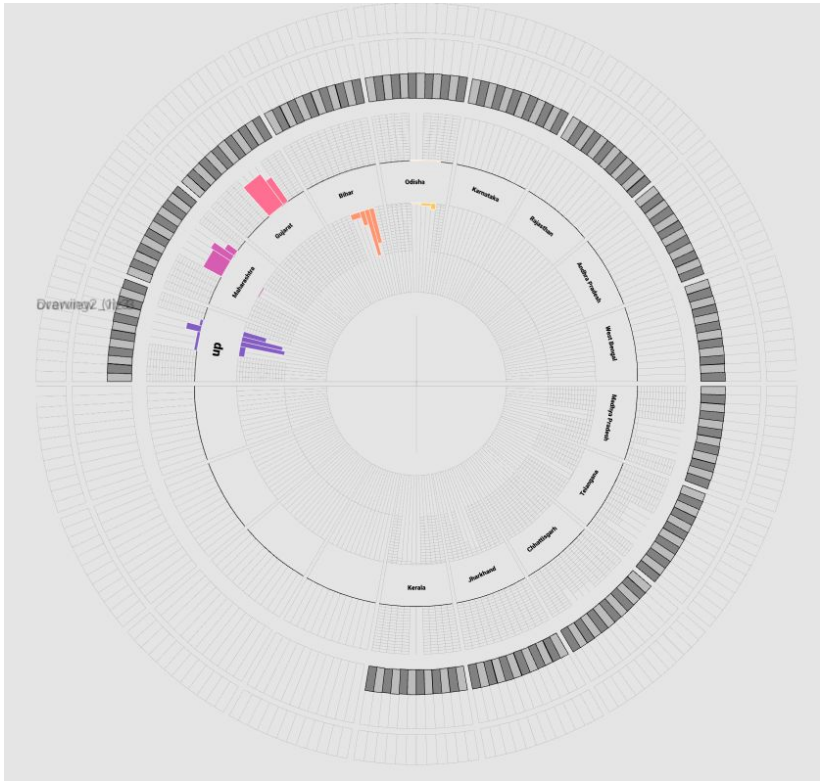


Fig 6.2 (d) : Low fidelity mock of version 3 of timeline

The areas available for each concentric chart were optimised. The radius of the innermost circle was increased to allow a wider wedge to the bar charts. The timeline area was moved closer to the bar chart (for outward movement) to allow addition of story and death related data outside the circle.all the other events can be shown in the inner-most circle. The bigger central circle can also be used to depict events not attached to a particular state.
The angle provided to each state was also increased to an extent where it provides sufficient width to individual week at the bottom most node. While maintaining a ¾ pie shape. The empty part of the pe can be utilised to provide legends and usage related information.

The final look of the visualization can be seen in fig 6.2(e)

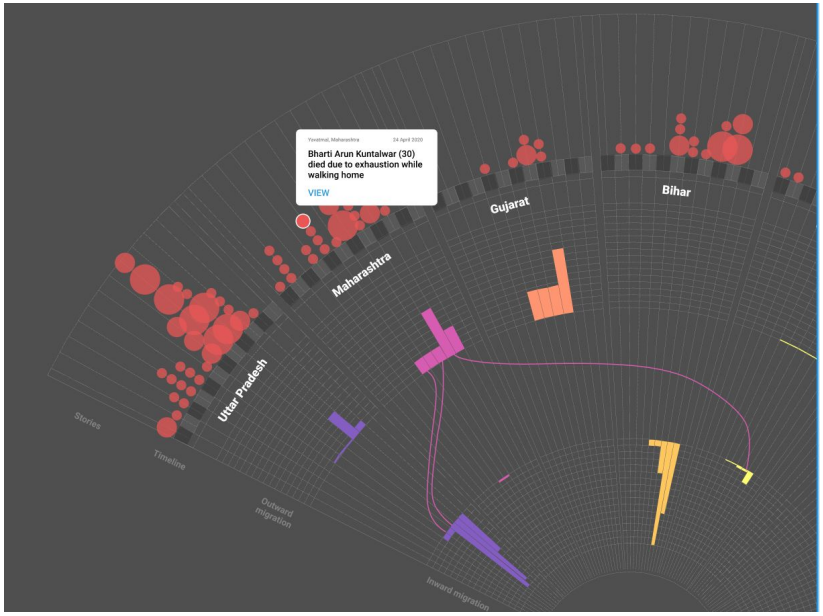


Fig 6.2(e): Final high fidelity mock of timeline visualization

6.3 Stories

This is in continuation with Idea 5.4. The stories can be triggered by clicking on their respective nodes in the timeline visualization. The motive behind the depiction of stories was to make the user empathise more with the migrants. To achieve this it was decided to do a graphical depiction of the story.

The first medium to be tried was 3D. Three.js canvas was used to create the scene and Adobe Maximo was used to animate the character. The character would do basic animations of movement on mouse movement based on the context of the story. The background and foreground of the scene would be used to show location and other sceneries for added context(fig 6.3a).

Fig 6.3(a): Low fi prototype of a story.

A lot of technical challenges were faced while trying to make a 3D human character with skins imitating indian migrant. It was even more difficult to add movement to the model. Hence it was decided to stick with the same layout and interactions but with 2D animations.

6.4 The DOT

Looking at all the different sections of the prototype the need for a binding element was realised. Hence the dot was visualised. This dot could be used to maintain the context while navigating through the document.
Some of the possible uses have been documented below.

1. Loaders
2. Pointers
3. Page transitions
4. Transformations

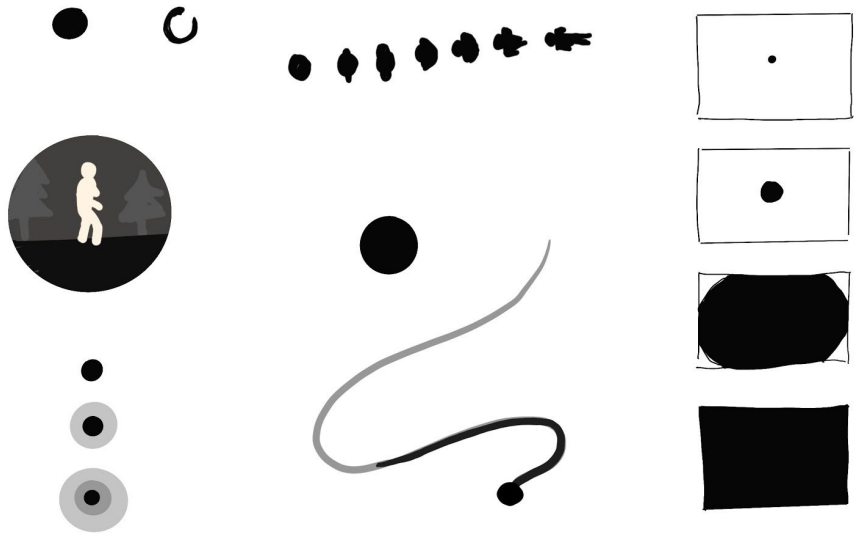


Fig 6.4(a): Ideation sketches of the dot

6.5 Color Exploration

The information is composed of pieces like pandemic, hardships, difficulties, sad stories of people etc, all of which gives it a dark theme. Hence it was decided to go all black with the website.
Black color signifies pain, grief and suffering.

Throughout the website various combinations of blacks and white are used with bright popping colors on visualizations.

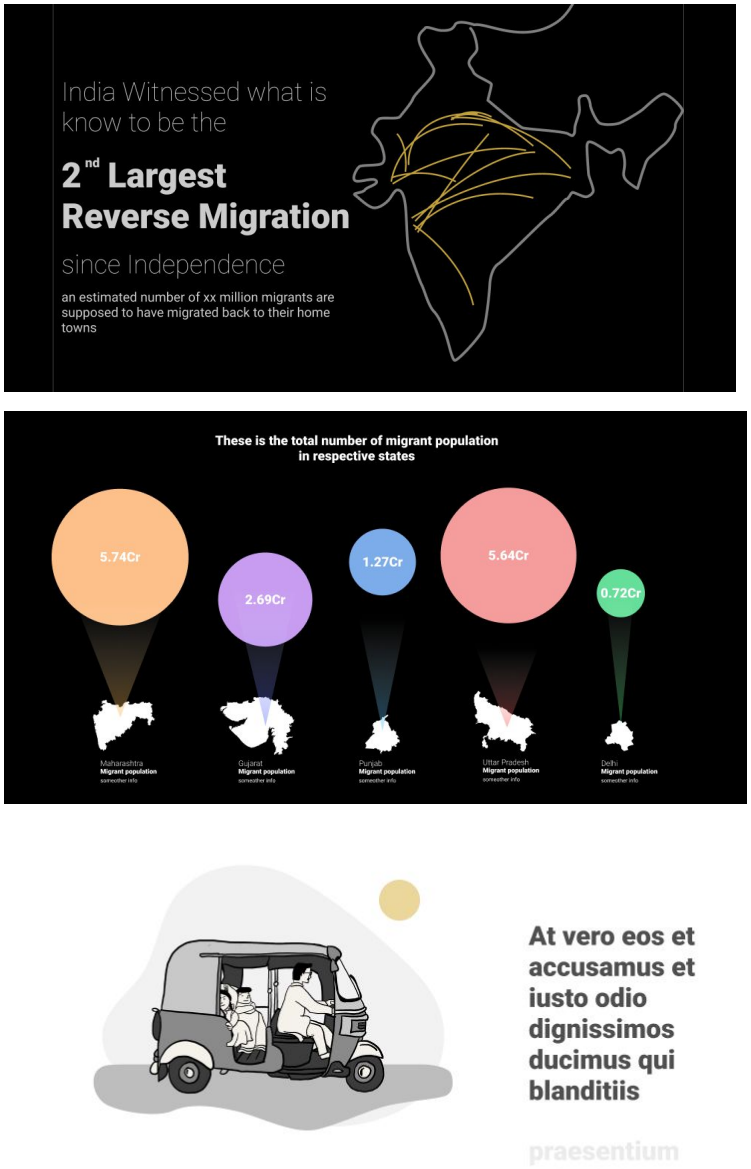


Fig 6.5(a): Screenshot from the website

7. All interactive sections

The final website can be found here. It consist of following interactive sections:

1. State-wise Migrant data
2. Unavailability of migrant data
3. Overview of timeline
4. Stories

7.1 State-wise Migration

This visualisation is a part of the introduction section. For this particular visualization a fixed physical map of India was used with scrolling text. The states can be hovered upon to see the following migration related data for the respective state.

1. Total number of Migrants in the state
2. Total number of external migrants in the state.
3. Numbers of top three migrant states.

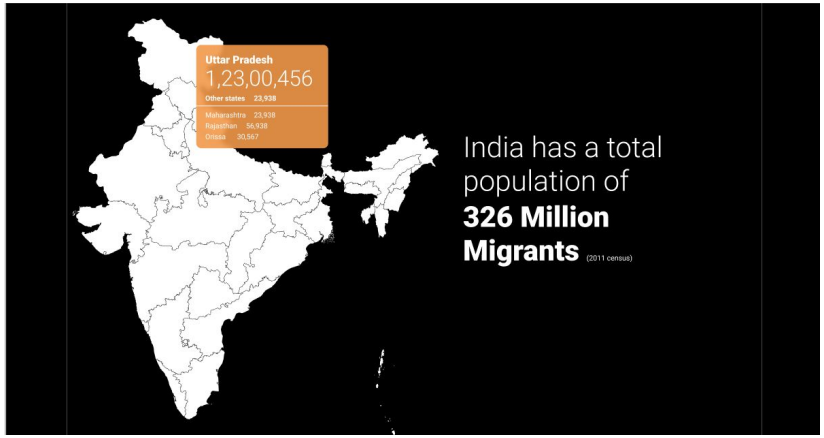


Fig 7.1(a): Screenshot of state-wise migration

7.2 Unavailability of migrant data

The motive behind this visualization was to bring out the reality of the government not being able to record data of migrants . For this following five states/UTs were selected with the highest numbers of external migrants (as per census 2011).

1. Maharashtra
2. Gujarat
3. Uttar Pradesh
4. Punjab
5. Delhi

This was done by breaking down the visualization into three parts that would transition on hover.

Step 1: Showing the total number of migrants in each state

In this step the selected states animate from their respective positions on the map of India and line up horizontally on the screen showing total number of migrants depicted by the areas of circle floating over each state(fig 7.2a).

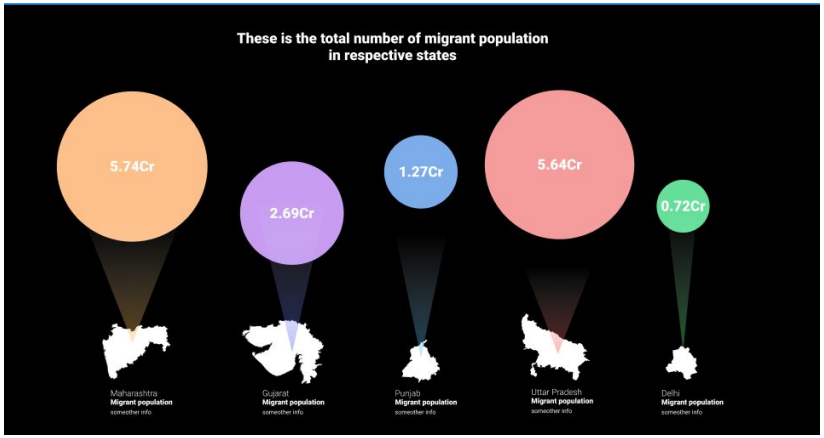


Fig 7.2(a): Screenshot of “unavailability of migration data” step 1

Step 2. Showing internal migrants

The external migrant population is shown in the form of a black circle concentric to the previous ones (fig 7.2b). The count is kept proportional to the area of the circle.

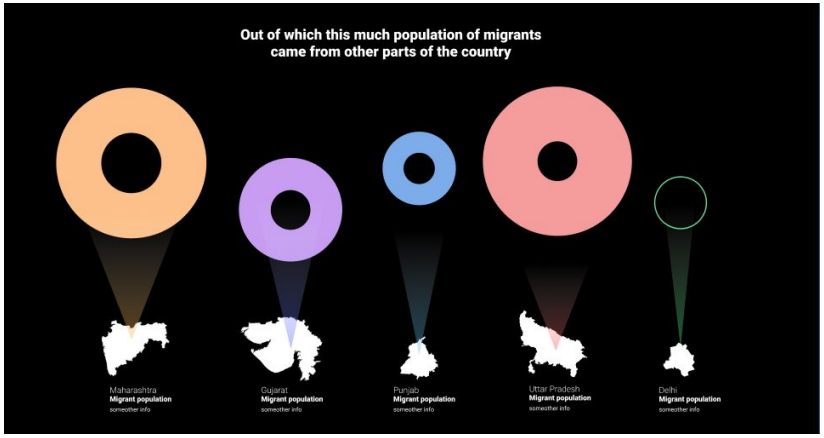


Fig 7.2(b): Screenshot of “unavailability of migration data” step 2

Step 3: Showing number of migrants transported through Shramik trains

The focus is brought to the number of external migrants by scaling up the black circles. The number of migrants transported through Shramik trains (1 May - 31 May) is then overlaid in the form of a colored wedge to highlight the emptiness of the remaining black piece(fig 7.2 c & fig 7.2 d). Which depicts the percentage of the migrants whose data is not available.

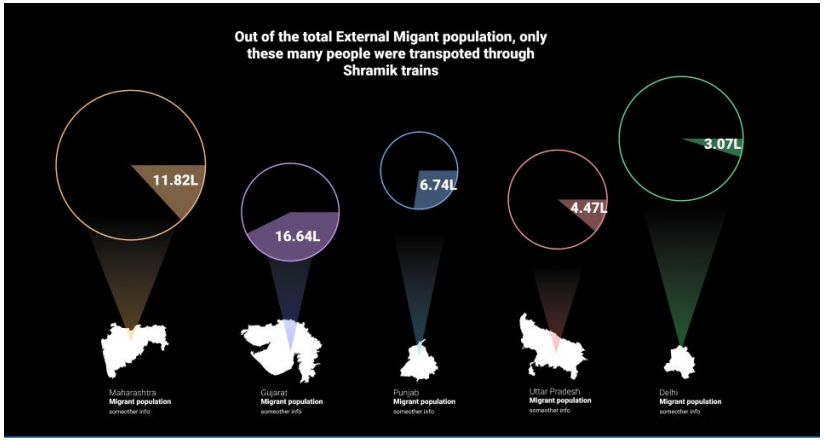


Fig 7.2(c): Screenshot of “unavailability of migration data” step 3

Fig 7.2(d): Screenshot of “unavailability of migration data” step 4

This visualization is very effective in creating that picture of scale. To add on to the intensity of this vis, additional info about various assumptions is made available to the user.

1. The migrant data is based on the 2011 census, which means the *actual numbers would be much higher*.
2. The number of migrants moved by trains is calculated with the assumption that the trains run at full capacity. When in reality some of the state governments reported that close to the end of May some of the shramik trains ran at 50% capacity or even less. Which means the *actual number would be much smaller*.
3. The trains also carried other migrants like students and stranded tourists, which means the number of actual poor migrants in the trains was even lesser.

7.3 Timeline Visualization

The final timeline visualization appears at the end of the introduction section.

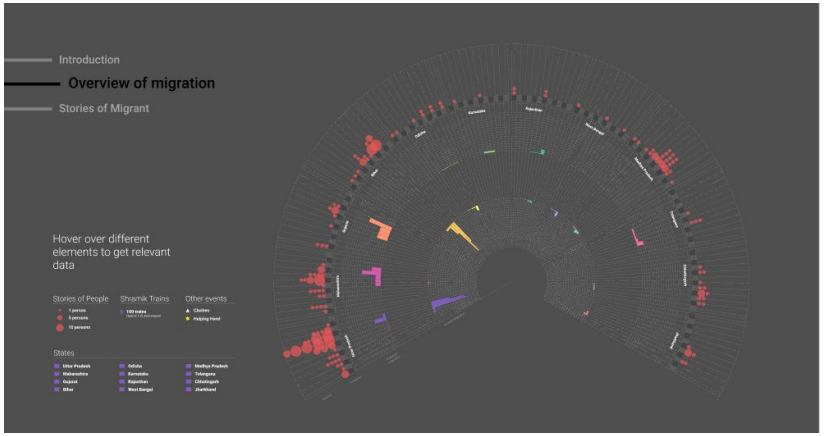


Fig 7.3(a): Screenshot of homepage of the website

The visualization acts as the home page for the website. The user can navigate into other sections using the vertical navbar on the top-left corner. The actual visualization is zoomable canvas where user can hover over different sections to get more information about the node and a link to the actual publication (fig 7.3b).

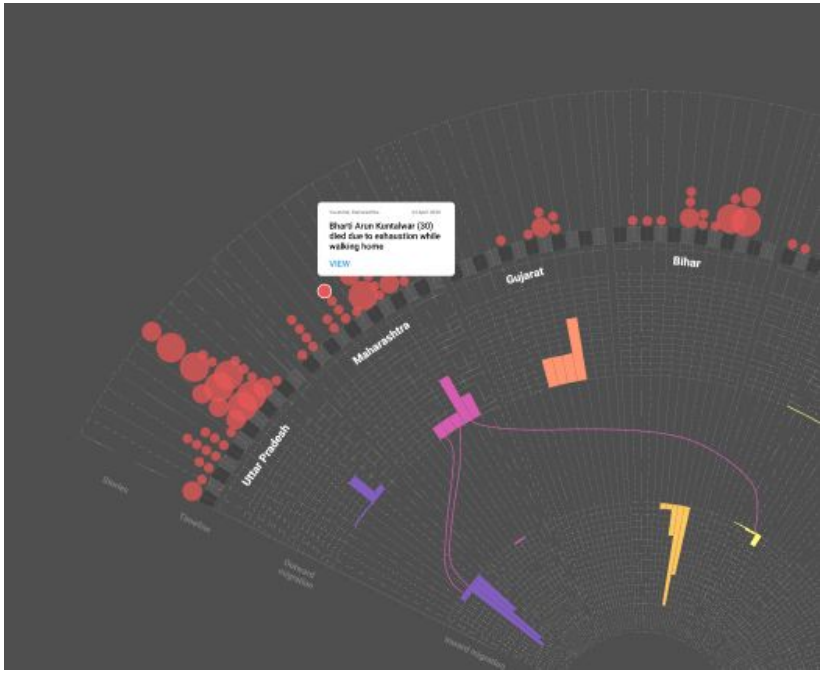


Fig 7.3(b): Screenshot of homepage of the website with hover activity

7.4 Story

This is the depiction of one of the migrant stories. This gets activated when a user clicks on a story node in the timeline visualization. The background of the story is used to depict various scenes of the story and scrolling text is shown in the right section in the foreground(fig 7.4a).

Fig 7.4(a): Screenshot from prototype of a story.

The prime mode of interaction is scroll. As the user scrolls the text on the right scrolls revealing different parts of the stories. The illustrations in the background perform 2d animation to depict the scenes.

Additionally black and whites backgrounds and dark transitions are used as per the emotion of the scene (fig 7.4b).

Fig 7.4(b): Screenshot from prototype of a dark scene of a story.

Considering time constraints,only one such story has been illustrated and animated in the final prototype.

8. Tools Used

Following tools for used for respective elements in the website.

8.1 Information

a. The page has been created in basic **HTML** and styled with **CSS**.
b. For the scroll related animation a javascript library named **ScrollMagic.js** was used.
c. For the line drawing animation a javascript library named **drawsvg.js**

8.2 Statewise-migration

a. The section was created in basic **HTML** and styled with **CSS**.
b. For the map activity **D3.js** was used

8.3 Unavailability of data viz

a. The object were created in basic **HTML** and styled with **CSS**.
b. For the scroll related animation a javascript library named **ScrollMagic.js** was used.

8.4 Timeline Viz

c. The viz was created in figma as **SVG.**
d. All the interactivity has been added by basic **jQuery** and **animation.js**

8.5 Story

d. The sketches were made in **Procreate**
e. The animations were made by animating sprite sheets using **css**

9.Evaluation Plan

For evaluation of the final website two types of tests were conducted.

Test 1: With live users
Objective: To understand and improve the experience

Users were asked to interact with the website for 10mins. Think aloud protocol was used as it would focus on user's interactions with the website. Thus helping in identifying its strength and weakness. This was followed by a semi structured interview where basic questions related to their experience with the website were asked.

Test 2: Qualitative feedback using google forms
Objective: To elicit user understanding of the topic after website usage.

A google form (https://forms.gle/jYGBXRcKLLiC2K2K6) was shared with users after they have gone through the website. The

10. Tables

Table 4.1(a) : List of domains and topics created through brainstorming.

11. Figures

12. References

[1] Nair, Shabarinath; Verma, Divya (19 May 2020). "A Policy Framework For India's COVID-19 Migration". BloombergQuint. Retrieved 25 May 2020

[2] Deshingkar, P., & Anderson, E. (2004, June) People on the move: New policy challenges for increasingly mobile populations. Priya Deshingkar and Edward Anderson. Natural Resource Perspectives. Number 92. Retrieved from http://www.odi.org.uk/nrp/nrp92.pdf

[3] India Today. (2020). Retrieved from https://www.indiatoday.in/india/story/coronavirus-migrantssprayedwithdisinfectants-on-road-in-up-bareily-dm-assures-action-1661371-2020-03-30

[4] Kundu, A. (2012). Migration and exclusionary urbanisation in India. Economic & Political Weekly, 47(26 and 27), 219–227.

[5]https://www.censusindia.gov.in/2011-Common/CensusData2011.html

Appendix

Appendix 1.
All the data used in the project can be found in respective sheets in the undermentioned file.
https://docs.google.com/spreadsheets/d/1XfWaMdbKhXc9YslbZ-Mrb9QvKh-Q8yth4ypT8NmW5IA/edit?usp=sharing

-