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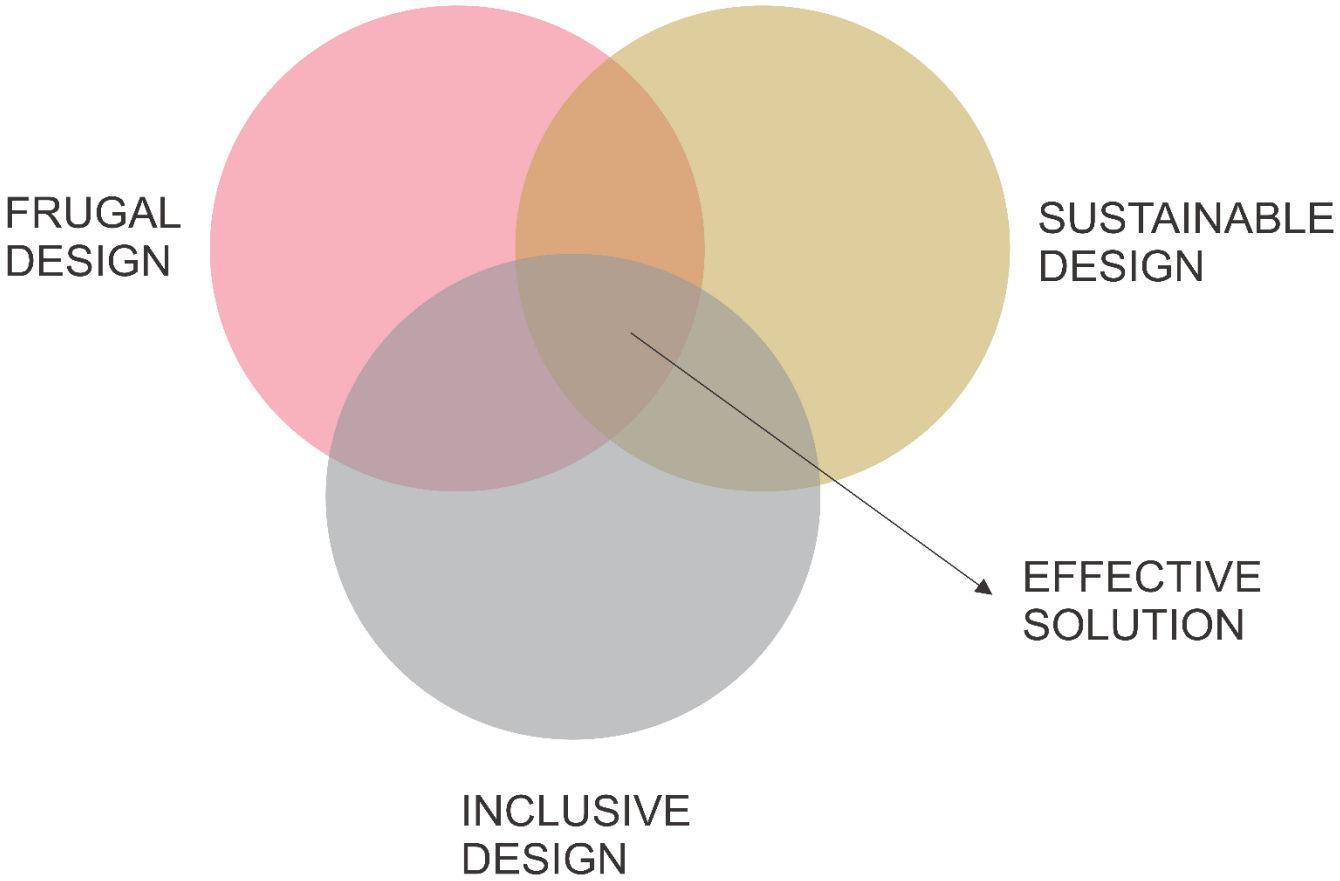
DESIGN FOR ALL



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EDITORIAL

FRUGAL INNOVATION BRIDGING GAPS OF ASSISTIVE TECHNOLOGY

Assistive technology is a specially produced technology for improving the functioning of individuals with impairments. These devices are designed to improve the user's quality of life and provide essential functional benefits. Even though there is a significant level of need in low and middle-income countries, a lack of understanding about assistive technology leads to a lack of demand. Frugal innovation has been identified as an important component in improving the economic and social quality of life. Frugal innovation addresses issues of affordability, accessibility, and functionality. Frugal innovation refers to new products and services that "seek to minimize the use of material and financial resources to lower the cost for purchasing while meeting acceptable quality standards. Numerous examples of low-cost medical equipment include the Jaipur Foot, a rubber-based prosthetic limb, and General Electric's Mac 400, an economical, portable, and simple-to-use ECG. Issues within access to high-quality, affordable AT solutions are a major issue faced by the world. These devices are essential to achieve sustainable development goals. Both the AT field and frugal innovation seek to address difficulties that affect low-income groups in resource-constrained environments. frugal innovation may be able to fill the gap between the need for assistive technology. Conventional ways of assistive technology provision have not been able to fulfill worldwide demand till date. Even within current marketplaces,

rising demand shows that traditional systems are incapable of meeting the needs of people with disability.

Frugal Innovation can be an alternate and complementary strategy to overcoming this shortage. Frugal innovation principles can be applied to the development and design of assistive technologies, making them more affordable and accessible to a broader range of users, especially in resource-constrained environments. Frugal innovation can be integrated with AT by utilizing local materials, repurposing existing technologies or catering specific needs by simple and effective solution. By embracing frugal innovation, they can create not only cost-effective but also more sustainable assistive technologies in the long term. The intersection of frugal innovation and assistive technology offers an opportunity to tackle the global challenge of providing accessible solutions for people with disabilities, particularly in regions with limited resources. The application of frugal innovation principles to the design and development of assistive technologies can contribute to increasing accessibility and inclusivity for people facing mobility, sensory, or other challenges. Frugal innovation focuses on reducing costs without compromising product quality, a crucial aspect in the assistive technology sector, where devices and solutions can be expensive. Adopting cost-effective manufacturing processes, utilizing locally available materials, and minimizing unnecessary features can make assistive technologies more affordable and accessible to a larger population. Frugal innovation often involves simplifying product designs to make them more user-friendly and easier to produce, leading to assistive devices that are easier to use, maintain, and repair. This is especially beneficial for users and emphasizing the importance of understanding local needs, frugal

innovation designs culturally and contextually relevant assistive technologies to address specific challenges faced by different communities. This localization also involves incorporating feedback from end-users in the design and development process. Frugal innovation often creates adaptable and modular products, reducing the need for frequent replacements and potentially bridging the gaps in assistive devices for people with disabilities."

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Empathetic Insights into Pregnancy Discomfort: Causes and Coping Strategies for Lower Back and Pelvic Pain

Mohammad Zaki

Abstract

Pregnancy in women, transcending societal boundaries, introduces a phase marked by substantial physical and psychological changes, often accompanied by debilitating lower back and pelvic pain, especially during the 3rd trimester. Unfortunately, a permanent solution to this pervasive issue remains elusive. Our research project seeks to enhance the quality of life for expectant mothers during this critical phase through the development of an innovative product that acknowledges and respects their resilience. This undertaking is informed by exhaustive research, interviews, and surveys to dissect the root causes and pain points experienced by pregnant women. The resultant design comprises two core elements: a Bralette and a Belly Belt. This innovative solution tactfully redistributes the load from the lower back to the shoulders, delivering maximum comfort and support. The Bralette functions as regular innerwear, with the inclusion of hooks or Velcro for the attachment of the lifting strap from the Belt, positioned under the armpit area. Our research draws from existing literature, underscoring the potential benefits of exercise and support belts in mitigating pregnancy-related back and pelvic pain. However, the distinct effects of various support belt types remain speculative, necessitating further scrutiny. Maternal Support Belts

exhibit the potential to enhance balance and Functional Reach Test scores, particularly in the third trimester. These support belts have also demonstrated efficacy in addressing symphysis pubis pain. Pregnancy-related lower back pain is pervasive, accentuating the need for proactive measures. While an array of support belts is available, only a handful have undergone scientific evaluation, revealing their effectiveness in bolstering postural stability, mitigating pain, and alleviating associated symptoms.

In summation, this research project endeavors to provide a precise, ergonomic, and pragmatic solution to the significant issue of lower back and pelvic pain during pregnancy. It acknowledges the sacrifices and patience exhibited by expectant mothers, aiming to impart happiness during this transformative period. The design, which elegantly redistributes load from the lower back to the shoulders, marks a meaningful stride in ameliorating the physical discomfort experienced by pregnant women, thereby advancing their overall well-being.

Introduction

Lower back pain is commonly described as discomfort in the lower back region, which is typically musculoskeletal in nature and can result from a combination of mechanical, circulatory, hormonal, and psychosocial factors. Pregnant women frequently experience this issue, with an estimated 50% of them reporting some form of back pain during pregnancy or in the postpartum period. The precise causes of pregnancy-specific low back pain remain somewhat ambiguous.

From a biomechanical perspective, the shifting center of gravity due to increased abdominal and breast size during pregnancy

leads to alterations in posture, such as reduced plantar arch, knee hyperextension, and pelvic anteversion. These changes create stress in the lumbar lordosis and subsequently result in tension in the paraspinal muscles. Additionally, the gravid uterus can compress major blood vessels, reducing blood flow to the spine and potentially causing low back pain, particularly in the latter stages of pregnancy. Notably, significant water retention triggered by progesterone and ligamentous laxity induced by relaxin secretion can destabilize the lumbar spine and hip joints, making them more susceptible to stress and pain.

Several risk factors associated with low back pain during pregnancy have been identified, including a history of low back pain during the menstrual period and a previous history of low back pain. Furthermore, younger patients are more likely to develop pregnancy-related low back pain, and increased body weight can lead to sacroiliac joint instability, heightened spinal flexibility, and the exacerbation or onset of low back pain. Numerous prevalence studies underscore the prevalence of low back pain during pregnancy, indicating the substantial impact it has on affected women in terms of severity, discomfort, and its adverse effects on sleep quality, physical well-being, work performance, social activities, household tasks, and leisure.

Given these considerations, this study aimed to assess the frequency of low back pain during pregnancy and examine its characteristics.

Literature Survey

The available evidence, though of limited quality, indicates that engaging in exercise may have a potential benefit in alleviating pregnancy-related low-back pain. Moreover, there is moderate to

low-quality evidence supporting the idea that any form of exercise can enhance functional ability and reduce sick leave more effectively than standard prenatal care alone. Additionally, acupuncture and craniosacral therapy have shown promise in addressing pregnancy-related pelvic pain, while osteomanipulative therapy and multi-modal interventions have also demonstrated potential benefits [1]. Pelvic discomfort typically emerged during the 14th to 21st week of pregnancy, often exacerbated by daily activities. Notably, the consistent use of support belts demonstrated a notable reduction in pain, resulting in a 20 mm decrease on the visual analogue scale. It is important to note that these findings hold true only when pregnant women utilize support belts regularly and for shorter durations.

Support belts present themselves as promising tools for mitigating pelvic pain and enhancing the overall comfort of expectant mothers. However, the distinct effects of various support belt types on global, sacroiliac joint, and back pain during pregnancy remain speculative and necessitate further investigation for validation. This observed pain alleviation could potentially be attributed to an analgesic effect combined with proprioceptive and biomechanical influences [2]. The distribution of gestational weight, often asymmetrical, leads pregnant women to adopt a posture where they arch their backs to shift the center of mass of their upper body rearward. This adjustment increases the stress on the facet joints. Simultaneously, the growth of the uterus results in the lengthening of abdominal muscles and can contribute to an increase in lumbar lordosis. To estimate these three levels, Convexity Index (CI) and Normal Arrangement Index (NAI) maps were employed.

The CI map is instrumental in identifying flat, concave, and convex regions, while the NAI map aids in distinguishing cylindrical, planar, and spherical areas. In particular, the NAI map is a valuable tool for differentiating between cylindrical, planar, and spherical regions [3]. Utilizing Maternal Support Belts (MSB) demonstrates enhancements in addressing balance deficits and positively influences Functional Reach Test (FRT) scores across all pregnancy stages, with particular benefits evident in the third trimester. MSB proves to be a valuable tool in preventing falls during pregnancy, with the third trimester reaping significant advantages [4]. The problem of symphysis pubis pain is a significant issue for some pregnant women. This research sought to evaluate the effects of exercise, guidance, and the utilization of pelvic support belts in addressing symphysis pubis dysfunction during pregnancy. Subsequent to the intervention, there was a substantial reduction in the Roland-Morris Questionnaire score, the Patient-Specific Functional Scale score, as well as in both average and worst pain scores among all participants. Importantly, it is noteworthy that, except for the average pain level, there were no statistically significant differences observed among the participant groups in relation to the other measures [5]. Lower back pain is a common issue experienced by pregnant women, with approximately 50% of expectant mothers reporting varying degrees of back pain during their pregnancy or in the postpartum phase. The main aim of this study was to explore the occurrence and characteristics of lower back pain in pregnant women. It is evident that lower back pain is a prevalent issue during pregnancy, exhibiting unique attributes and frequently reaching its peak in the second trimester. These results emphasize the importance of implementing preventive measures to improve the overall health of pregnant women and alleviate the

impact of lower back pain [6]. Most of the available belts on the market often feature endorsements from health professionals lacking substantial scientific evidence, alongside anecdotal accounts of their efficacy from previous users. Only seven distinct belt brands have undergone scientific evaluation as standalone interventions, demonstrating effectiveness in enhancing postural stability, reducing symphyseal and back pain intensity and duration, and alleviating PGP symptoms.

These belts are offered in various sizes, accommodating hip circumferences ranging from 78 cm to 178 cm. Notably, one brand, 'The Ultimate Maternity Belt,' provides options in sizes extending up to 3XL. Prices for these belts vary, spanning from approximately $20 USD to $99.95 USD, contingent on factors such as belt width, construction materials, patented designs, and additional features. Some belts are equipped with extra straps that function as extenders, allowing for adjustments to accommodate abdominal growth, and they can be worn either under the belly or around the hips (high/low) [7].

Primary Research

User Interview Questions

Users were interviewed using a variety of techniques. A set of prepared questions that we developed after revisiting the problem statement a few times and engaging in a few quick brain-writing sessions. As the users is a group of extreme cases, so the interview was conducted with 5 people with their consent.

Fig. 1 Qualitative Survey with Pregnant women in Hospital

- ***What is your daily diet?***
- ***What is your daily routine?***
- ***What is your current weight and height?***
- ***What is your occupation?***
- ***How did the pain start?***
- ***How long ago did the pain started?***
- ***What do you think is the reason behind the pain in your back/spine?***
- ***Have you been suffering the pain since pregnancy?***
- ***At what stage/month of pregnancy did you started feeling the pain?***
- ***Is there any current medical conditions or issues you are facing?***
- ***Do you have any deficiency like Vit D or calcium?***
- ***Do you use Vit D or calcium supplements?***
- ***Have you ever consulted a doctor?***
- ***What did the doctor say?***
- ***What all home or self-remedies have you tried for reducing the pain?***
- ***Did you attend physiotherapy sessions?***
- ***Did the physiotherapy or exercises helped you in reducing pain?***

- ***Please rate the amount of pain relief and comfort provided by physiotherapy or exercises?***
- ***Have you ever seen or heard about Abdomen Support Belt?***
- ***Have you ever worn Abdomen Support Belt?***
- ***Did doctor ever suggested you to wear the belt for supporting back/spine?***
- ***Did belt help you in reduction of pain and supported your back?***
- ***Please rate the amount of support and comfort provided by the support belt?***
- ***Is it comfortable to wear the Support belt?***
- ***For how long do you wear the Support belt.***
- ***What features you don't like in current Support belt?***
- ***What features you would like to be implemented in the current Support belt so that it can be worn easily?***

Doctors Reviews & Interview Questions

Doctors and specialists were interviewed using a variety of techniques. A set of prepared questions that we developed after revisiting the problem statement a few times and engaging in a few quick brain-writing sessions.

Fig. 2 Qualitative Survey with Gynaecologist

- ***What are stages of pregnancy?***

- ***What category of pregnancy does create the issues in back/spine/pelvis pain?***
- ***What category of pain issues are there in back/spine/pelvis?***
- ***What methods and steps are used by a doctor to diagnose the root cause of pain?***
- ***What are the major reasons behind the Pelvic or back pain?***
- ***Are the Symptoms of pregnancy same for every woman?***
- ***What are the changes during pregnancy in women's body?***
- ***What category of pregnant women face back pain?***
- ***What are the prominent areas of back pain?***
- ***What are the main reasons behind the back pain?***
- ***What all daily movement positions pregnant women struggle in their daily life?***
- ***Is there any relation in between back pain and size of abdomen?***
- ***What are the major issues dealt by the user regarding back pain?***
- ***What are different methods that users use to reduce the pain?***
- ***What all suggestion you provide to user for reducing the pain?***
- ***Is there a solution to reduce the compression and back pain both surgically and non-surgically?***
- ***Is there any external device available for user to use for support system?***
- ***At what stage of pregnancy, your advice a patient to wear the Maternity belts/Binders?***
- ***Does user prefer to wear the support devices?***
- ***How successful is the current solution of supporting belly and reduces the pain?***
- ***Does the existing solution work on pregnant females?***
- ***Does the existing product have any ill effect on the baby or user?***

- ***What features don't you like in current Support belt?***
- ***Have you ever advised any patient to use the maternity belt during pregnancy?***
- ***What all improvements can be made to enhance the efficiency and effectiveness of product?***

Secondary Research

The period during which a foetus develops inside a woman's womb or uterus is known as a pregnancy. When counting from the last menstrual cycle through delivery, a pregnancy typically lasts about 40 weeks, or just over 9 months. Pregnancy is divided into three trimesters, as described by healthcare professionals.

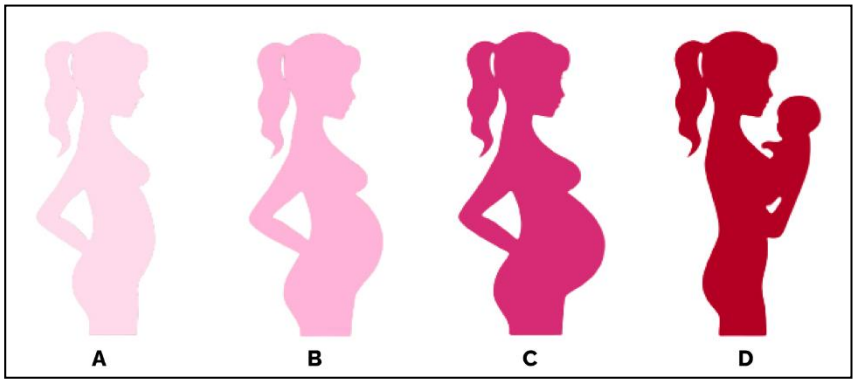

Fig. 3 Phases of Pregnant women; (A)-Women in 1st Trimester, (B)- Women in 2nd Trimester, (C)- Women in 3rd Trimester, (D)- Women in 4th Trimester

- **1st Trimester**
  - ***12 Week Foetus***
  - ***6cm Long***
  - ***End of 1st trimester, baby's heart start to beat***
  - ***Major organ starts to develop and mature***
  - ***Spine and brain begin to take shape***
  - ***Arm & Legs begin to bud***

- **2nd Trimester**
  - ***28 Week Foetus***
  - ***Women start to appear pregnant.***
  - ***Physical changes: Breast and Tummy Grow, Stretch Marks, Dark Skin Patches, Numbness on finger tips, Swelling on legs and ankles etc.***
  - ***Body ache, Light Back pain starts***
  - ***Foetus starts to move upward and inside in the uterus.***

- **3rd Trimester**
  - ***240 Week Foetus***
  - ***Women develops prominent belly.***
  - ***Physical changes: Breast and Tummy increases to full size, Stretch Marks, Dark Skin Patches, Numbness on finger tips, Swelling on legs and ankles etc.***
  - ***Body ache, Chronic pain starts in lower back and pelvic regions.***
  - ***Foetus starts to move downward and outside in the uterus. Week Foetus***
  - ***Women start to appear pregnant.***
  - ***Physical changes: Breast and Tummy Grow, Stretch Marks, Dark Skin Patches, Numbness on finger tips, Swelling on legs and ankles etc.***
  - ***Body ache, Light Back pain starts***
  - ***Foetus starts to move upward and inside in the uterus.***
- **4th Trimester**
  - ***4 - 8 weeks period after birth***
  - ***Also known as 4th trimester***
  - ***Women feels empty due to physiological changes***
  - ***Mild bleeding up to 8 weeks***

- ***Hormone level drops.***
- ***Take 3 - 5 to come back to normal.***
- ***Miss periods for 6 months***
- ***Sometimes women go in Postpartum depression due to emptiness feelings***

Spinal Areas Affected

The weight, position and size of the baby inside the womb of a women determines the level of pain and compression that will occur in the lower back and pelvic regions. Also, the level of nutrients, minerals and vitamins available in the body of the user effects the pain.

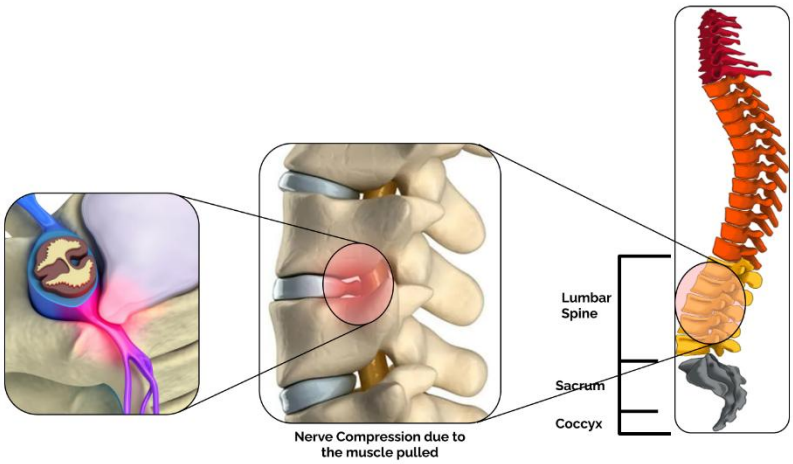

Fig. 4 Areas Affected in Spine during 3rd trimester causing Lower back pain

SPD (Symphysis Pubis Dysfunction)

A set of symptoms referred to as symphysis pubis dysfunction (SPD) is responsible for causing pain in the pelvic region. During pregnancy, pelvic joints can become stiff or move unevenly, leading to discomfort in both the front and back of the pelvis. It's estimated that up to one in five pregnant women may experience some level of SPD. This condition is a result of the release of

chemicals such as relaxin during pregnancy, which softens the muscles and ligaments in the hips, abdomen, pelvic floor, and pelvis. While SPD is not harmful to the baby, it can be exceptionally painful for the expectant mother. In severe cases, the pain may significantly impact the individual's mobility. Additionally, the baby's weight and position are believed to contribute to pelvic pain. As the pregnancy progresses, the symptoms of SPD typically become more pronounced.

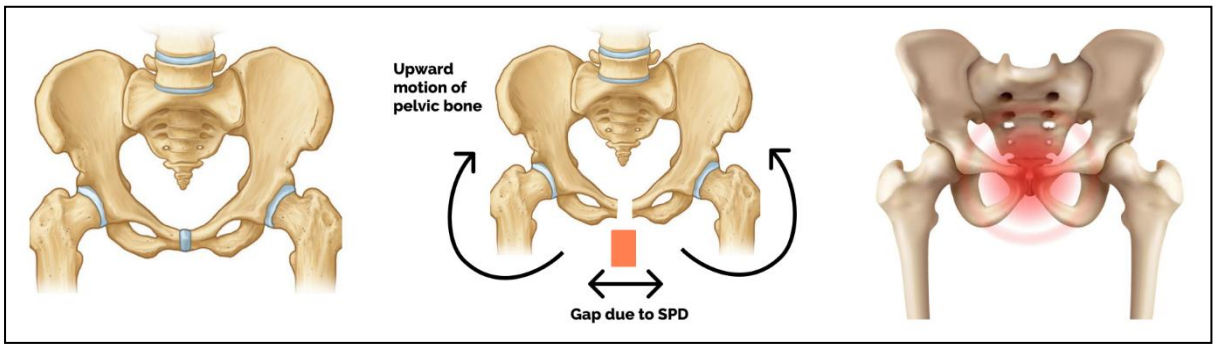

Fig. 5 Areas Affected in Pelvic area during 3rd trimester causing Lower back pain

- **Common Symptoms**
  - ***Pain in the front center of your pubic bone***
  - ***Pain in your lower back on one or both sides***
  - ***Pain in your perineum, the area between the anus & vagina***
- **Cause for Pain**
  - ***Walking***
  - ***Using stairs***
  - ***Putting your weight on one leg***
  - ***Turning over in your bed***
  - ***It might also be challenging to widen your legs.***
  - ***This can make daily tasks such as getting out of bed, getting dressed, or getting in and out of a car difficult.***

Effects of Exercise on SDP

While there is some evidence that exercise can help with lumbopelvic pain and low back pain in pregnant women, there isn't any proof that it can help with pelvic girdle discomfort. Exercise has a small protective effect against low back pain during pregnancy.

Effects of Belts/Binders

The use of belts can cause a reduction in impairment and an improvement in functioning of body normally. Therefore, the pelvic belt, and the usage of a modified belt with lumbar and PG support can dramatically lessen back and pelvic pain in pregnant women.

Current Available Design of Maternity Garments

There are basically 5 major classification of maternity garment design available for users in market to use. They are as follows

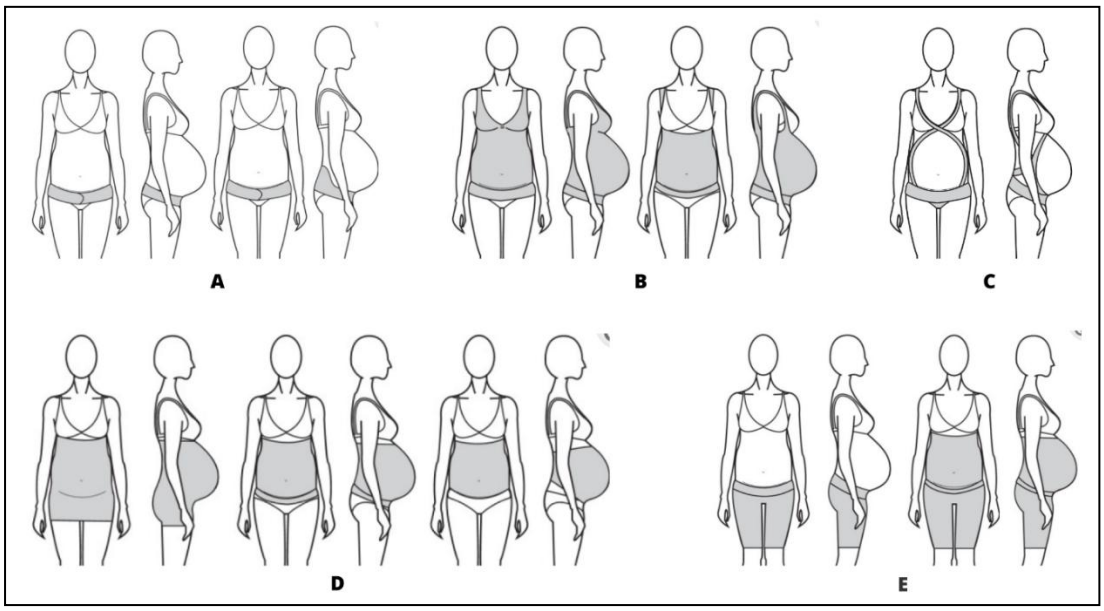

Fig. 6 Available Design of Maternity Garments; (A)- Maternity Support Belts, (B)- Full Torso MSGs, (C)- Maternity Support Cradles, (D)- Maternity Support Bands, (E)- Maternity Support Brief, Shorts and Legging

Analytics and Data

Almost 50% of women suffering from pregnancy related Lower Back Pain and seek advice from a health care professional. The symptoms get worse at night in 71.2% pregnant women with the frequency of lower back pain was 68%. The mean age of pregnant women was 26.2 years and the median gestational age was 30 weeks. 85% of women with back pain in a previous pregnancy will develop back pain in a subsequent pregnancy.

- **Target Audience - Currently there are 213 million Pregnant women present in World**
  - **World Market Size for Maternity products are -**
    - **2022 - USD 19.08 Billion**
    - **2029 - USD 25.62 Billion with CAGR - 4.8% (Expected)**
  - **Birth rate of India per 1000 people**
    - **2021 - 17.37 Births**
    - **2020 - 17.59 Births**
    - **2019 - 17.80 Births**
    - **2018 - 18.02 Births**

User Persona

I have built 3 user persona profile to understand pain and gain points of the user. 1st User Persona is a new mother who is facing her 1st ever delivery, the 2nd User Persona is a 2nd time mother who is facing her 2nd delivery, and the 3rd User Persona is a new mother who has just given birth 2 weeks ago and is in her Postpartum period.

- **1st Time Mother**

Bio	**About**
Name – Simran Age – 27 years Occupation – Accountant Place – Ghaziabad Number of Child – 0 Pregnancy – 1st	Simran is 1st time mother. She works as an accountant in a MNC in Noida. She lives with her husband and belongs to Meerut, UP. She is in her 7th month of pregnancy. She is a little anxious and scared as its her 1st time and she has twins. She hopes for a healthy and normal delivery.

Pain Points

- Handling the other child while being in pregnancy
- Problem in doing Daily chores
- Sometimes problem in sleeping due to back pain
- Fatigue happens when standing for longer duration and back starts to ache.

Gain Points

- To have lesser Back Pain
- Can do daily chores easily
- To have relaxed back
- To have a safe and healthy baby

Bio	**About**
Name – Mehak Age – 34 years Occupation – Teacher Place – Delhi Number of Child – 1 Pregnancy – 2nd	Mehak is teacher in a Private School of Delhi. She lives with her In-Laws and belongs to Indore, MP. She has a 4-year-old daughter, Payal. Mehak is in her 8th month of pregnancy. She is very good and caring mother. Her utmost priority is to give best ordination and upbringing to her kids.

- **2nd Time Mother**

Pain Points

- **Problem in Sitting up and down.**
- **Sleeping in straight postures.**
- **Cannot do anything in pain and have to bear it anyway.**
- **Feels like a bag of potato.**
- **Have joint Pains.**

Gain Points

- **To reduce pain anyhow.**
- **Can do movement easily.**
- **don't want to feel like Bag of potato.**
- **Reduce joint pains.**
- **Lift the belly anyhow to remove stress.**

- **Postpartum Period Mother**

Bio	**About**
Name – Rabiya Age – 26 years Occupation – HR Place – Gurugram Number of Child – 1 Pregnancy – 1st	Rabiya is an HR in a Bank located in Delhi. She lives with her In-Laws and belongs to Delhi. She is in her Postpartum period of pregnancy. She had C - section delivery due to some complications. She faced her back pain since 7th month of pregnancy. She is very good and caring mother.

Empathy Mapping

Using Empathy mapping as a visualisation tool to understands about a user. With the aid of this tool, we wearable to gain a deeper knowledge of the "why" behind user needs and desires.

- **S**

imr

Say	**Thinks**
Pain in back.	Can bear the pain.
Sleeping problems	Pain is for short period.
Fatigue due to weight of baby.	Can feels relaxed if weight is less
Not able to do Daily chores	Pain will be gone after delivery

tpartum

ıores.

- Problem in standing up due to back pain during pregnancy.
- Has stretch marks and pigmentation on belly.

Gain Points

- To minimize Back Pain
- Can go back to normal lifestyle.
- To feel cheerful.
- To make her baby healthy and happy.

an (1st Time Mother)

Feels	**Does**
Feels uncomfortable.	Lie or sit down when feels pain.
Unbearable pain sometimes.	Massage the back and take painkillers.
Not able to sleep, stand, sit.	Take support while doing chores.
Movement increases pain.	Try to do less work.
	Do walking, exercise and physiotherapy.

- **Mehak (2nd Time Mother)**

Say

Pains a lot in lower back.

Sleeping problem if paining.

Unbearable pain sometime.

Problem in sitting up & down.

Thinks

Pain will go away soon.

Pain is due to twins.

Can feels relaxed if weight is less

Baby should not be harmed

Feels

Feels uncomfortable.

Unbearable pain.

Not able to sleep, stand, sit.

Jerky movement increases

Does

Lie or sit down when feels pain.

Massage the back with ointment.

Take painkillers.

Take support while doing chores.

Try to do less work.

Try to relax and sleep.

Do walking, exercise and physiotherapy.

Apply ice pack on the back.

- **R**

abi ya (Po stp art um Period)

Say

Was to have pain in back during pregnancy.

Feels in depressed.

Feels empty like something is lost

Thinks

Will have to suffer this.

My baby needs my attention.

Depression will go away.

Back pain was due to complications

Feels	Does
Feels depressed.	Lie or sit down when feels pain.
Feels empty.	Massage the back.
Still feels slight pain some times.	Try to relax.
Bearable pain and will fade in	Do walking, exercise and yoga
some time. pain.	Apply ointments or ice packs.
Pain is only for some time.	

User Needs and Requirements

After doing the research and analysis of all the reviews, interviews, data and surveys we go to noted down the need, requirement and Insights of user in the product and what they demand in the product.

- **More Comfortable Material - Comfortable, breathable and soft in feel**
- **Overall Surround Support - Should provide overall support to belly & womb**
- **Stretchable Material - Should be elastic and stretchable**
- **Flexibility in Material - Should have Flexibility and adjustability**
- **Good Fabric - Fabric and material should be skin friendly and soft**
- **Low Impression Fabric - Product should not leave any marks or impressions of skin**
- **Overall Affordability - Product should be affordable**
- **Easy to Wear - Product should be easy to wear and remove without any fuss**

How Might We Statements

After having the research data, we analysed it. The pain points and insights of users were gathered on sticky notes. Then the clusters were formed and common pain points of users were observed. These pain points were then converted into HOW MIGHT WE? questions. These questions were later on used during the Concept exploration, prototyping.

- **How might we bring the comfort in back and pelvis region of a user?**
- **How might we try to reduce the stress from spine of a pregnant women without effecting the health of baby?**

Problem Statement

A way to reduce the Lower back pain amongst pregnant women to achieve overall comfortable pregnancy experience during there last trimester.

Concept Exploration

Crazy 8 Method

Using of crazy 8 method for idea generation and HMWs as a reference, I brainstormed and noted all the wild, basic, stupid, amazing ideas that came to our mind. Useful and feasible ideas from these are being used currently for generation.

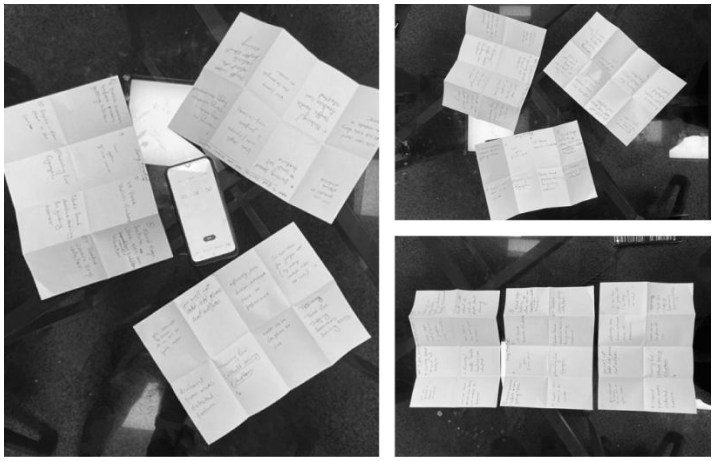

Fig. 7 Crazy 8 Method

Feasible Ideas	Crazy Ideas
Was to have pain in back during pregnancy.	Mechanical Straps
Feels in depressed.	Spinal Straps
Feels empty like something is lost	Metal Strapping around body
Has stretch mark and	Body Web
	Belts with stockings

for Concept Exploration

Human Factor Criteria

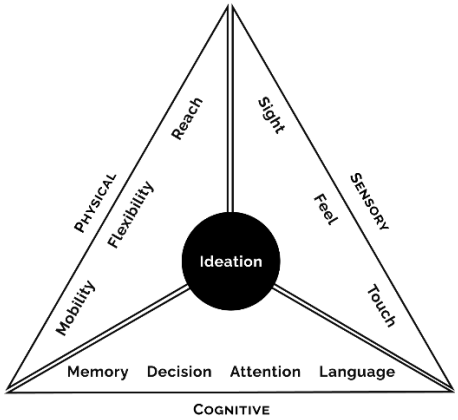

Fig. 8 Human Factor Criteria for Development and selection of Concept

Ideation

With the help of research and analysis I have tried to generate the ideation and concept keeping the constraints, needs, requirements demand and comfort the user. There were many iterations and variations before we reached the final design solution.

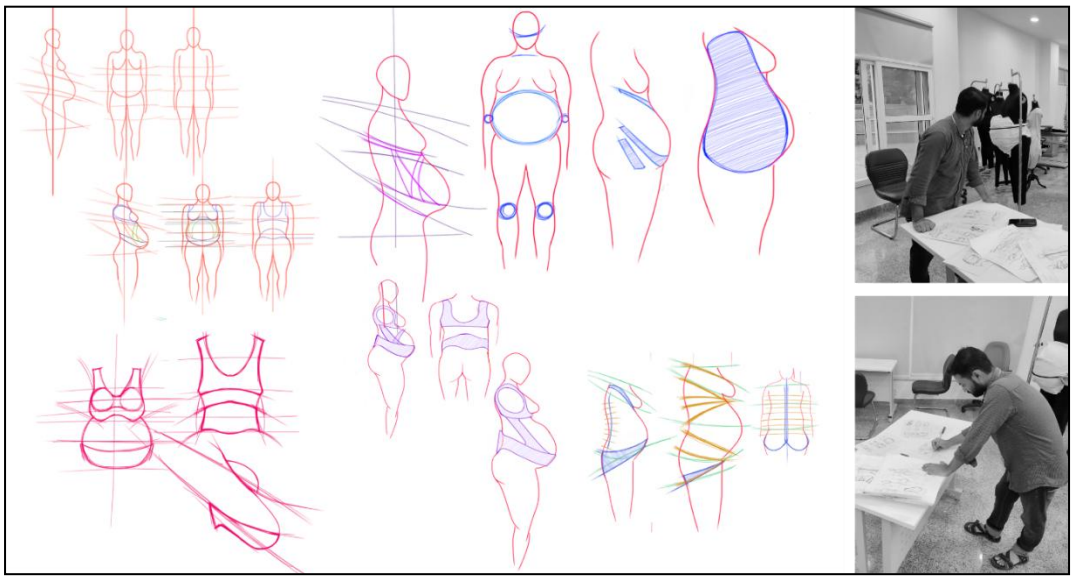

Fig. 9 Ideation and Concept Exploration

Render and Working

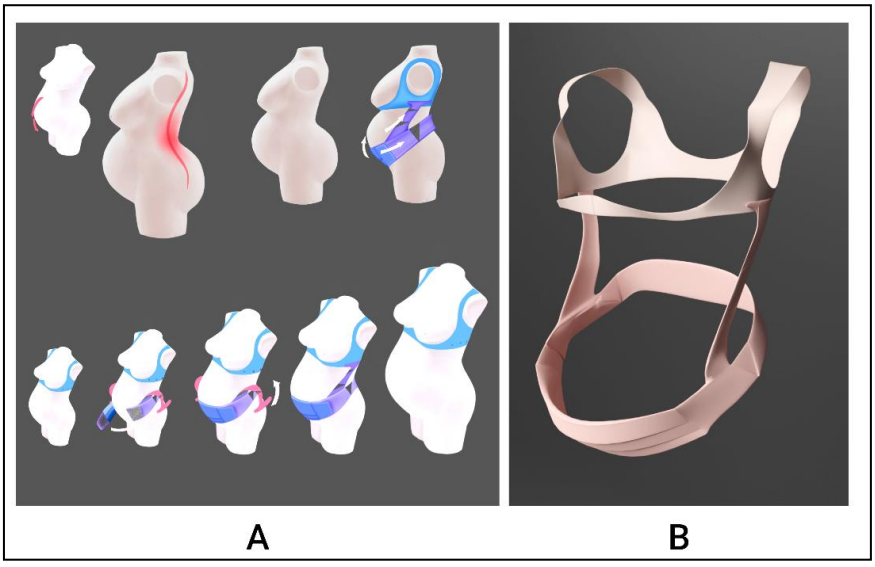

Fig. 10 (A)Working concept of Product; (B)3D Render of Product

In the figure 10 there is a representation of the load distribution and product wearability technique. There are 2 major components of the product, a Bralette and a Belt. The Bralette can be worn like a normal brassiere. Under the armpit area, near the middle of rim there can be hooks or Micro hook Velcro so that its easier to attach the lifting strap of the belt. The belt can be worn like a normal support belt. The belt will have layered front end which allows the belt to be flexible to adjust and allows air to circulate through layers to reduce the humidity under belt. The closing strap being in front end allows women to access the closing of belt easier with the help of Velcro. Unlike the regular maternity belts the load is divided into two directions and in which majority will be directed towards the shoulder through bralette.

Prototyping

An attempt to prototype the design was conducted to evaluate the feasibility of the product in real life. In the figure given below, the low fidelity prototype with a belly resembling the womb of pregnant women and blue colour wrap is the prototype of the product.

Fig.11 Prototype of the Product

Conclusion

In conclusion, this research project addresses a significant issue affecting pregnant women during their 3rd trimester, namely, the discomfort and pain in the lower back and pelvic region. This problem is widespread and often goes unmitigated due to the absence of a permanent solution. With a deep respect for the women who endure this pain and the sacrifices they make for the sake of motherhood, the project aimed to develop a product that could enhance their quality of life during pregnancy. Extensive research, interviews, and surveys were conducted to understand the root causes of this problem and the pain points experienced by users. The result is a thoughtful and ergonomic solution, comprising a Bralette and a Belly Belt, which redistributes the load from the lower back to the shoulders. This design not only offers maximum comfort and support but also maintains simplicity, aesthetics, and wearability. Ultimately, this project represents a significant step towards alleviating the physical discomfort experienced by pregnant women, contributing to their well-being during a crucial phase of life.

Abbreviations

CAGR – Compound annual growth rate

SPD – Symphysis pubic Dysfunction

PGP – Pelvic Girdle Pain

MSG – Maternity support garment

PGP – Pelvic girdle pain

LBP – Lower Back Pain

CI – Convexity Index

NAI – Normal Arrangement Index

MSB – Maternal Support Belts

FRT – Functional Reach Test

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Let's Cook: Simplifying Cooking for Youngsters Living Away from Family

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Abstract:

"Let's Cook" is a health recipe application designed to streamline cooking-related chores for young individuals living away from their families. This project aims to address the common challenges faced by this demographic, such as unhealthy eating habits and limited cooking knowledge (Nicole I. Larson C. L.-S.)**, by offering personalized, easy-to-follow recipes and a convenient ingredients delivery service. The application is built with user-centricity in mind, ensuring that it meets the needs and preferences of its target audience.**

To achieve this goal, extensive user research was conducted, including interviews, surveys, and competitive analysis, to gain valuable insights and understand user pain points. The findings were used to develop a comprehensive design strategy, encompassing elements like user personas, journey maps, empathy maps, and a well-defined problem statement.

The project's development phase involved brainstorming and information architecture to create innovative solutions that cater to the specific needs of the users. Wireframes, style guides, and a

click-through prototype were meticulously crafted, ensuring that the interface not only complements the application's functionality but also maintains a high standard of design.

To validate the user-friendliness and effectiveness of the application, usability testing was conducted, and user feedback was incorporated into the final design. The "Let's Cook" project offers a holistic solution to the challenges faced by young adults living away from their families, ultimately promoting a healthier and more convenient cooking experience.

Key Words:

Health Recipe Application, Young Individuals, Simplifying Cooking-related Chores, Ingredients Delivery Service, Unhealthy Eating Habits, Limited Cooking Knowledge, Personalized Recipes

Introduction:

In today's fast-paced world, the transition to independent living is a hallmark of young adulthood. Yet, along with newfound freedom comes a challenge that many young individuals face: the need to cook and maintain a balanced, healthy diet (University, 2015)**. The "Let's Cook" project has emerged as a beacon of innovation, offering a health recipe application tailored to the unique needs of those living away from their families. This article takes you on a journey through the development and impact of "Let's Cook," a revolutionary solution designed to address the common culinary challenges faced by this demographic.** (Anna Hertzler, 1992)

Empowering Independence with "Let's Cook":

Young adults venturing out on their own are often confronted with the twin dilemmas of unhealthy eating habits and limited cooking knowledge (Samara Joy Nielsen, 2002), (Nicole I. Larson M. S.-S., 2006). "Let's Cook" steps in as a guiding light, embracing user-centricity as its guiding principle. The foundation of this project is built on extensive user research, delving deep into the experiences and preferences of the target audience.

Extensive user research methods, such as interviews, surveys, and competitive analysis, were employed to gain invaluable insights into the pain points of young individuals living independently. This research laid the groundwork for a comprehensive design strategy that includes elements like user personas, journey maps, empathy maps, and a well-defined problem statement. The goal was clear: to create a cooking solution that truly resonates with its users.

Empathize:

During the Empathize stage, we conducted user research to gain insights from various users, in order to formulate a comprehensive design strategy. We engaged with a diverse range of users, actively inquiring about their challenges and concerns.

We interviewed 12 potential users over video calls to understand the challenges they face while cooking. A few sample questions are listed below:

1.*From where do you have your meals usually?*

2.Do you like home cooked food?

3.How often do you order food from outside?

4.Do you cook yourself? How much would you rate yourself in cooking?

5.Do you have any plans or follow any diet plan?

6.Do you have any cheat days?

7.What is your cooking journey?

8.How do you find new recipes?

9.What problems do you face while cooking a new recipe from the internet?

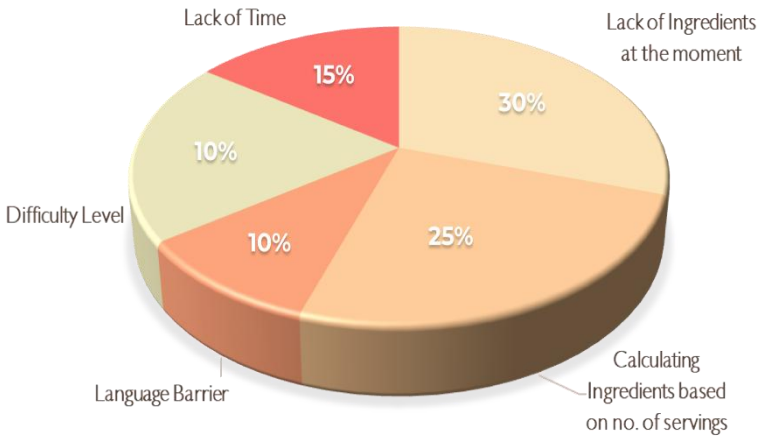
10.Do you avoid any ingredients while cooking?

11.What do you do when you come to know you are lacking on some ingredients while cooking?

12.How do you manage your grocery shopping? Any online apps?

13. What is your biggest roadblock from cooking meals yourself?

14. Do you have any favorite celebrity chef? What do you like the most about him and his channel?



Quantitative Analysis:

We circulated survey form to about 30 potential users to understand the challenges they face while cooking.

Competitive Analysis:

We mapped out 2 competitors and did a competitive analysis to

Figure 1 Pie diagram showing challenges faced by people while cooking.

assess the strengths and weaknesses of current competitors and

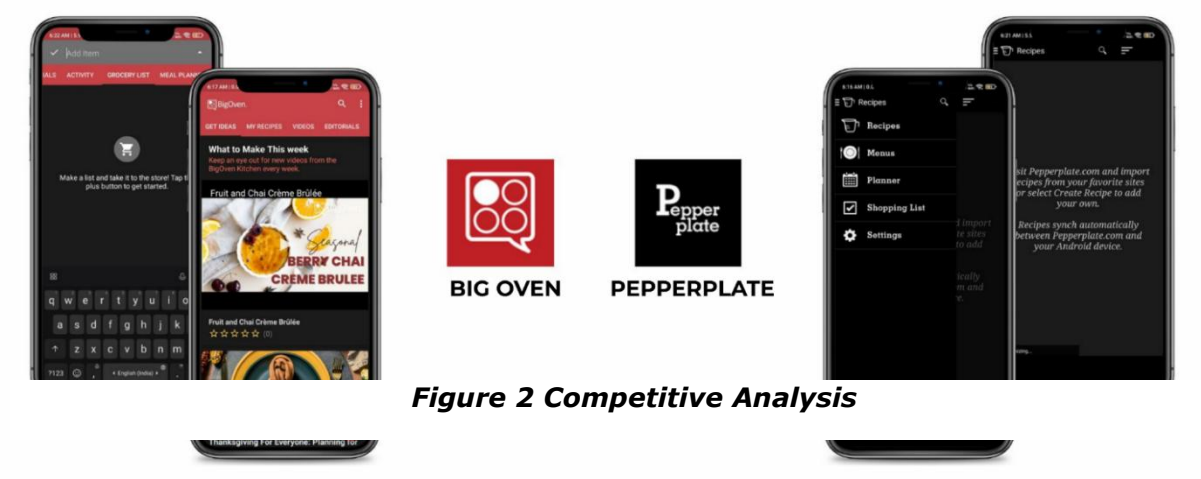


Figure 2 Competitive Analysis

build a strategy, identifying potential opportunities to outperform. (BigOven, 2022) (Pepperplate, 2022)

Table 1 Competitive Analysis (BigOven, 2022) (Pepperplate, 2022)

Applications	BIGOVEN	PEPPERPLATE
Features	• Basic search • Grocery list • Use up leftovers • Menu planner	• Manage recipes • Plan meals • Build shopping list • Add own recipes.
Strengths	• Easy to navigate. • Aesthetically pleasing.	• Add as many recipes as you want. • Cook Now feature allows you to set timer while viewing the recipe.
Pain Points	• No icons • Meal planner is dysfunctional. Need subscription. • To add items in the grocery list, you will have to manually enter every item.	• Poorly designed user interface. • No colour theme used. Black colour is used. • Icons used are not easy to understand. • Multiple fonts used. • You have import recipes on their site from other websites and then check it in the app.
Opportunities	• Icons could be used instead of only text. • In home page, different sections could be added for the ease in searching recipes instead of scrolling. • Different categories for grocery items could be provided for the ease of searching.	• A suitable colour theme could be used. • Recipes could be self imported rather than uploading it each time to the website. • User interface could be improved.

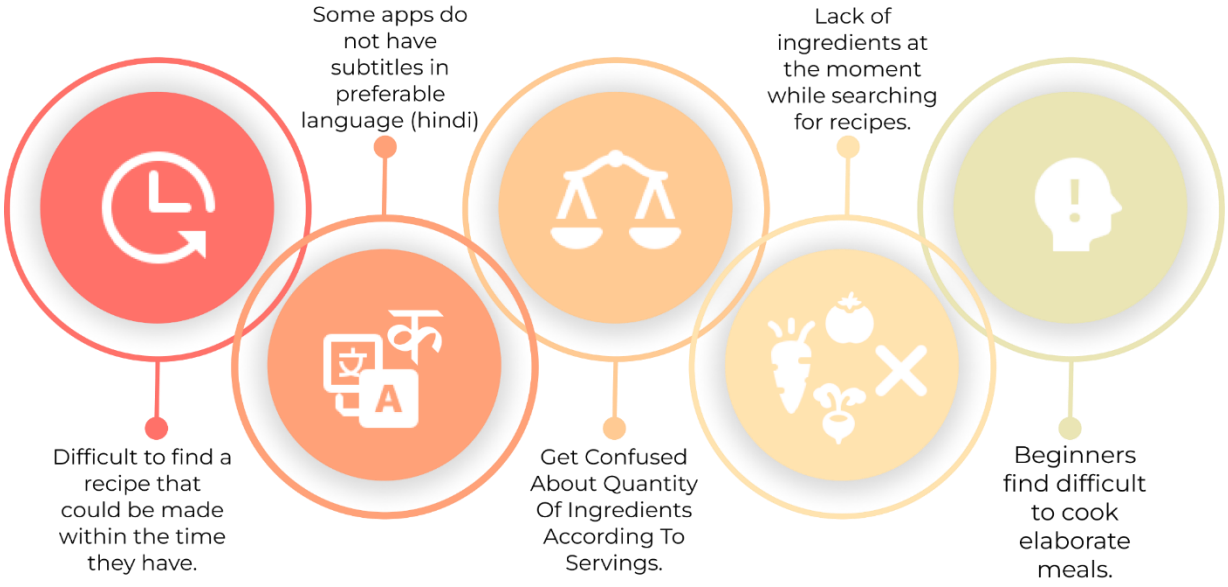


Figure 3 Key Insights from user interviews, Survey and Competitive analysis

Define

In the Define stage, we gathered research data and created strategic elements like User Journey, User Persona, Empathy map, Information Architecture, Site maps, Wireframing, and more.

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Figure 4 User Persona 1

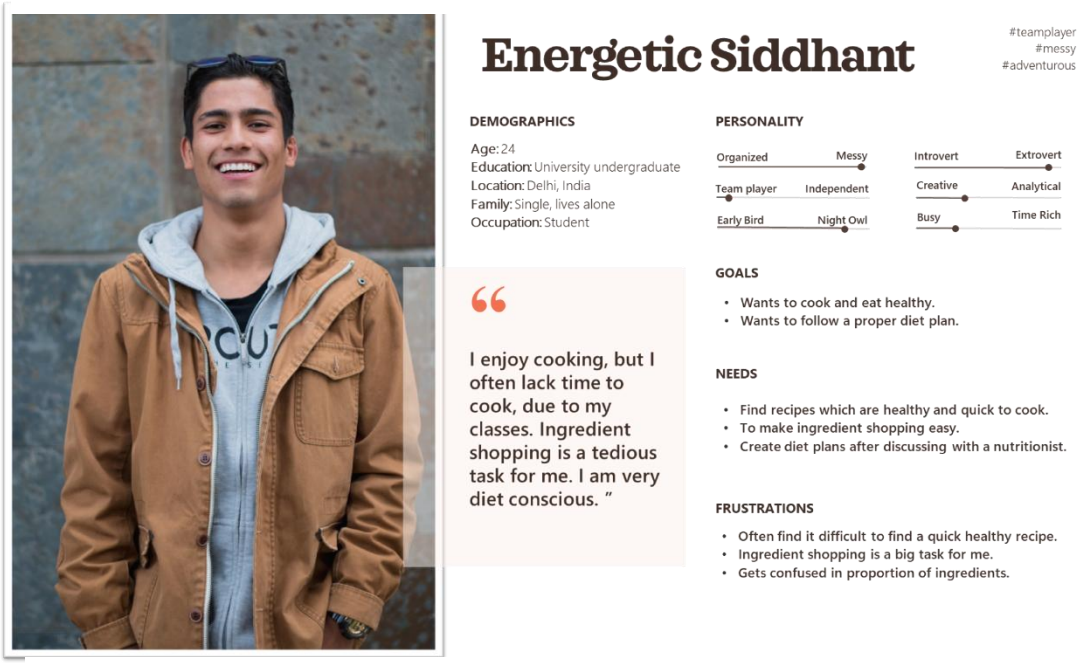

Figure 5 User Persona 2

User Personas

Storyboarding

Figure 6 Storyboard depicting the journey of a user who decides to cook. Source: (Freepik, n.d.)(edited by author)

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Journey Map

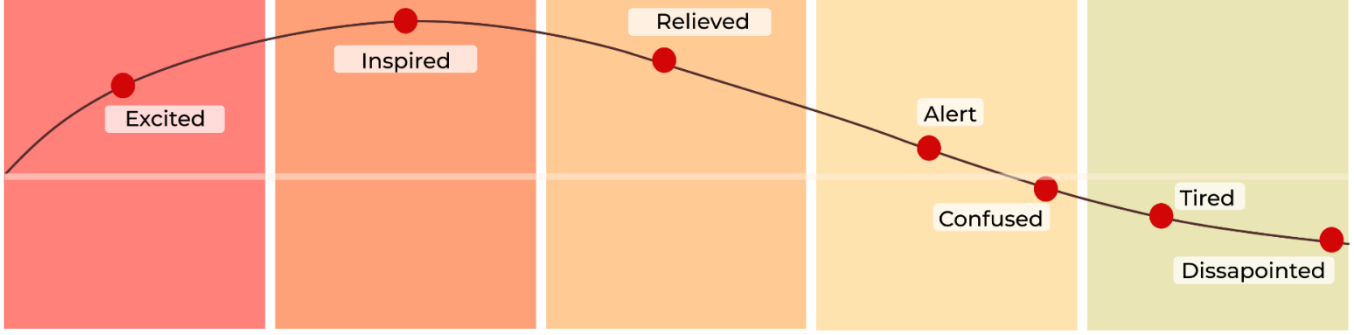
SIDDHANT

SCENARIO: Siddhant is a Young guy, who is living away from home. He wants to quickly cook something tasty as he have his friends at home.

EXPECTATIONS

- Able to follow the recipe steps easy.
- He wont need to go for grocery shopping.
- The final dish turns out well.

PLANS TO COOK SOMETHING	CHECKS RECIPES ONLINE	REALIZES INGREDIENTS ARE MISSING	COOKS THE RECIPE	DISAPPOINTED WITH THE RECIPE OUTCOME
• Youngster, living away from home. • Beginner level • Plans to eat • Have friends at home.	• Remembers a recipe reel he saw on social media. • search the detailed recipes online. • Youtube	• Grab all the required ingredients. • Doesn't have a ingredient and searches an alternative option.	• Starts to cook. • Gets confused about the amount of ingredients needed according to no. of servings.	• The final dish didn't came out as expected. • As he made mistake while putting the required amount of ingredients. • Orders food online.
IMPROVEMENT OPPORTUNITIES	• Filters can prove out to be beneficial in finding the perfect recipe quickly.	• There should be an option to enter available ingredients. • Instant ingredient delivery service would be very beneficial.	• Serving calculation, calories, cook time, difficulty level, video, steps to follow, ingredients required should be available.	• App should suggest recipes with vegtable peels, or leftover food as ingredients. • Eg. Lemon, mango, banana peels, rice, sabzi, etc.



(University, 2015)

Figure 7 Journey Map

Empathy Map

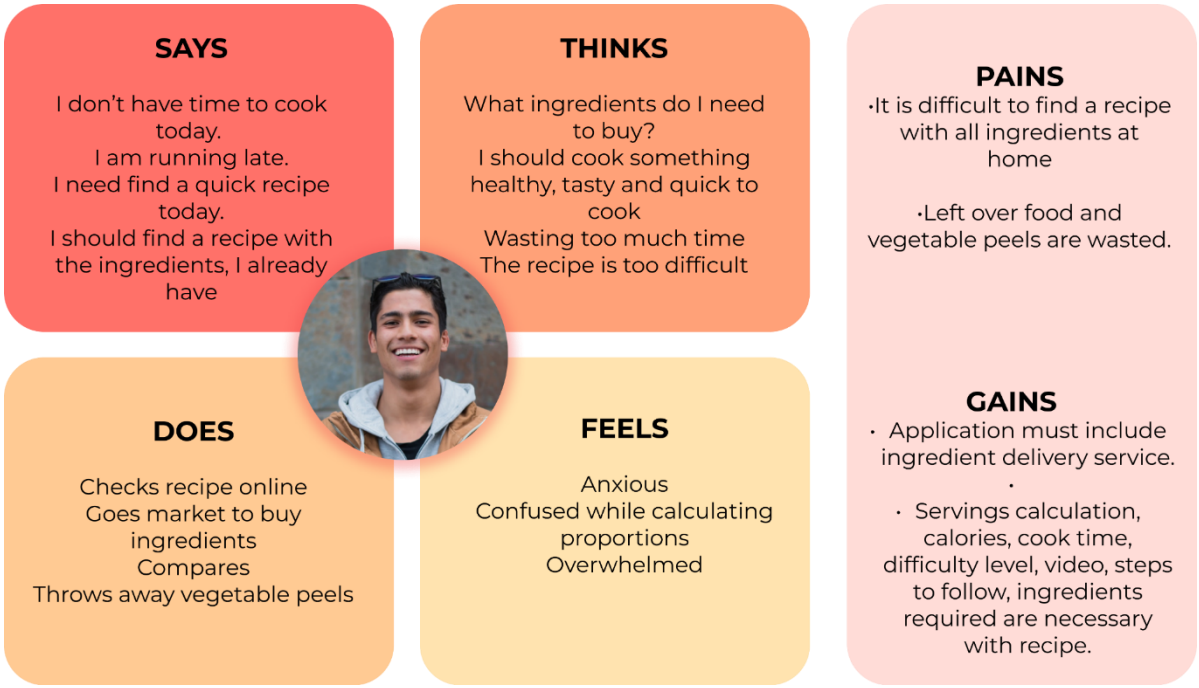


Figure 8 Empathy Map

Invisible Problem:

Based on results of the user interviews, following are some of the findings:

- ***Measuring proportion of ingredients according to number of servings***
- ***Unavailability of ingredients***
- ***Lack of motivation***
- ***Lack of time***

How Might We Statement:

How might we enable youngsters who don't know how to cook and live alone to consume healthy self-cooked food.

Innovation in Action:

The development phase of "Let's Cook" was marked by creative brainstorming and an emphasis on information architecture. The focus was on devising innovative solutions that catered specifically to the needs of the users. (Tanya M Horacek, 1998)

Brainstorming:

We drew some insights and brainstormed further to develop creative solutions. We created a set of user stories to carve out the attributes required to solve the problem.

The following are the strategies and approaches that we decided to work further, which would provide essential features and functionalities.

Figure 9 Features of the application

Information Architecture:

After analyzing the data (through research, User needs and key insights), we were able to draw information Architecture which will help us to communicate what the structure of the application will be.

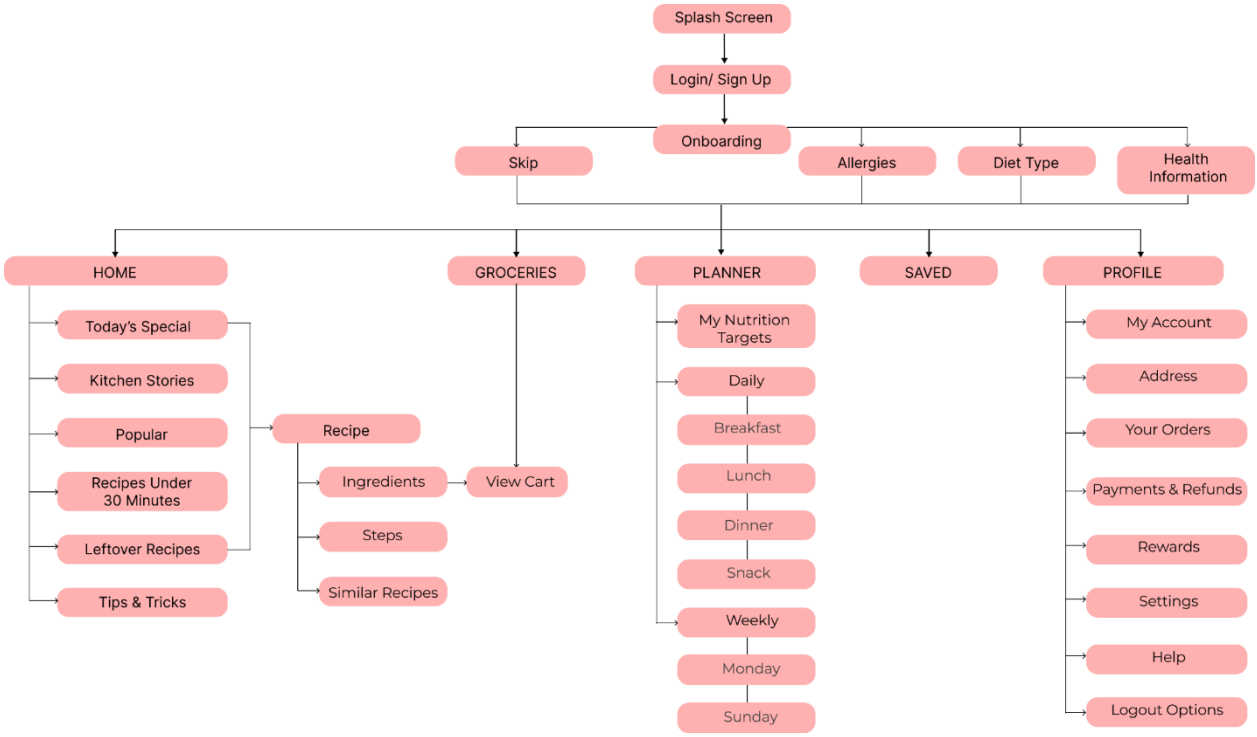


Figure 10 Information Architecture

Wireframes, style guides, and a meticulous click-through prototype were crafted to ensure that the application was not only functional but also visually appealing and intuitive to use.

Wireframes:

After finalizing the overall flow and structure of the application, we started working on the wireframes, to establish a basic structure (layout) of the portal before we proceed with the visual design.

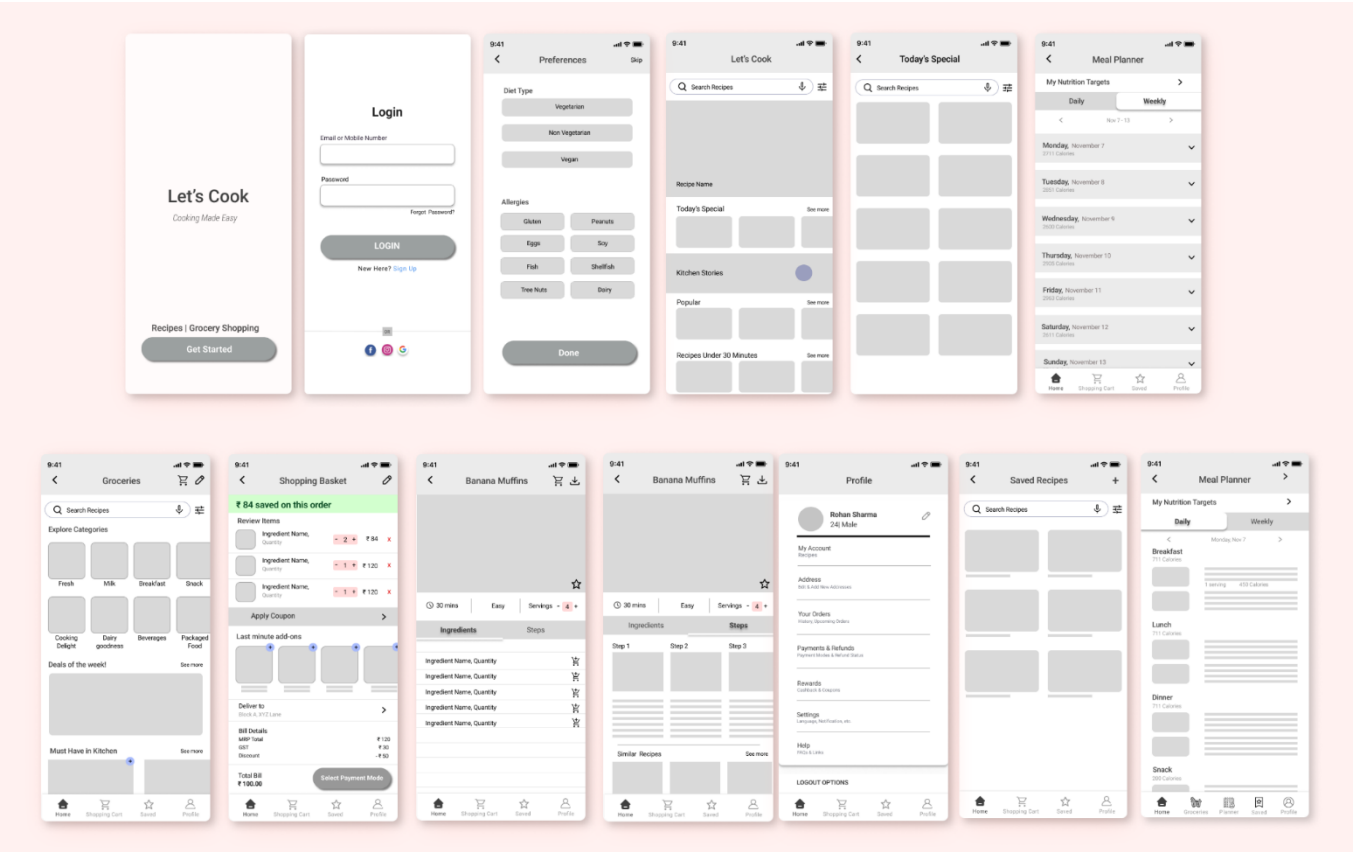


Figure 11 Low Fidelity Wireframes

The user experience was at the forefront of every design decision, from the layout of the interface to the color schemes used. This meticulous attention to detail is what sets "Let's Cook" apart from other cooking apps. It transforms the cooking experience from a daunting task into an enjoyable, stress-free activity.

Style Guide:

Style Guide is the set of standards for the design which covers all the visual standards to design a product.

Color Pallet

Color Selection Rationale: Red and yellow colors are thoughtfully chosen for their strong association with food, evoking the

tastebuds and stimulating the appetite, aligning with the application's motive and services.

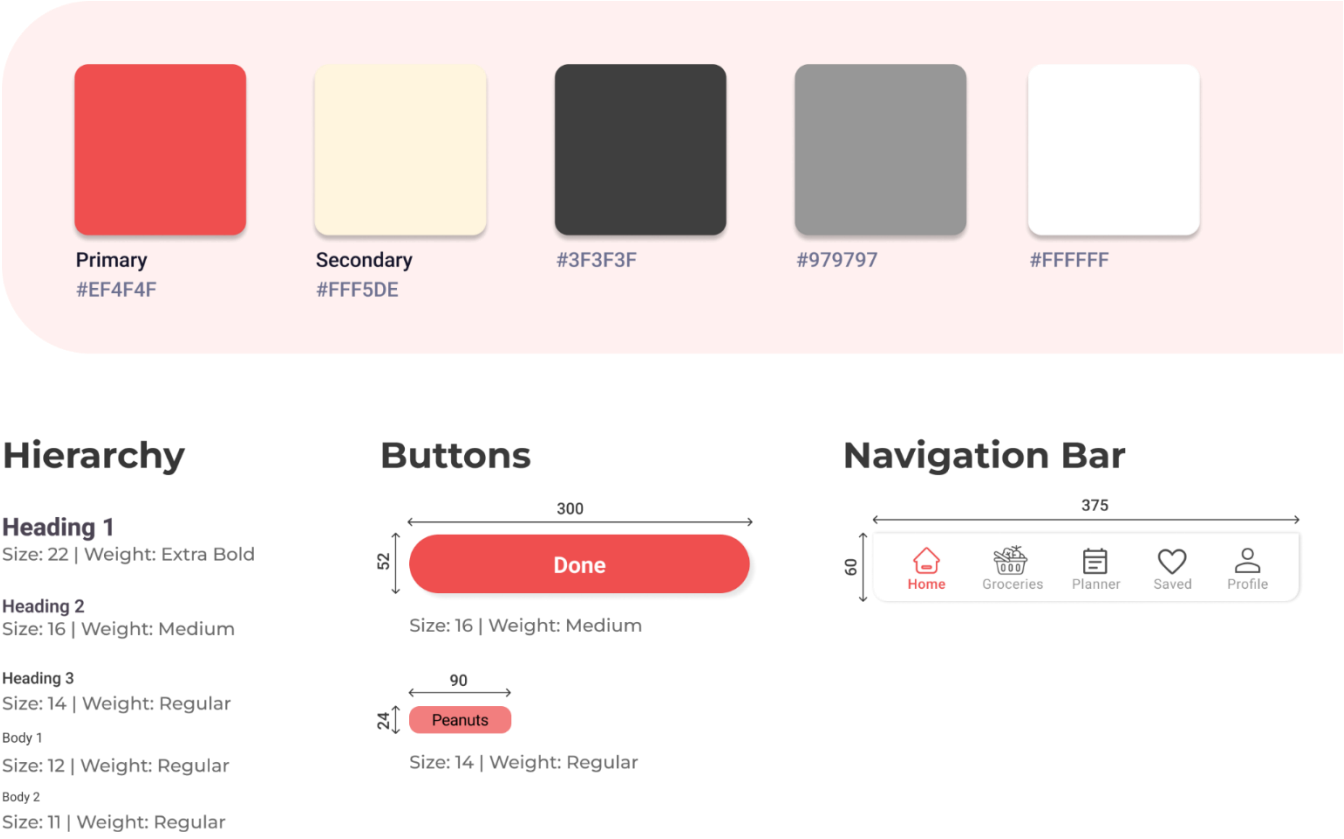


Figure 12 Style Guide of the application

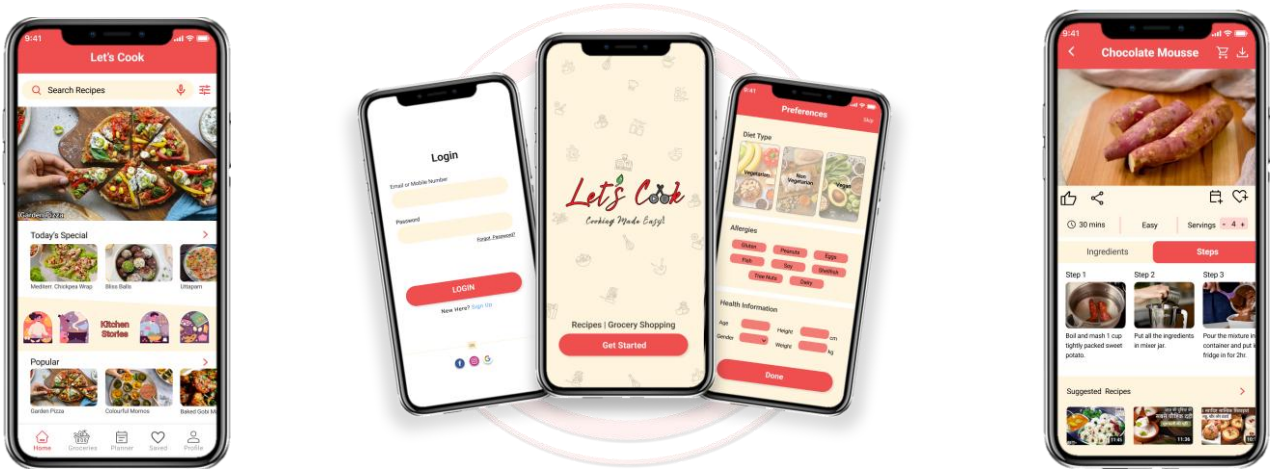


Figure 13 High Fidelity Screens

Final Screens

This iterative approach ensures that "Let's Cook" evolves in sync with the changing needs of its users. It is an application that adapts to the preferences and expectations of its dynamic demographic, making cooking a seamless and enjoyable process.

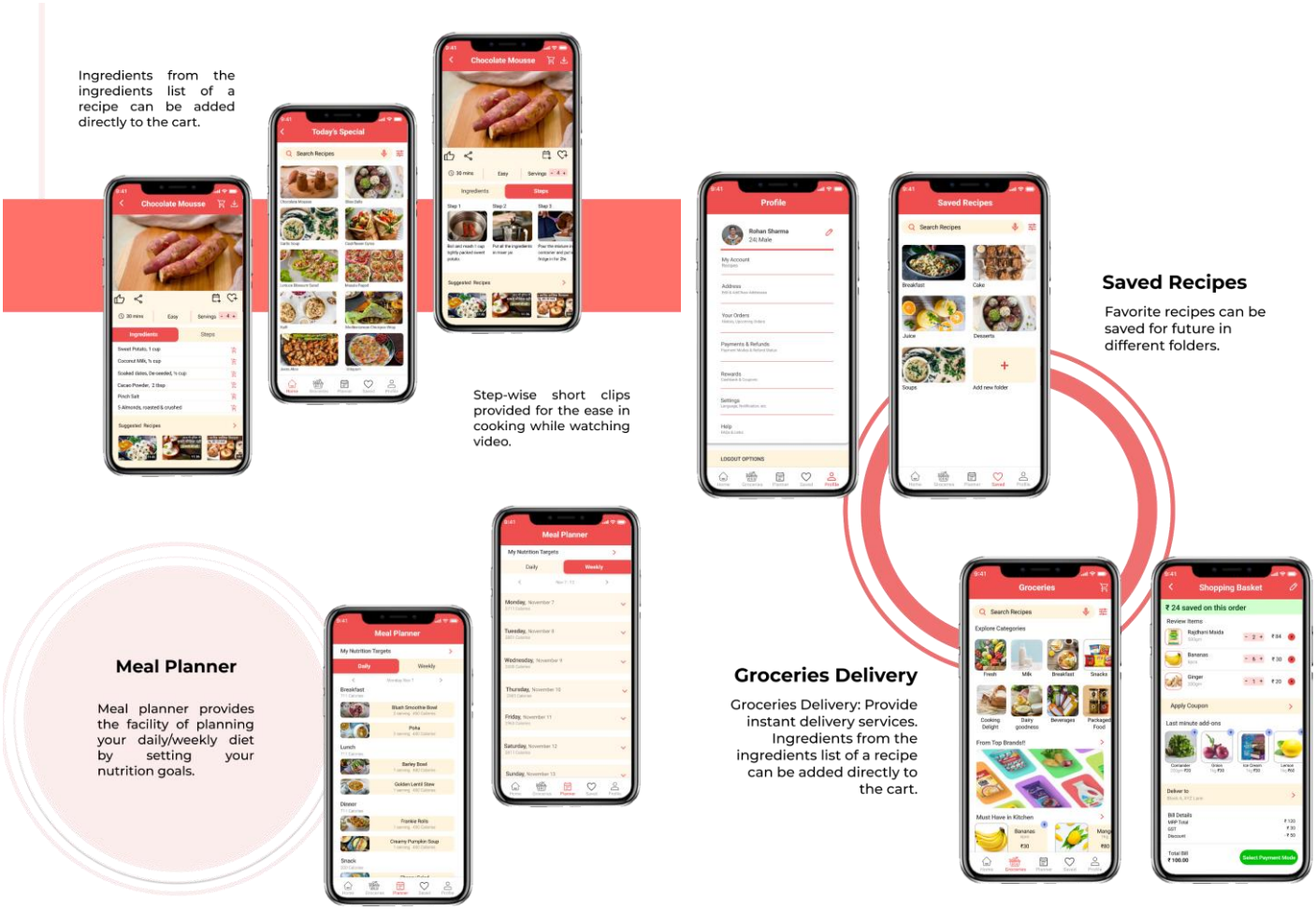


Figure 14 High Fidelity Screens

Continuous Improvement through User Feedback:

Usability testing is a cornerstone of user-centric app development, and "Let's Cook" exemplifies its commitment to enhancing user experience through a moderated usability study. Conducted in Delhi with remote participants, this study lasted 10-15 minutes and unveiled valuable insights. Users found ease in navigating recipes, and their activity steps offered insights into app usage. Notably, participants expressed a desire for a feature allowing recipes to be added to their meal plans seamlessly. Furthermore, users highlighted a keen interest in last-minute add-ons,

indicating the need for a feature suggesting complementary ingredients at the checkout stage.

This iterative approach ensures that "Let's Cook" evolves in sync with the changing needs of its users. It is an application that adapts to the preferences and expectations of its dynamic demographic, making cooking a seamless and enjoyable process.

Figure 15 Application Logo

Logo Design:

Typeface: Bright Sunshine font

It is hand-drawn, giving it a unique and creative feel that's perfect for young adults. Its playful and energetic design makes it an excellent choice for cooking apps, adding a sense of fun and excitement to the activity. Using this playful font, gives a message cooking can become a more engaging and enjoyable experience for users of all ages.

Figure 16 Mockups

Conclusion:

In a world where fast food and takeout often tempt young individuals living away from their families, "Let's Cook" is a breath of fresh air. This health recipe application not only offers personalized, easy-to-follow recipes but also provides a convenient ingredients delivery service, making cooking at home a hassle-free endeavour (Nancy M. Betts 1, 1997)**. Through extensive user research, innovative design, and an unwavering commitment to user feedback, "Let's Cook" has emerged as a holistic solution to the challenges faced by young adults living independently. It promotes healthier eating habits and offers a convenient path to culinary self-sufficiency. As we've explored in this article, "Let's Cook" is more than an app; it's a culinary companion for young adults navigating the journey of independent living, making it a true game-changer in the world of cooking applications.**

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Efficiency in the practice of ASHA Workers

घर घर में आशा

Abstract

The National Rural Health Mission (NRHM) of India, initiated in 2005, aims to address rural healthcare needs, especially among vulnerable populations. Central to NRHM is the deployment of Accredited Social Health Activists (ASHA) to facilitate access to healthcare. However, ASHA workers face challenges like inadequate resources and communication issues, impacting their productivity. This project explores a novel approach to enhance healthcare awareness among pregnant women by introducing a new method of sensitization as a crucial component of the ASHA (Accredited Social Health Activist) kit. The aim is to bridge the gap of miscommunication and insufficient awareness that often hinders ASHA workers in their mission to connect marginalized communities with essential public health services. The proposed solution involves incorporating a health information asset into the ASHA kit—a user-friendly household product designed to convey vital health information in the context of prenatal care. This innovation empowers pregnant women, streamlines ASHA workers' efforts, and improves their productivity by reducing time consumption and workloads.

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Keyword

Accredited Social Health Activists (ASHA), Rural Healthcare, Sensitization, National Rural Health Mission (NRHM), Healthcare services, Prenatal Care, Productivity, Fieldwork Experience.

Design Process

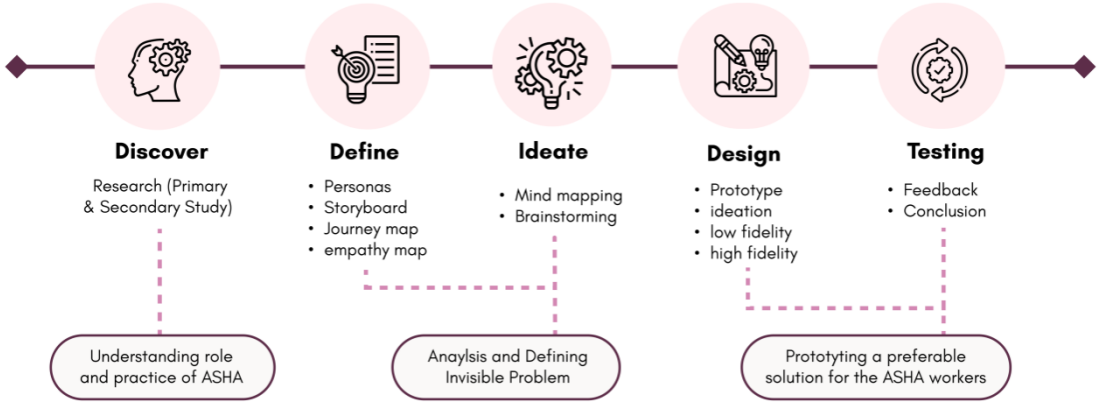

Figure 17: Design Process

Scope of Work and Timeline

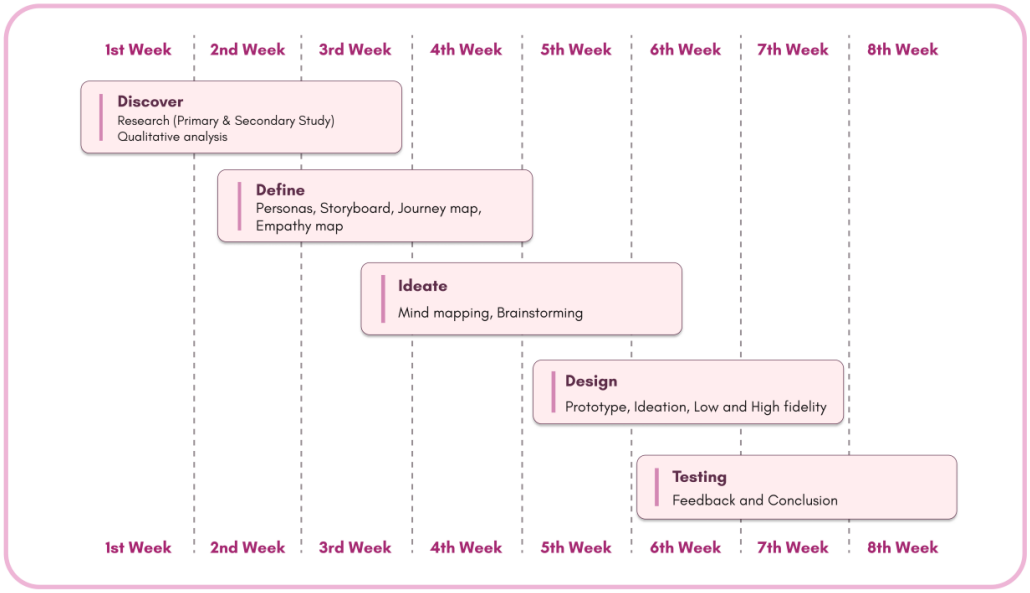

Figure 18: Scope of Work and Timeline

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Empathize and Discover

Introduction

The Accredited Social Health Activist (ASHA) program plays a pivotal role in addressing the healthcare needs of marginalized communities in India. ASHA workers are the connecting bridge between these communities and essential public health facilities. Their responsibilities include counseling for awareness, fostering community participation, and facilitating the utilization of health services, especially during pregnancy and prenatal care.

Figure 19: ASHA Workers: Bridging Communities to Vital Health Services

However, the efficacy of ASHA workers in fulfilling these vital roles is often compromised due to a lack of proper materials in their kits, miscommunication issues, and a general lack of awareness among their target population. This situation creates challenges in convincing pregnant women to adopt healthier practices and in addressing their specific healthcare needs. Consequently, the productivity of ASHA workers is hampered, leading to increased time consumption and workloads. Addressing

this gap can empower pregnant women to make informed healthcare decisions and allow ASHA workers to carry out their responsibilities with greater efficiency.

Opportunity Statement

How might we support ASHA workers in making their practice more time-efficient and productive, proposing easier ways of sensitization, and enhancing their fieldwork experience?

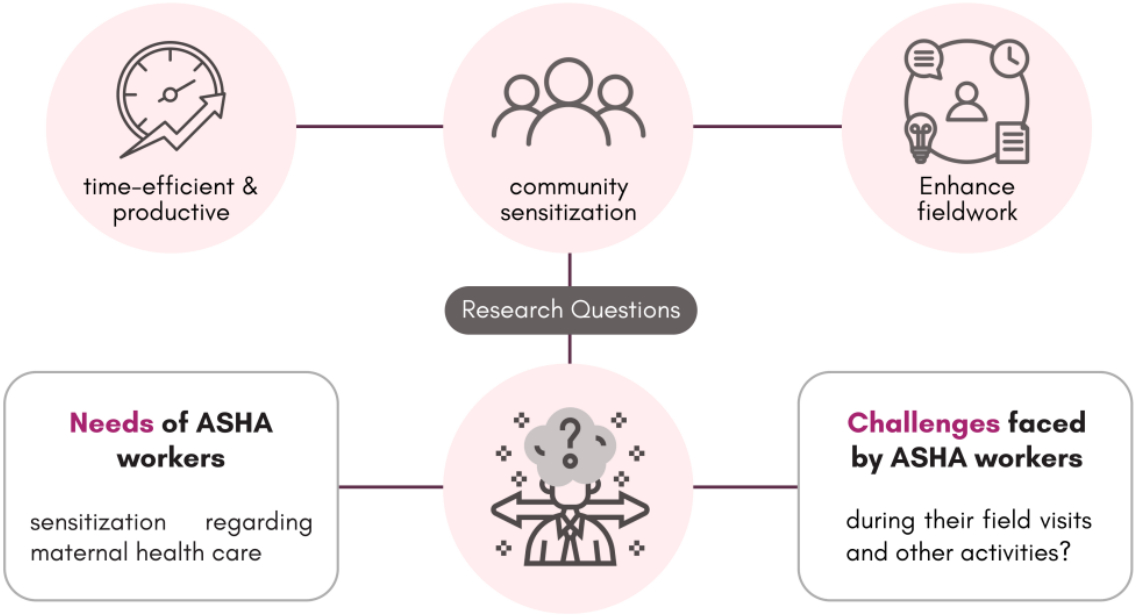

Figure 20: Research Questions

The Eco System

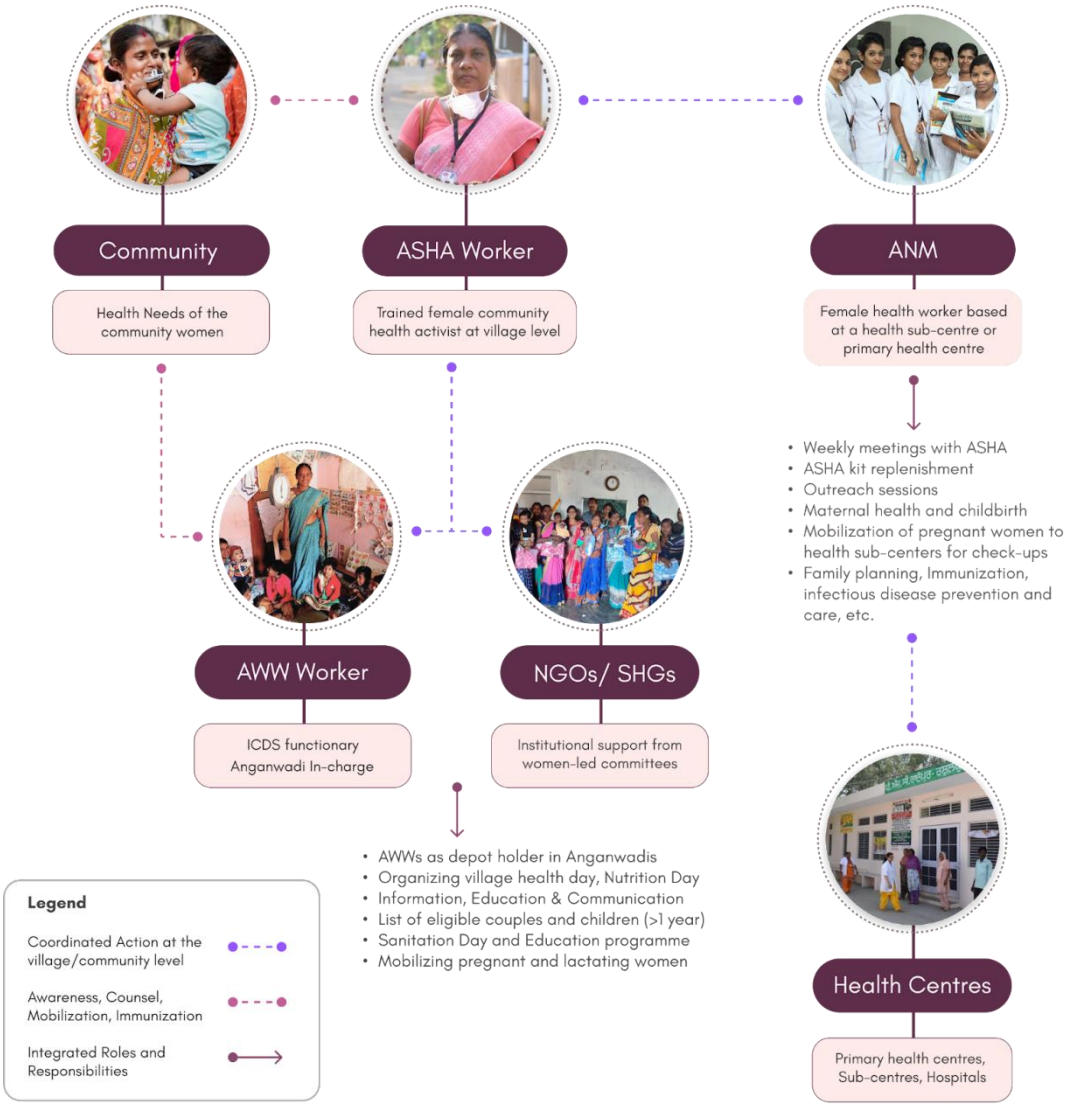

Figure 21: Healthcare Ecosystem

In the healthcare ecosystem, each village has an ASHA (Accredited Social Health Activist), an Auxiliary Nurse Midwife (ANM), and an Anganwadi worker (AWW). They are responsible for delivering health and nutrition services to the communities.

Each of the workers plays a distinct yet interrelated role in the same village. Their collective efforts can lead to improved maternal and community health outcomes.

Criteria and Selection of ASHA

- ***A resident of the village***
- ***Age Group 25-45 yrs***
- ***Education upto eight class***
- ***Communication skills and leadership qualities***

Selection of ASHA

- **1 ASHA ≥ 1000 Population**
- **1 ASHA Per Habitation/village/Community**

Field research

Figure 3: Anganwadi center (left), Paper pamphlets that were distributed to ASHA Workers (right)

Figure 22: Mother being counseled by the ASHA and NGO worker at AWC (left), Noticeable posters on the wall of Anganwadi centers (right)

Following our field visit, several key observations emerged regarding the practice of ASHA workers.

Findings | Shortlisted Problem Clusters

There are multiple barriers and challenges in effectively delivering healthcare advice and services to women in the community. These challenges include skepticism among women, time-consuming efforts to educate and convince them, health issues arising from improper food and medication choices, miscommunication, reliance on word-of-mouth information due to low awareness, and a lack of timely access to essential materials and resources within the ASHA kits, such as medicines, ASHA diaries, PNC forms, and awareness posters.

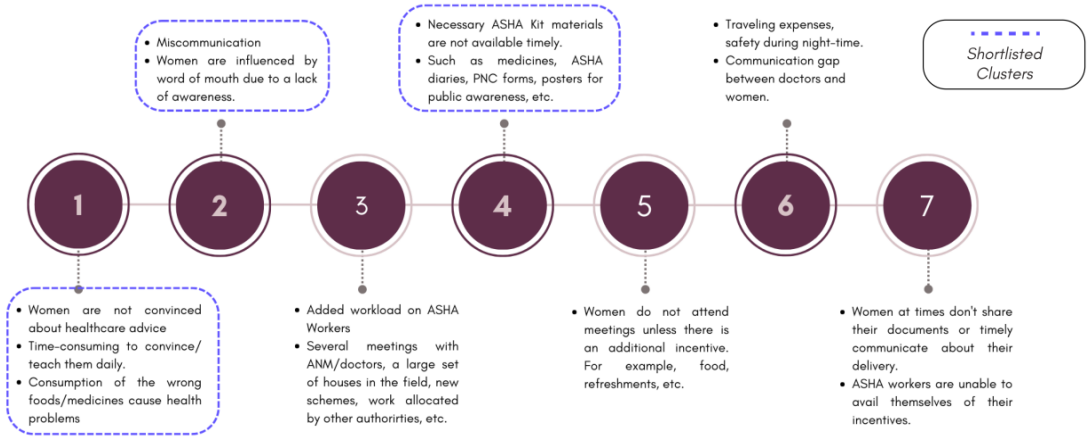

Figure 23: Primary Research Findings

Define and Ideate

User Personas

Two different Personas were created based on the target users. The two characters were based on the ASHA worker and a first-time pregnant mother. The motivations, frustrations and goals of the characters were defined to get a better understanding.

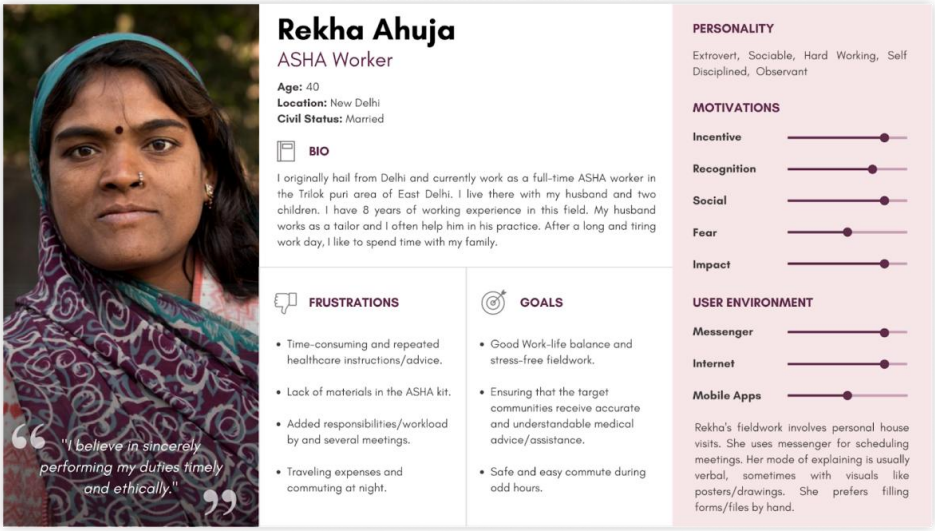

Figure 24: Persona I-The ASHA Worker

Figure 25: Persona II-First-time Mother

Storyboards

These storyboards illustrate various situations encountered by ASHA workers during their visits to communities as part of their fieldwork.

Scenario 1

Rekha, an ASHA worker gets ready for her daily rounds and visits. Rekha, including the other ASHA workers, are instructed about their task by the ANM, which is to be completed by the end of the day.

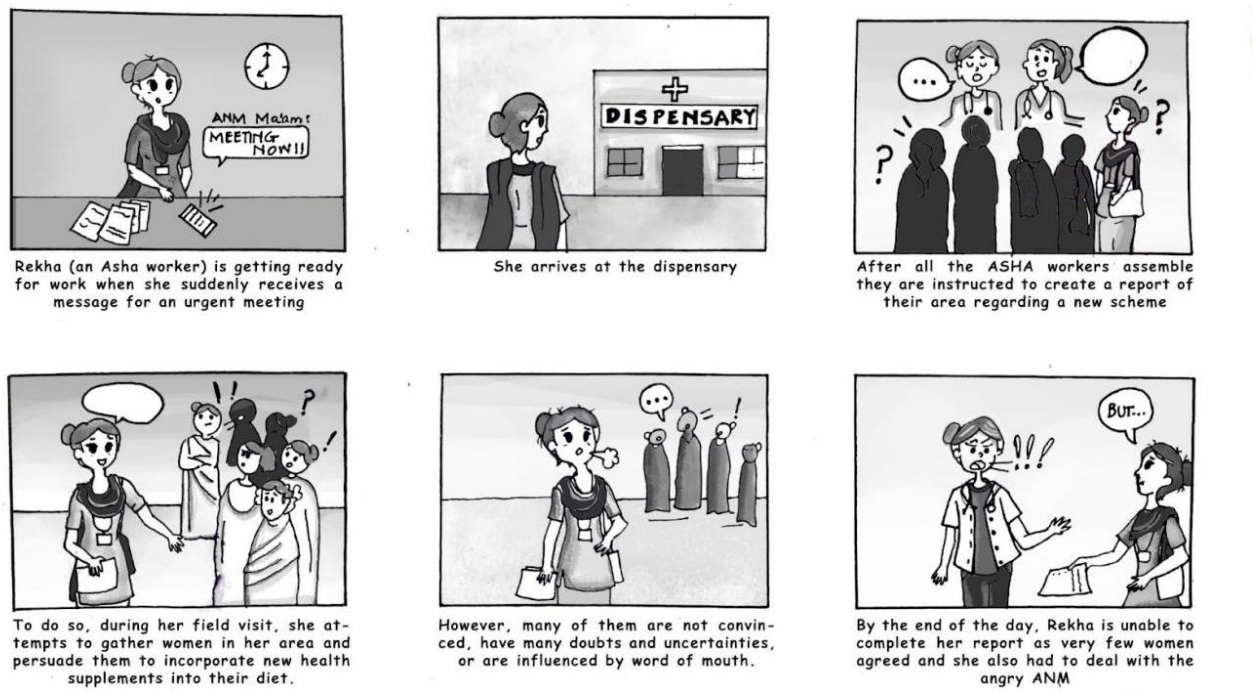

Figure 26: Scenario 1

Scenario 2

Rekha is on her door-to-door field visit. She counsels a new mother verbally about the diet requirements, medicines, breast-feeding, etc. But, the woman gets overwhelmed with the amount of information received and forgets about some important details.

As a result she is bound to make a misinformed health choice and bear its negative consequences.

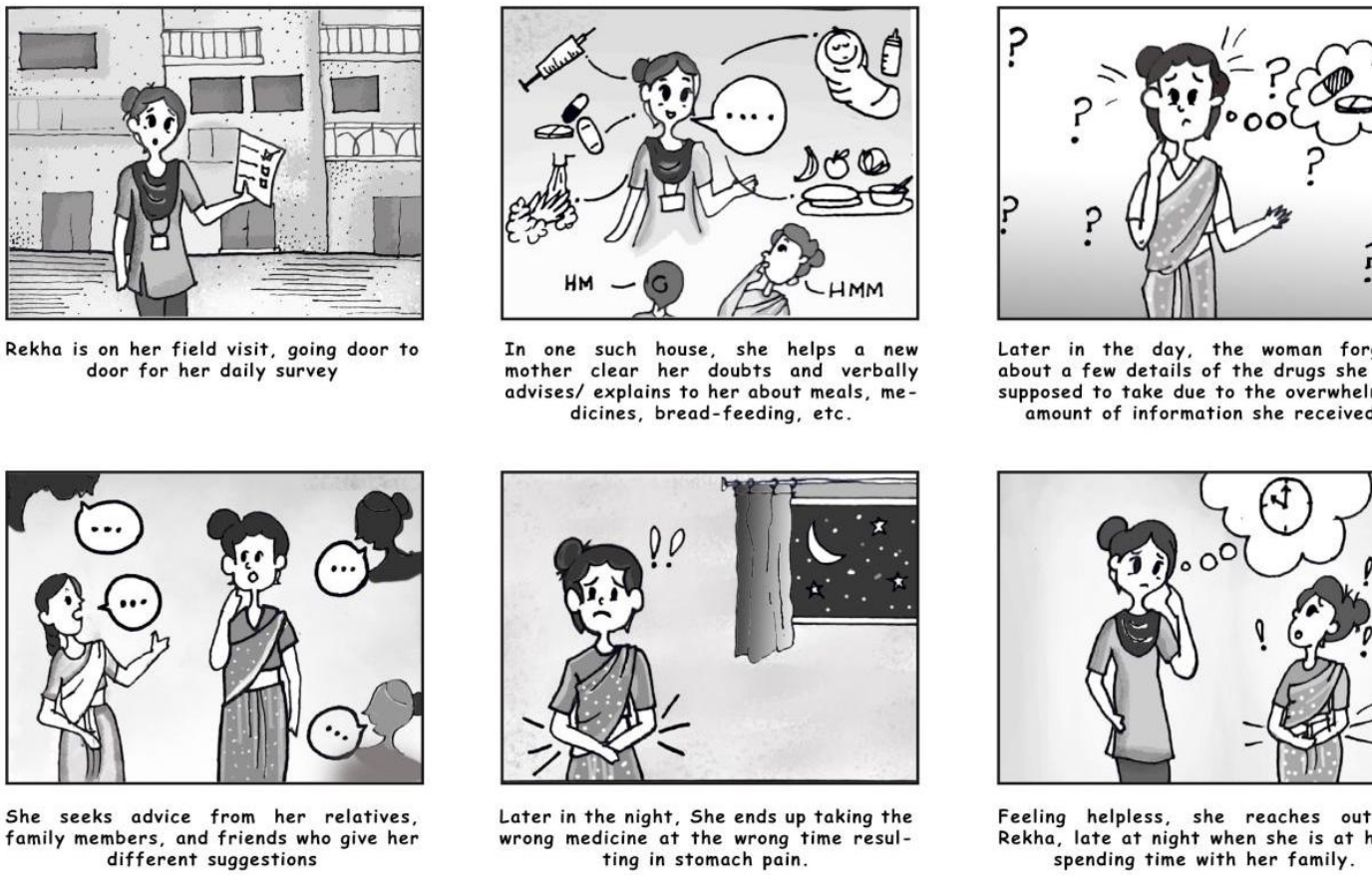

Figure 27: Scenario 2

Journey Mapping

After the story boarding the findings were categorized in way that would lay out users journey.

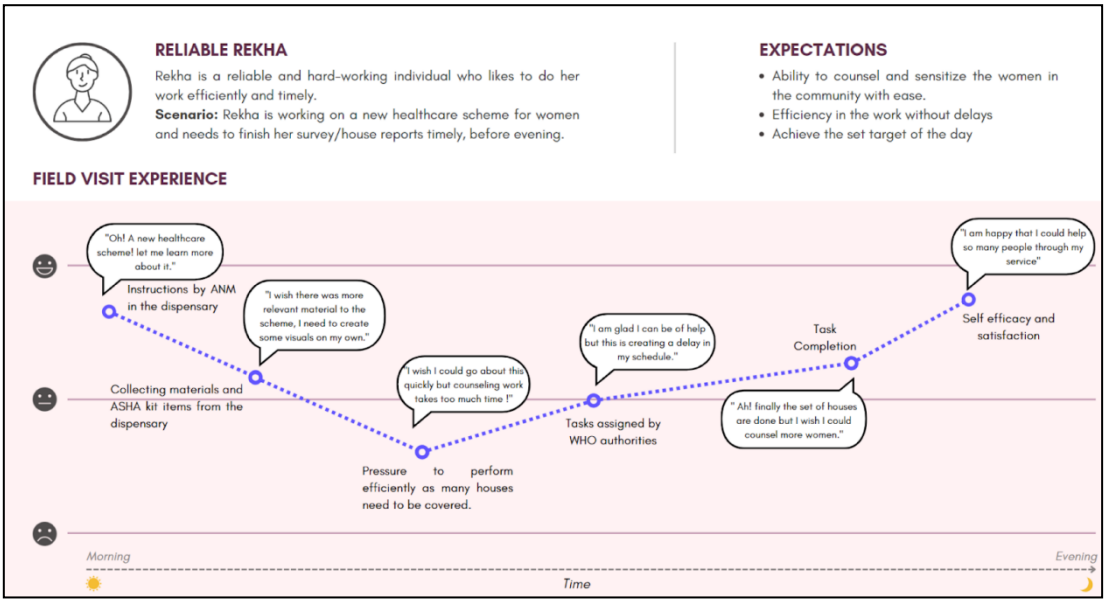

Figure 28: Journey Map

Empathy Map

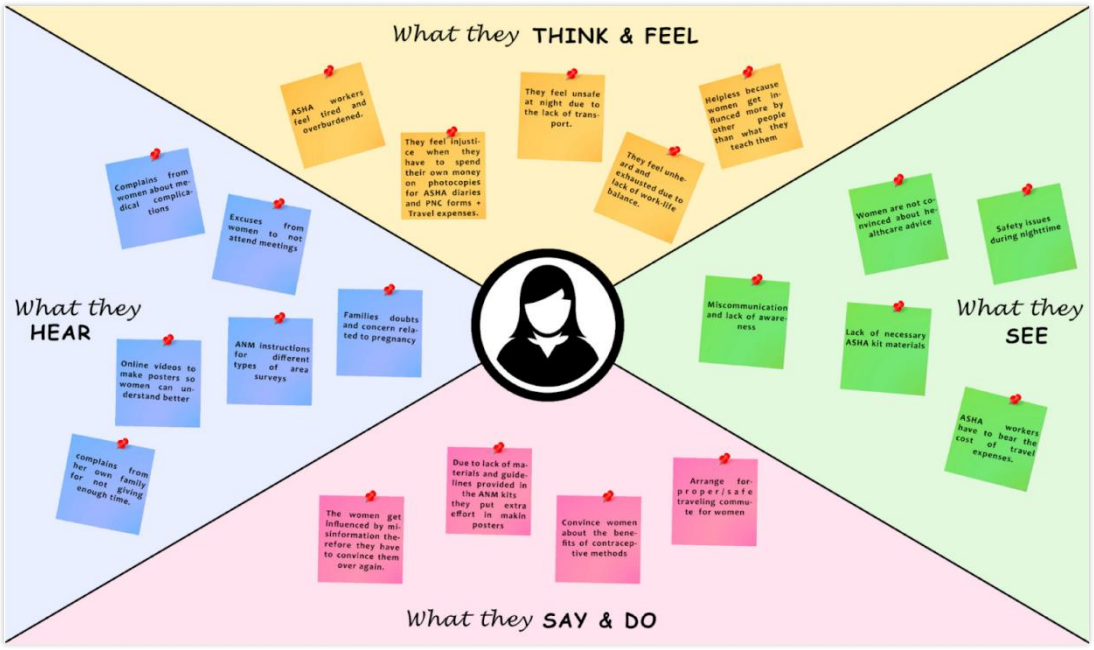

Table 23: Empathy Map

Iceberg Model

Table 1: Iceberg model for the problem

What we see?	• Women are not convinced about healthcare advice. • Miscommunication and lack of awareness. • Lack of necessary ASHA kit materials. • ASHA workers have to bear the cost of travel expenses. • Safety issues during nighttime
What users feel?	• ASHA workers feel tired and overburdened. • They feel injustice when they have to spend their own money on photocopies for ASHA diaries PNC forms and travel expenses. • They feel unsafe at night due to the lack of transport
Why users do what they do?	• There is a lack of materials and guidelines provided in the ANM kits due to which convincing is time-consuming and tiresome. • The women get influenced by misinformation and also fear the side effects of extreme contraceptive methods, such as Injections, Copper-T (IUD), etc. • Lack of proper traveling commute leads to various safety concerns for ASHA workers.

Through the iceberg model we gained a deeper understanding of the issues at hand, addressing the root causes rather than just the visible problems.

Brainstorming

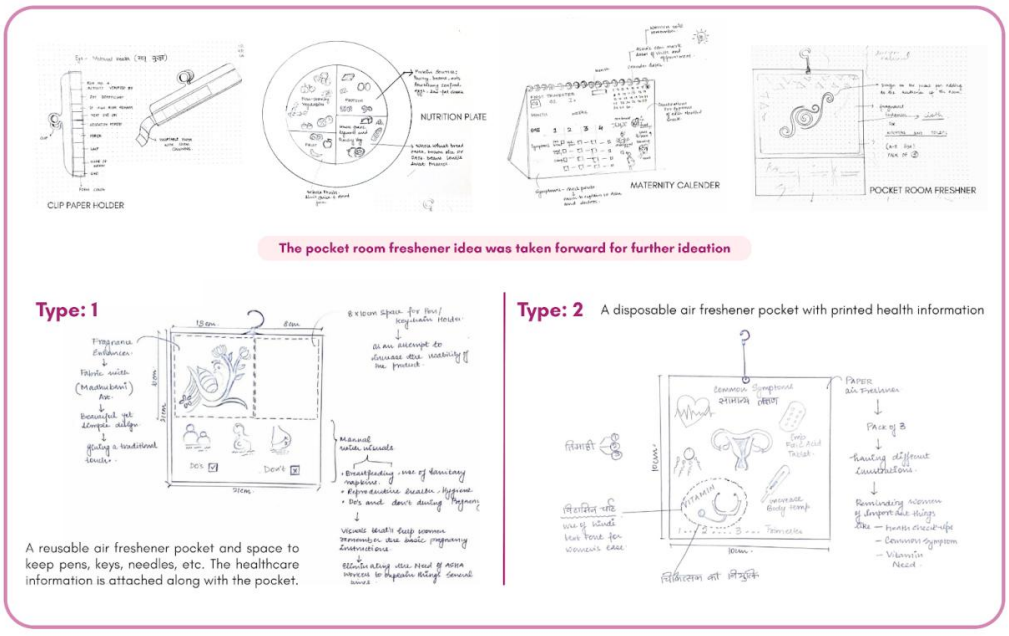

Figure 29: Concept Ideas

Design and Testing

Proposed Solution and Prototypes

Proposal: Introducing a method of sensitization/awareness about healthcare for pregnant women as a part of the ASHA kit materials.

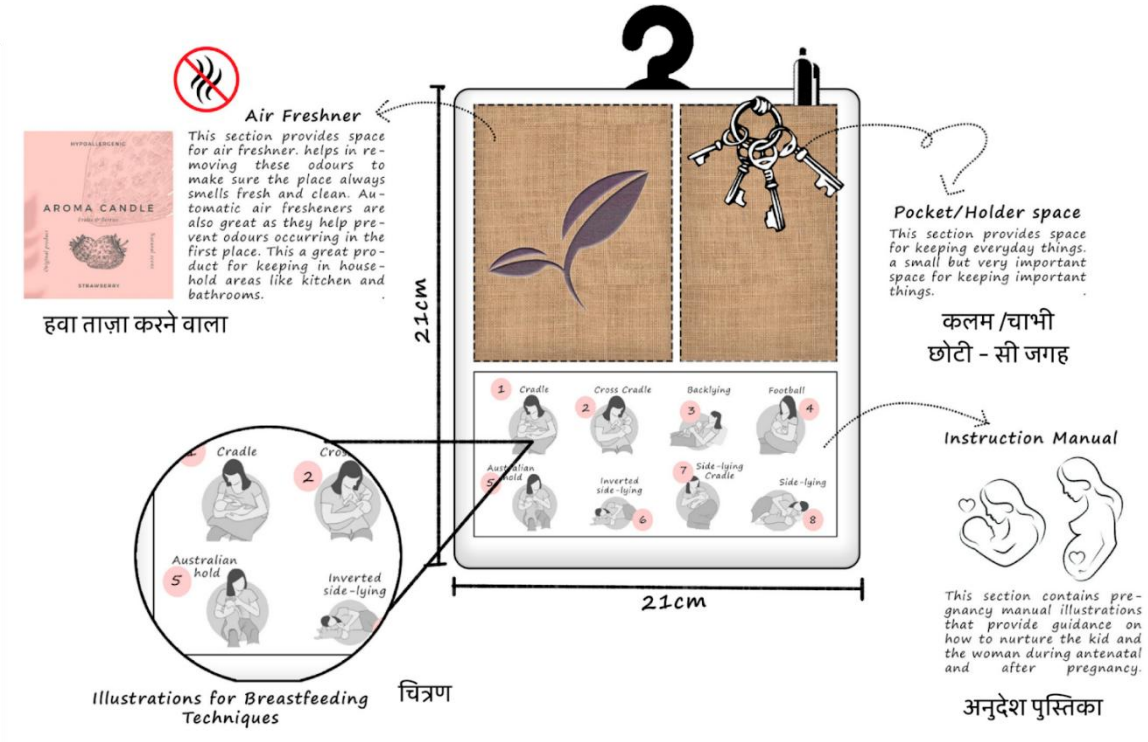

Figure 30: Proposal Idea

Health Information Asset | Easy-to-use household product:

Communicate important health information in the context of prenatal care/ pregnancy that can empower pregnant women and mothers and act as a facilitator in making the practice of ASHA workers more efficient.

Figure 31: High Fidelity Prototype

Key Features:

1. **The product features a health information manual, incorporating visuals and regional language for effortless access and sharing, thus serving to enhance community awareness.**

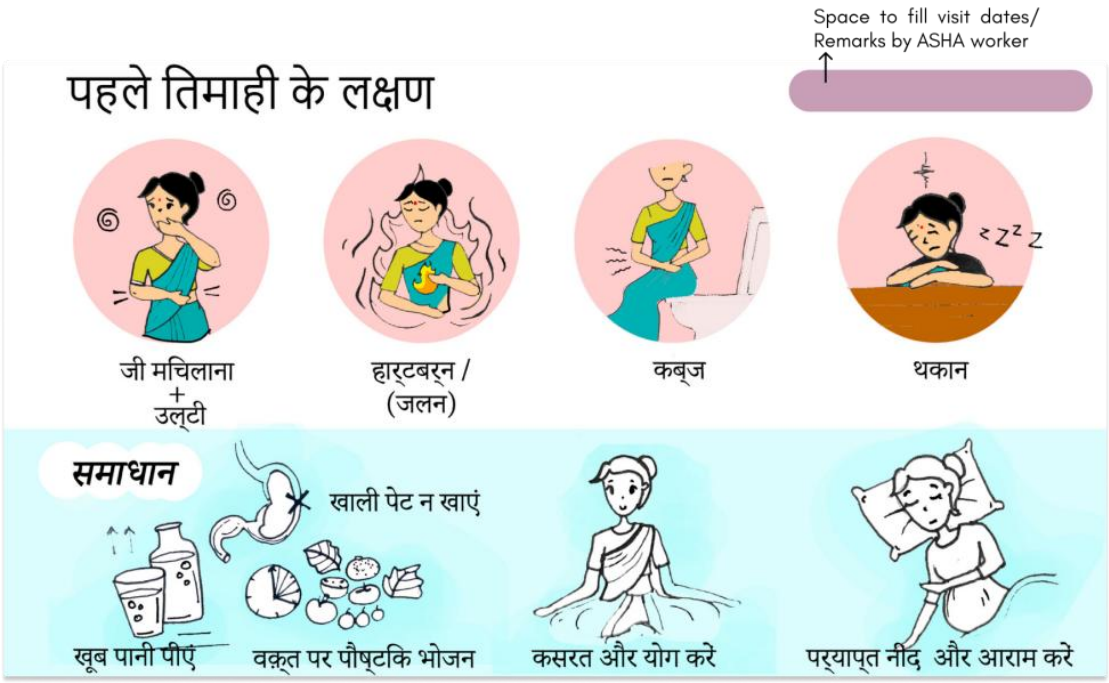

Figure 32: Visuals for Trimester 1

Figure 33: Visuals for Trimester 2

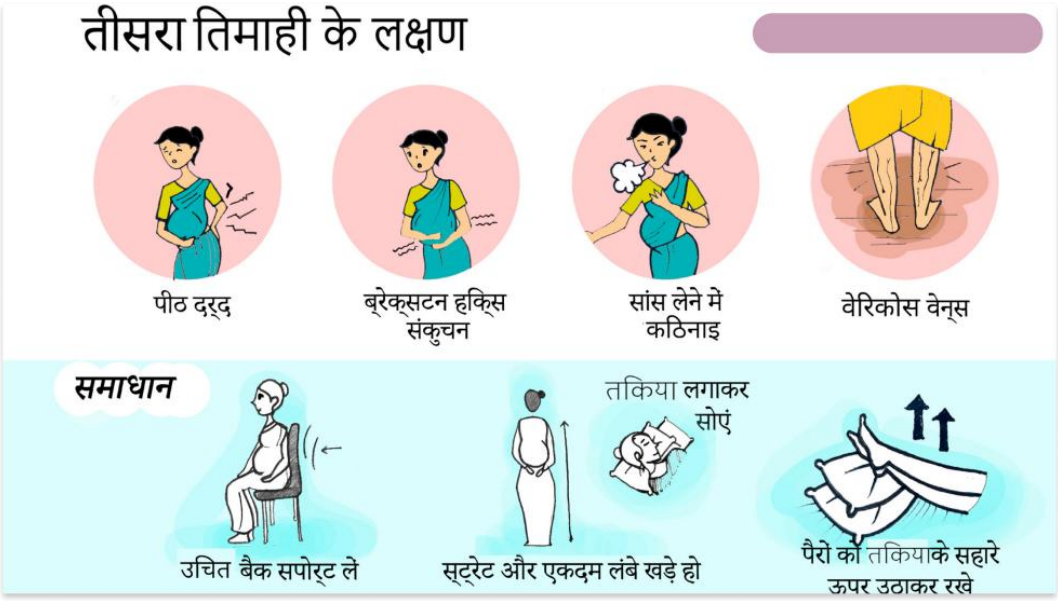

Figure 34: Visuals for Trimester 3

2. **It also includes a reusable air freshener pocket designed for prolonged usage within household areas.**
3. **To enhance the product's practicality, multipurpose sections for everyday items have been thoughtfully integrated.**
4. **Notably, the product upholds ecological and environmental sustainability principles by employing jute fabric for its pockets and sections.**
5. **The reusable air freshener pocket effectively reduces waste generation.**
6. **Furthermore, the health information manual is printed on white biodegradable coated paper, providing an environmentally-friendly substitute for conventional plastics. This paper is water and tear-resistant while remaining lightweight.**

Figure 35: Proposed Solution

Feedback

- ***It was found that the illustrations could convey the health information message to the user.***
- ***While the use of pockets was earlier thought to be for items like notepads and pens, the user suggested that it can be rather used to place medicines.***
- ***A useful approach for the ASHA workers, as they can advice them about specific medicines to be kept in the pocket.***

Figure 36: Feedback with solution prototype

Conclusion

Our idea is focused on spreading important health information in the context of prenatal care/ pregnancy that can empower pregnant women and mothers and act as a facilitator in making the practice of ASHA workers more efficient. It can help enhance the overall knowledge and awareness in the community where women are closely connected and provide access to an environment where there is clear communication, elimination of doubts/ misconceptions, relevant healthcare advice, etc.

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Empowering Independent Mobility: An Innovative Solution for Individuals with Mobility Impairments in Delhi

Ananya Singh & Sara Sanwal

Abstract

As the emphasis on accessible design gains prominence in the physical environment, it is imperative to acknowledge that the streets of Delhi remain inadequately equipped to facilitate independent travel for individuals with mobility impairments. Despite the allocation of a substantial budget exceeding 500 crore rupees for the development of accessible transportation options for individuals with disabilities, a significant portion of this demographic continues to grapple with challenges in achieving independent mobility on par with their fully abled counterparts. This paper introduces an innovative service in India that addresses the mobility challenges faced by individuals with disabilities. This paper outlines the service's concept, design, and implementation, emphasizing its potential to enhance the quality of life for people with mobility disabilities and contribute to a more inclusive urban environment.

Keywords: ***Accessible Design, Transport Design, Persons with disability, User Centered Design, Application Design, Tandem Bike, Service Design***

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1. Introduction

1.1 Cost of Disability

According to the WHO, 10% of the world's population is disabled in some way.[1] In contrast, the National Sample Survey Organisation (NSSO) report [2] and 2001 Census data [3] stated that its prevalence in India was as low as 2%. To have a disabled member in one's family, increases the cost of expenditure by 17% than a family with all fully abled people. The Government of India has invested an estimated cost of more than Rs. 1,325 Crores in the accessibility sector for the Divyangjan (People with Disabilities), according to the recent 2023 reports [4]. New Delhi is one of the most accessible urban cities in India. However, it is still not fully accessible as a person of disability would still have to be dependent to travel in the city.

5 types of transports are available to the public for use - Delhi Metro, Delhi Buses, Autos, Rickshaws. Out of which two of them (Delhi Metro and Delhi Buses) are supposed to be accessible for a *divyangjan* (Persons with disability) however still these transports are not being used by being in a wheelchair.

1.2 Problem Area

Our Project focuses on identifying the limitations faced by persons with disabilities in the everyday span of life when the government has invested so much for easy access of public transport for persons with motor disabilities (PWMD).

This research paper presents a pioneering service as a solution to enhance the travel process for these individuals on wheel chair. It integrates a tandem companion bicycle with an attachable/detachable wheelchair system to offer a pragmatic

solution for short-distance travel, with a specific emphasis on enhancing accessibility to public transportation hubs. Complementing this service is a mobile application that streamlines booking and provides real-time tracking, ultimately improving the convenience and autonomy of those with mobility disabilities.

Overall, this service represents a transformative step toward a more inclusive and accessible urban environment, achieved through careful planning, user-centered design, and a strong commitment to accessibility.

2. Background Study and Related work

The mobility challenges faced by individuals with disabilities are a significant concern in urban environments, particularly in regions like India. Accessing public transportation is a vital aspect of daily life, yet it often presents formidable hurdles for people with mobility disabilities. One of the primary obstacles is the considerable distance that many individuals must traverse in order to reach transportation hubs with accessible options. For example, Delhi's unplanned, low-income areas have very limited access to affordable and efficient public transport services. Planned and wealthier areas are comparatively better connected, but still fall short. If all Delhi settlements, planned and unplanned, are not equally well connected to and accessible to public transport, the capital will fail to fully implement its sustainable, low-emission modes of travel (such as walking, cycling, or public transport).[5] The draft Delhi Master Plan 2041 (MPD 2041) projects a population of 27-30 million by 2041, with 50% of this growth due to migration. This surge will result in 46.2 million daily motorized trips. Without a substantial shift to public transport, as targeted by MPD 2041 (80:20 split in favor of public

and shared transport), Delhi will face persistent pollution and carbon issues, warns CSE reports.[5] Immediate enhancements in local accessibility to bus and metro services, along with minimizing interchanges, are imperative. Achieving MPD 2041's goal of 50% population within mass transit influence zones requires improved neighborhood-level design and infrastructure for safe and efficient access.[6]

3. Research Design Process

This research was carried out in the phases of the double diamond method with a few altercations (*fig.1*) according to our personal experiences.

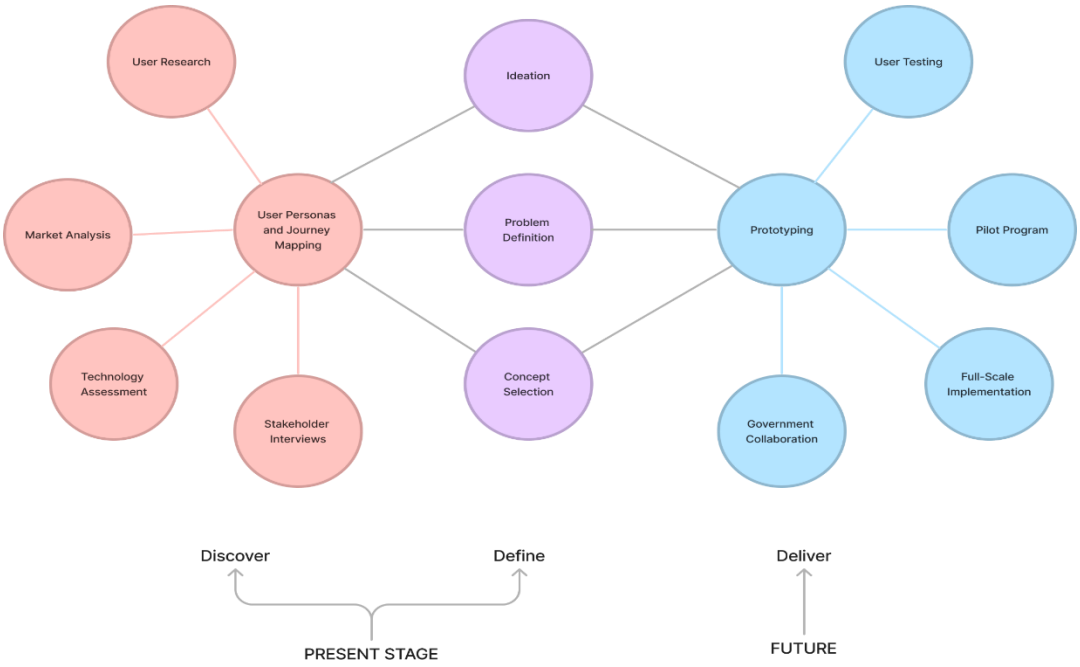

Figure 1- Research Design Map

3.1. Literature Research

The literature review for this research project involved conducting a comprehensive secondary research using various online sources. Research papers and design studies were utilized to gain insights

into the current state of the research topic, identify gaps in the existing literature, and evaluate outdated information that needed to be revised.

3.2. Defining Research Goals

Following the literature review, the research objectives were defined based on the insights gathered from the document analysis. The main goal of the research project was to gain a better understanding of the limitations that a person using a wheelchair faces which leads them to not choose Delhi Transports for the travel.

3.3. Shadowing

We spent time following one of the participants in their daily routine to understand and get insights on the struggles of traveling on the streets of Delhi as an independent individual. We conducted this activity to observe and notice the pain points in the journey from start to end. This helped us gain an in-depth understanding of the daily experiences and challenges faced by a person with disability.

3.4 User Interviews

In-depth interviews were conducted with people with disabilities, asking questions about their backgrounds, reasons for not using public transports, and their experiences with traveling independently in Delhi. This provided valuable insights into the user's perspectives and helped identify key pain points and areas for improvement.

4. Literature Review

Over the years, there have been several conceptualizations of disability, encompassing models such as the medical, individual, social, religious, inter-social, market, moral, economic, spectrum, rights-based, charity, and authenticity models. [7] posits that disability can be primarily categorized into two paradigms: the medical model and the social model. The former focuses on an individual's medical condition, while the latter views disability as an interplay between individual limitations and the environment, with a stronger emphasis on societal barriers [8]. The social model advocates for the dismantling of societal barriers that marginalize individuals with disabilities, including physical, institutional, and attitudinal obstacles. Research by Otmani and Imrie and Kumar [9] reveals that the constructed environment, typically not designed with disabilities in mind, perpetuates the exclusion of disabled individuals from social life. [10] Further elaborate that today, disabled individuals encounter various forms of discrimination, leading to a range of challenges and barriers, much like in the past. Issues such as suboptimal designs, insufficient information, and prejudicial practices have contributed to the social isolation of disabled individuals. In considering the plight of the disabled, the built environment emerges as a powerful symbol of their exclusion from social life [11].

Our aim is not to rely solely on government initiatives to render facilities accessible. Instead, we aspire to establish robust transit services tailored to the needs of individuals with motor disabilities. Through this research and our ultimate objective, we strive for a form of progress characterized by equivoqual advancement. This approach aligns with our vision of inclusivity and self-sufficiency for all members of the community.

5. Participant Study

For this project, we included 30 participants to infer experiences and insights on the problem. Out of 30 participants, there were 9 interviewees, 6 participants in focus group discussions and 15 survey responses. Apart from this, we also shadowed 1 participant in her daily commute from home to college.

6. Findings

We mapped the insights from the interviewees into an affinity diagram (*fig.2*) to categorize the users' experiences and thoughts into a structured format which could help us identify the problems with the existing features.

Figure 2 - Affinity Mapping

We followed the 5-W method (Who, When, Where, What, Why and How) to understand the user and the factors affecting the problem area.

1. **WHO -** ***Our user is a wheelchair bound individual with limited mobility.***
2. **WHEN -** ***The user faces the problem when they have to cover short distances.***
3. **WHERE -** ***The local roads and pathways are inaccessible for a person on wheelchair.***
4. **WHAT -** ***To connect the user to disable friendly public transportations seamlessly.***
5. **WHY -** ***A wheelchair bound person could travel independently in the city like any other individual.***

The next step after the research was to analyze the data into valuable insights which could ultimately be used for defining the problem factors. To get to the root cause of the problem, we used fishbone technique (*fig.3*) to move forward.

Figure 3 - Fishbone Diagram for root cause analysis

According to the findings, the primary problem being people with motor disabilities not using the public transportations like the Delhi Metro and the Delhi Bus in spite of them being pwd friendly, was further divided into possible sub problems :-

1. **Poor Infrastructure Design within living communities**
2. **Lack of Empathy amongst people**
3. **Lack of opportunities amongst the crowd**
4. **Cost of Travel high for private vehicles**

According to Census 2011, there are 2.68 crore persons with disabilities in India who constitute 2.21 percent of the total population. Out of the total population of persons with disabilities, approximately 1.50 crore are men and 1.18 crore, are women. [12]

It was necessary to get direct real-time insights from the stakeholders in this problem (*fig 4.*):-

1. **Primary user on wheelchair**
2. **Person in contact with the user in the wheelchair**
3. **People in direct environment with the user**

Sno.	User Type	Gender	Age	Usage of Public Transports	Usage of Private Transports	Usage of Bus Stations ?	Usage of Metro Stations ?	Road Infrastructure between Bus stations ?	Road Infrastructure between Metro stations ?	Insights
1	DAP	F	23	+	+	-	+	-	-	Doesn't travel in metro alone
2	SAP	F	31	+	+	+	+	O	-	Usually someone gives her a seat in the metro/bus
3	SAP	M	17	-	+	-	-	-	-	Using private vehicle is expensive but atleast it caters to all my needs.
4	FAP	F	21	+	+	-	+	-	+	Usually take metro for long distances and cover short distances using private vehicle.
5	DAP	F	19	+	-	+	+	-	-	I cannot afford to travel with Private vehicles. Using public transport is tough, but I have no choice.
6	SAP	M	26	+	+	-	+	O	O	I have had a fracture in my do
7	SAP	NB	20	+	+	-	+	O	-	I don't know anything about the bus stations but I have travelled once in metro when I was injured. I realised that was very difficult
8	FAP	F	19	+	+	+	+	+	+	For a person like me, Its quiet difficult to with crowd and all. I suppose for a person with disability, it would be very difficult.
9	DAP	M	24	-	+	-	-	-	-	Its difficult for me to come from my car to the department. Imagine how difficult it would be to travel on the street.
10	FAP	M	21	+	+	+	+	+	+	I usually help my friend to go from one place to another between classes. You need to have a lot of compassion and empathy to do that.

Figure 4 - User Data

The following pointers lead to the inference that prevents the user from using the public transportation system in delhi -

1. **The local delhi metro is a disabled friendly public transportation for wheelchair prone and visually impaired individuals.**
2. **The network of Delhi metro is spread across the whole city, with metro stations at and within every 5 km.**
3. **The problem lies amongst this short distance because of poor road infrastructure, potholes and an unstable path for a person in a wheelchair or who cannot see.**

7. Hypothesis

After comprehension of all the information gathered from the research phase, we started constructing the problem statement on the basis of it. We followed the format of the How Might We Statement to create a clear, cut defined statement to build ideas upon.

How Might We Statement

How might we create travel easy and accessible for people with motor disabilities for short distances to reach accessible public transportation (Delhi Metro) ?

8. Discussions

After defining the problem space, it was necessary to decide how to move forward with ideating the solutions (*fig.5*). We divided the scale into a priority-feasibility matrix which could help us in keeping aligned to our goals.

Engaging with accessibility experts and developing a user friendly app interface was kept at high priority to create a meaningful and seamless experience for the users. We also investigated the potential regulatory hurdles with the purpose of high desirability but low feasibility.

Figure 5 - Kano Model

This paper introduces a cutting-edge service designed to address the mobility challenges that people with disabilities face in India. The service combines a tandem companion bike [13] with an attach/detachable wheelchair design to provide a practical and innovative solution for short-distance travel. This service aims to bridge the accessibility gap in a country where accessibility remains a major concern, particularly in reaching public transport stations (*fig.6*).

The accompanying mobile application simplifies the booking process and provides real-time tracking, ensuring users' convenience and efficiency. Individuals with mobility disabilities gain a new sense of independence and mobility as a result of this

service, allowing them to navigate urban environments more easily.

The safety and stability of the bike-wheelchair attachment, user-friendly app design with accessibility features, and compliance with local regulatory standards were all important considerations in the service's development. Furthermore, community engagement and feedback were critical in refining the service to meet the specific needs of its target audience. This paper describes the conceptualization, design, and implementation of the service, highlighting its potential to significantly improve the quality of life for people with mobility disabilities in India. This service represents a transformative step towards a more inclusive and accessible urban environment, thanks to careful planning, user-centered design, and a commitment to accessibility.

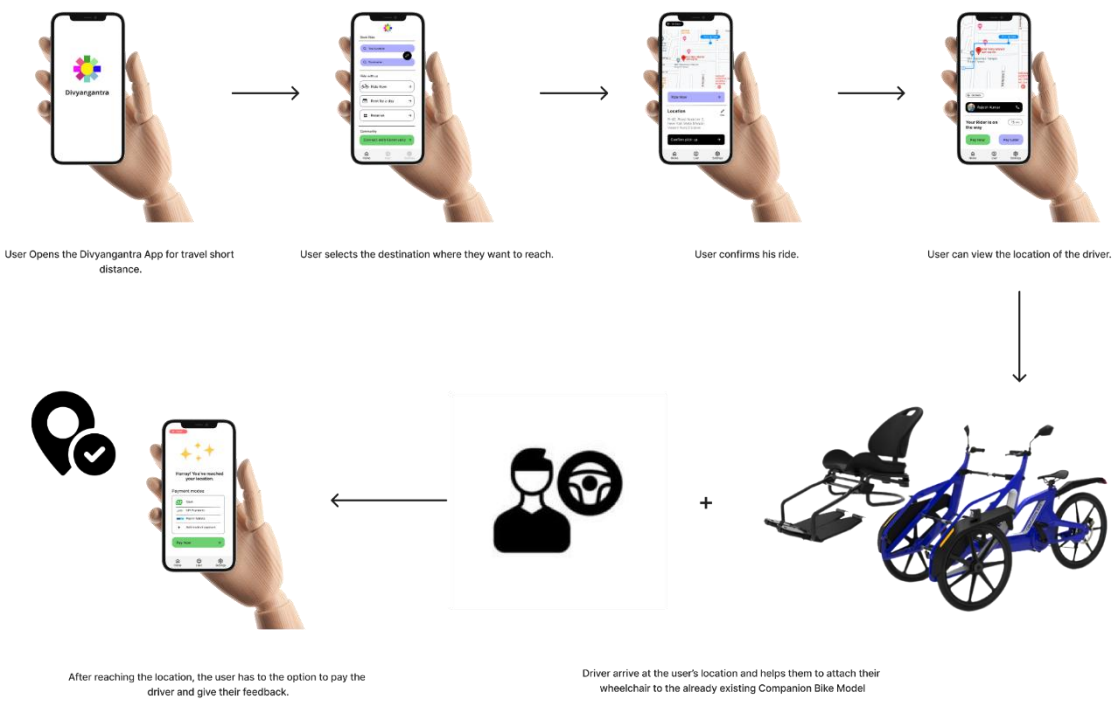

Figure 6 - Userflow Diagram

9. Social Impact

This project is instrumental in directly enhancing the travel experience for individuals with motor disabilities. The service is meticulously crafted to empower individuals who use wheelchairs, enabling them to travel with self-sufficiency and ease, without the need for external assistance. Consequently, this service transforms the act of traveling for a person with a disability from a cumbersome liability into a normalized and inclusive experience. The underlying principle is founded on the belief that individuals should have the capacity to travel without being encumbered by the societal constraints and limitations often imposed upon them.

10. Limitations

This service imposes a constraint wherein the user's ability to travel is limited to solitary journeys; it does not facilitate travel with a companion. It should be noted that this service primarily functions as a rehabilitation solution, designed with the intent of mitigating the issue to a certain degree.

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Sambhav - Service Design

Ritwik Raj, Veshwas Verma, Rahul Dobhal, Tanmay Wadhankar, Tanuj Narain

Keywords: *Service Design, Circular Design, Slum Development, Education, Upskilling, Ethnography*

Context

Sambhav, a Service Design Concept, achieved recognition as the Silver Winner in the 2023 Student Service Design Challenge. This competition was organized by Philips Experience Design, in collaboration with Service Design College, and received support from respected partners like IBM, Ikea, and the Ellen MacArthur Foundation. The event spanned from November 15, 2022, to May 26, 2023, with our concept presentation to the jury taking place on June 9, 2023.

The challenge was structured into four distinct stages, concluding with a dragons den jury evaluation of the services. Participants were tasked with crafting a service that not only enhances personal well-being and resilience but also has a positive impact on collective happiness, spanning from individual lives to workplaces, schools, communities, cities, and even our planet.

The Stages

The challenge was broken into the following stages -

1. Identify and Explore

1.1. Overview:

The journey to identify a focal point for enhancing well-being commenced with a comprehensive examination of various well-being facets and their interrelationships. We sought to comprehend how these facets mutually influence one another and contribute to overall well-being. Our guiding question was, "Which issues, if addressed, could trigger a feedback loop with a far-reaching impact on the well-being of people across different domains?" After extensive brainstorming and data analysis, we discerned housing as a promising area of focus. It became evident that the realm of housing held substantial potential for improvement, which could significantly enhance the overall well-being of previously underserved communities.

1.2. Adequate Housing and Well-being:

Adequate housing stands as a cornerstone of individual well-being. The current housing landscape, both locally and globally, grapples with numerous challenges, affecting various dimensions of well-being, such as physical health, emotional and social well-being, and economic growth.

1.3. Challenges in Housing

The most common issues faced in the housing sector:

1.3.1. Homelessness:

- **Unemployment**
- **Poverty**

- **Lack of Affordable Housing**
- **Mental Health and Addiction Issues**

1.3.2. Improper Housing:

- **Lack of Affordable Housing**
- **Rapid Urbanization**
- **Economic Instability**
- **Access to Land**

1.3.3. Other Issues:

- **Low Rental Yields**
- **Vacant Houses**
- **Arbitrary Evictions**
- **Systemic Issues**

1.4. Slums:

Our secondary research prompted us to delve deeper into the nature of slums, their functioning, and the interplay between residents and the available opportunities.

1.4.1. Definition:

Slums are characterized by substandard living conditions and severe overcrowding. The United Nations defines a slum as a place where residents lack one or more of the following five amenities:

- **Durable Housing**
- **Sufficient Living Areas**
- **Access to Improved Water**
- **Access to Improved Sanitation**
- **Secure Tenure**

1.4.2. Formation of Slums:

The proliferation of slums is a result of urbanization, with individuals from rural areas moving to urban centers in the hope of better living conditions and employment opportunities. This influx has led to overcrowded and substandard housing.

1.5. Expert Interview Insights:

During our interview with Dr. Namesh Killemsetty, whose academic expertise centers on urban poverty and the housing rights of slum dwellers, we gained the following insights:

- ***Challenges in availing government services and policies.***
- ***Garbage piling due to ineffective waste management, impacting public health.***
- ***Influence of local leaders and powerful families in the slums, leading to arbitrary rules.***
- ***Extra charges for essential services in non-notified slums by private vendors.***

1.6. Local Scenario:

The situation of slums in India is a multifaceted challenge influenced by factors such as population growth, urbanization, lack of affordable housing, and insufficient infrastructure and services.

1.7. System Map:

A system map providing a visual representation of the

dynamics within slum communities.

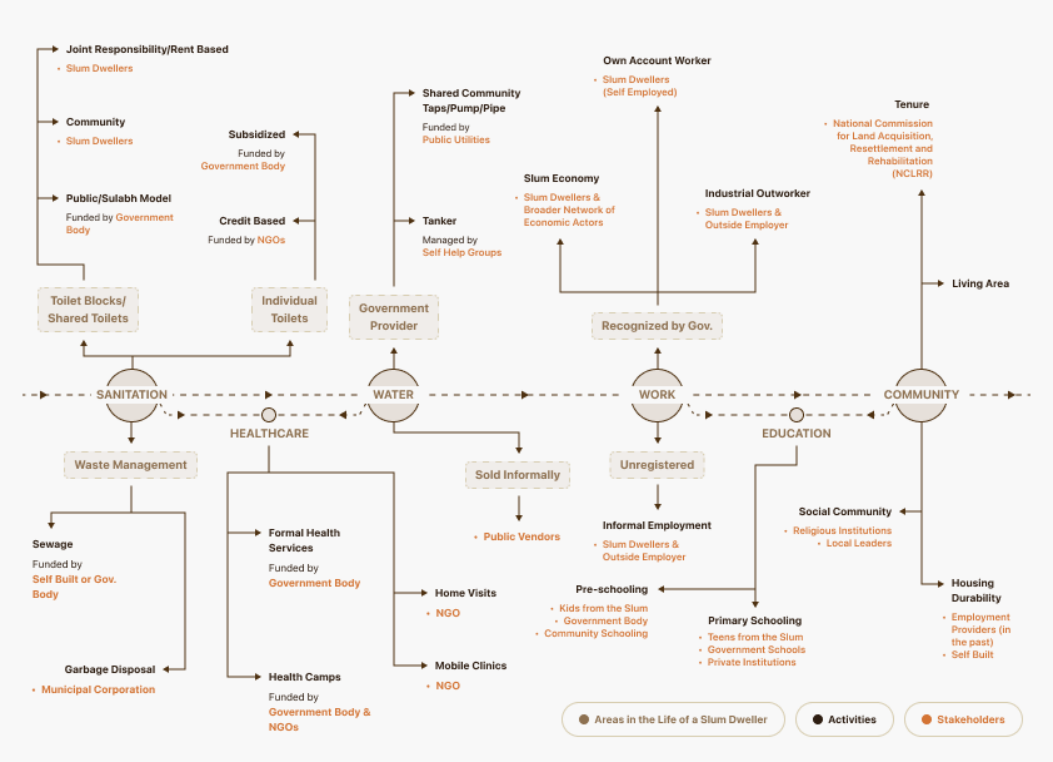

Figure 1 : Slum System Map

1.8. Opportunity:

Studies indicate that by 2030, one in four people will reside in slums. It's essential to recognize that not all slum residents are impoverished; many hold white-collar jobs and run their businesses. However, inadequate housing conditions contribute to physical and mental health issues, impacting economic growth.

1.9. What we believe:

We believe that creating an inclusive solution that addresses the latent needs of those at the base of the socio-economic pyramid will promote the growth and well-being of all individuals with subpar housing conditions.

1.10. Problem Statement:

"How might we sustainably and inclusively enhance the well-being of slum residents by addressing the root causes associated with inadequate housing conditions?"

1.11. Expected Impacts:

By improving slum living conditions, we aim to have a direct impact on the following Sustainable Development Goals(SDG):

- **SDG 11: Sustainable Cities & Communities**
- **SDG 10: Reduced Inequalities**
- **SDG 6: Clean Water & Sanitation**
- **SDG 16: Peace, Justice & Strong Institutions**
- **SDG 3: Good Health & Well-being**

2. EMPATHIZE AND DISCOVER

2.1. The Real Slum:

In our second phase of exploration, we engaged in an in-depth examination of slum communities. Initially, we ventured into these areas independently. However, it became evident that our presence caused discomfort among the slum dwellers and presented safety concerns. In response to this, we sought out various non-governmental organizations (NGOs) working with slum communities in Delhi. We teamed up with Aashray, an NGO that had established a presence in multiple Delhi slums, including their initiatives focused on education and community engagement. In an effort to bridge the trust gap, we volunteered with this NGO

and accompanied their personnel during our visits to the slums. This collaborative approach enabled us to connect with the slum residents effectively.

As we commenced our visits to the slums, we encountered a stark contrast from our initial perceptions. These slums were composed entirely of makeshift materials, lacking proper housing structures, and the inhabitants had settled on illegally occupied land. Unauthorized electricity connections were prevalent, and residents often faced eviction threats from local authorities.

2.2. Challenges in Slums:

Through our field visits and interviews carried out in slum areas, we noted issues in the following sectors:

2.2.1. Healthcare:

- **Limited access to healthcare services.**
- **Shortage of doctors.**
- **Affordability issues.**
- **Improper documentation.**

2.2.2. Sanitation:

- **Absence of proper sanitation facilities.**
- **Sewage water flowing within the slums.**
- **Overcrowding.**

2.2.3. Education:

- **Lack of proper schools.**
- **No support system at home.**
- **Improper documentation.**
- **Lack of motivation to study.**
- **Poverty.**

2.2.4. Economy:

- **Unemployment.**
- **Job availability.**

2.3. Problems with Existing Jobs:

- **Inadequate compensation.**
- **No job security.**
- **Long working hours.**

2.4. Obstacles in Finding Jobs:

- **Facing discrimination.**
- **Lack of education.**
- **Limited social network.**
- **Informal job market.**
- **Lack of skills.**

2.5. Alternatives in Livelihood:

Many slum residents resorted to ragpicking as a means of livelihood, given their economic hardships and limited access to other job opportunities. Ragpicking involved the collection and sorting of recyclable materials for sale to recycling plants or scrap dealers.

2.6. The Next Generation:

Education emerged as a fundamental human right and a vital tool for improving lives and well-being. It provided individuals with the knowledge and skills essential for securing better employment, increasing income, and contributing to their communities.

2.7. Education Obstacles

Obstacles preventing children in the slums from accessing education included the perception that education was a lengthy process requiring twelve years

of study before yielding a decent income. Immediate needs, such as securing the next meal, took precedence. A lack of proper documentation and support systems further hindered educational enrollment.

2.8. Personas:

We utilized our insights to create personas and empathy maps in order to understand who we are designing for.

Figure 2 : Personas and Empathy Maps

2.9. Graph:

We identified a crucial difference between those in low-paying jobs and those resorting to begging. A lack of skills presented an obstacle for both groups in breaking free from poverty.

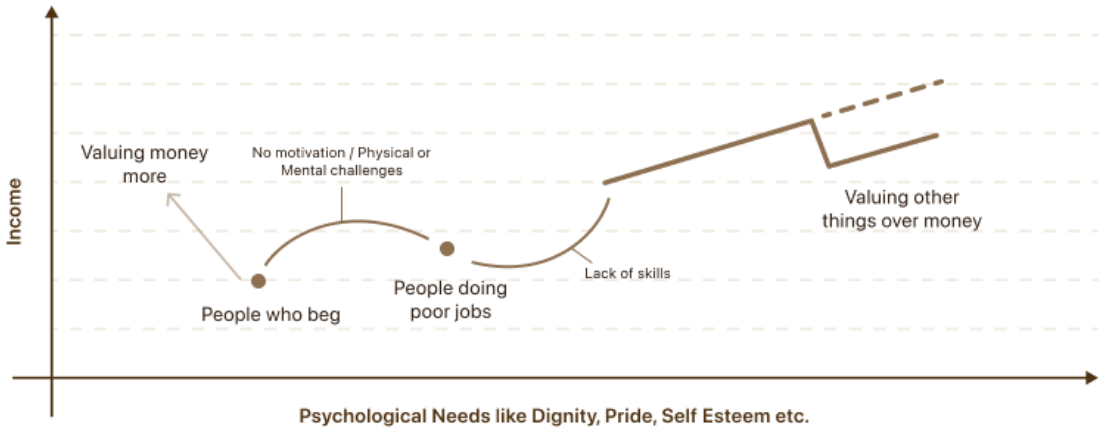

Figure 3 : Graph depicting the relationship between Income and Psychological Needs

2.10. Key Observation:

Based on our observations, we recognize the distinct motivation of individuals engaged in low-paying jobs to uplift themselves and their families, particularly through providing better educational opportunities for their children. In contrast, those who resort to begging appear to be more reliant on external support for their well-being.

3. FRAME AND DEFINE

3.1. The Cycle of Slum Dwellers:

3.1.1. Young Kids Growing Up in Poverty:

Children growing up in impoverished slum communities where their daily needs and education often take a backseat to economic pressures.

3.1.2. Need for Immediate Earnings:

The pressing need for money often compels individuals, including children, to seek immediate means of earning, sometimes at the expense of schooling and education.

3.1.3. Hindrance to Schooling/Education:

The pursuit of immediate income becomes a barrier to accessing education, perpetuating the cycle of poverty.

3.2. Case Study:

Throughout the research, we focused on studying select individuals' lives. By immersing ourselves in their daily routines and experiences, we gathered valuable insights into the unique challenges and circumstances they faced.

3.2.1. Chanchal:

We encountered Chanchal, a playful young girl in the slum. Despite her spirited demeanor, Chanchal aspires to join the army and avoid working under someone. She supports her family by assisting with household chores and resorting to begging when necessary. However, a lack of knowledge and skills creates a sense of exclusion in her school.

3.2.2. Nava:

Nava, a ragpicker with three daughters attending school, aspires primarily for a brighter future for his children. Nonetheless, the economic demands of the present compel him to send his kids to beg, creating a challenging cycle.

3.3. How Might We Statements (HMW):

We employed HMW to compile a list of the issues we are concentrating on and the problem we aim to address.

Figure 4 : How Might We Web

- **Empower slum dwellers to acquire new skills and knowledge leading to better job opportunities with improved pay, job security, and work-life balance.**
- **Address the obstacles preventing children from accessing education, including parental priorities and inadequate support systems.**
- **Support NGOs and community-based organizations working with slum communities to enhance and scale their impact.**
- **Raise awareness and combat social stigma and discrimination faced by slum dwellers, both in accessing education and employment opportunities.**
- **Improve living conditions in slums by providing better access to essential amenities such as clean water, toilets, and efficient waste management systems.**
- **Collaborate with local governments, policymakers, and other stakeholders to establish policies and programs prioritizing the needs and interests of slum dwellers.**

3.4. Problem Statement:

"To support parents in achieving a balance between their work and parental responsibilities, there is a pressing requirement to provide them with upskilling opportunities that can lead to better job prospects and increased availability to prioritize their children's needs."

3.5. **The ultimate objective is to break the cycle of poverty, enabling slum dwellers to create better opportunities for themselves and their children**

4. IDEATE AND DEVELOP

In the fourth round of our journey, we were committed to ideating the most effective solution for enhancing the well-being of slum dwellers. We aimed to ensure that the residents played an active role in decision-making and that their voices and needs remained central to our ideation process. To initiate this process, we listed the essential factors that our ideal solution should incorporate, based on our six months of research.

4.1. Brief Based Factors for the Ideal Solution:

The proposed solution should be in line with the challenge's requirements, and the concept should place emphasis on the following criteria:

- **People Centric: It should prioritize the well-being and needs of slum dwellers.**
- **Experience Based: The solution should be designed based on the experiences and insights gathered during our research.**
- **Society Oriented: It should address societal issues within slum communities.**
- **Technology Enabled: Leveraging technology for efficiency and effectiveness.**
- **Circular & Sustainable: Promoting sustainable practices and recycling.**
- **Business Viable: The solution should have a sustainable business model.**

4.2. Slum-Specific Factors for the Ideal Solution:

Through brainstorming sessions, we identified the following factors to address:

4.2.1. Community-Based:

The solution should involve forming and fostering a sense of togetherness and unity within the community.

4.2.2. Selling Side:

The solution should aim to eliminate the need for payment from the slum dwellers, given their limited purchasing power.

4.2.3. Income-Based:

The solution should provide a means of generating a stable income for the slum dwellers, given their financial constraints.

4.2.4. Provides Guidance:

The solution should act as a reliable source of information and guidance, especially for critical decisions such as childbirth, considering the lack of education and knowledge among the slum dwellers.

4.2.5. Parent-Child Relationship:

The solution should work towards improving the parent-child relationships in the slums, acknowledging the challenges parents face due to long work hours and the impact it has on their children.

4.2.6. Documentation:

The solution should simplify the process of accessing essential documentation and government policies for slum dwellers, particularly considering the literacy challenges they face.

4.2.7. Experience:

The solution should be experiential, enhancing the overall experience of the slum dwellers and addressing their specific needs.

4.2.8. Financially Capable:

The solution should enable the slum dwellers to become financially stable and able to cater to their own and their family's needs.

4.2.9. Provides Opportunity:

The solution should create opportunities for the slum dwellers, enabling them to grow and make positive changes in their lives over time.

4.2.10. Key Behavioral Change:

The solution should focus on fostering positive behavioral changes within the slum community, helping them overcome detrimental habits and practices that hinder their short- and long-term progress through the design intervention.

4.3. Kano Model

We employed the Kano Model to categorize these factors based on the opinions and needs of slum

dwellers, which helped us focus our ideation process:

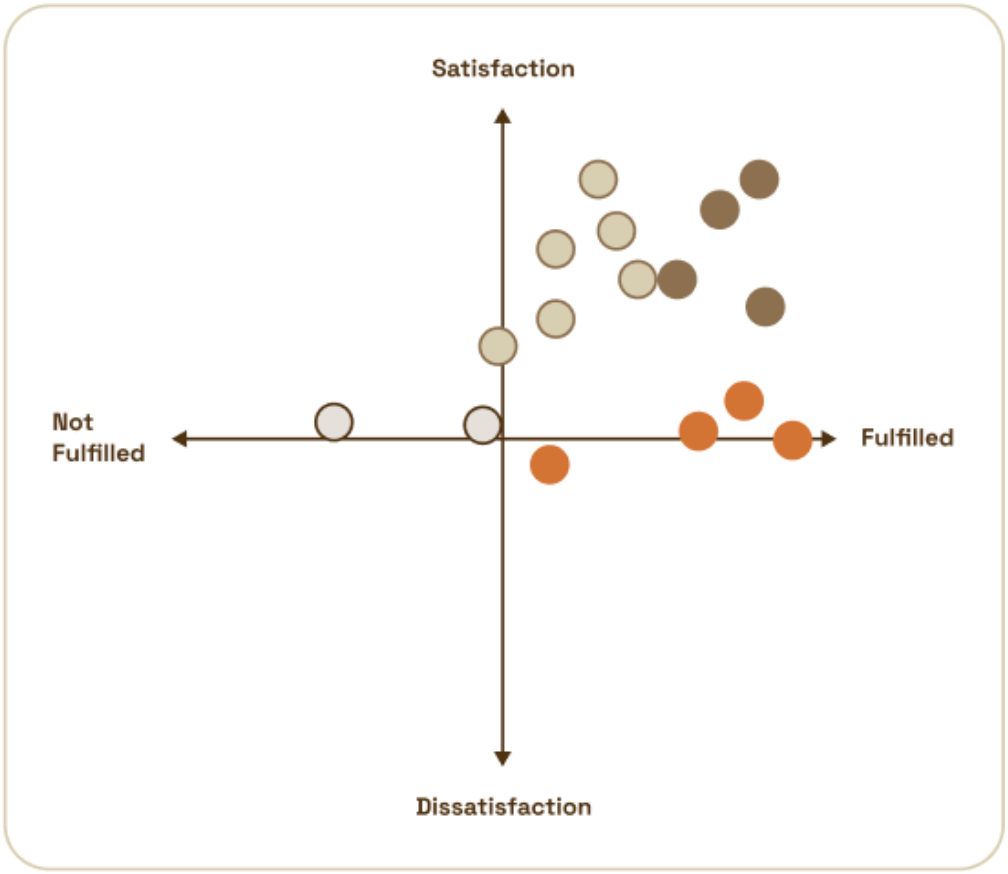

Figure 5 : Kano Model

4.3.1. Must-Have factors:

- **Selling Side**
- **Income Based**
- **Circular & Sustainable**
- **Scalable**
- **Provides Opportunity**

4.3.2. One-Dimensional factors:

- **Experience Based**
- **Upskills**
- **Future Ready**
- **Makes Financially Capable**

4.3.3. Attractive factors:

- **Parent-Child Relationship**
- **Provides Guidance**
- **Gender Equality**
- **Helps with Documentation**

4.3.4. Indifferent factors:

- **Brings Organization**
- **Technology Enabled**

We further validated these factors through interviews with slum residents and NGOs that work closely with them.

4.4. Brainstorming:

To begin the ideation stage, we used ideation cards with various problem statements and conducted brainstorming sessions while considering the factors we wanted to incorporate into our service.

Ideas included:

- ***Healthcare/Food Coupons***
- ***Weekly Payments***
- ***Ration Card Planning***
- ***Assistance with connecting to authorities***
- ***Improving documentation storage and access***
- ***Gamifying the learning process***
- ***Organizing existing Education NGOs***
- ***Making the curriculum inclusive for all***
- ***Upskilling and using their existing skills***
- ***Transitioning from an informal to formal job market***
- ***Creating a platform to sell their creations***

4.5. Concept Generation:

We organized various ideas generated during our ideation sessions into potential service concepts.

4.5.1. Concept 1:

Helping slum dwellers complete their documentation and enabling them to access government policies, including assistance with accompanying them to institutes, with slum dwellers paying for the service.

4.5.2. Concept 2:

Upskilling residents and providing them with the necessary skills to become a valuable workforce for businesses, offering weekly payments, healthcare and food coupons.

4.5.3. Concept 3:

Training ragpickers to create sustainable products from the waste they collect and recycle, with slum dwellers selling these products to partnered sustainable companies and receiving monthly payments, while learning proper waste processing.

4.6. Concept Selection:

We scored each concept on the matrices from the kano model to determine which concept would be the best fit.

Must have	Concept 1	Concept 2	Concept 3
Selling Side	–	+	+
Income Based	–	+	+
Circular & Sustainable	–	–	+
Scalable	–	+	+
Provides Opportunity	+	+	+
TOTAL	-1	3	5

Table 1 : Must Have Factors

One Dimensional	Concept 1	Concept 2	Concept 3
Experience Based	–	+	+
Upskills	–	+	+
Future Ready	+	+	+
Makes Financially Capable	+	+	+
TOTAL	0	4	4

Table 2 : One Dimensional Factors

Attractive	Concept 1	Concept 2	Concept 3
Parent Child Relation	–	–	+
Provides Guidance	+	+	+
Gender Equality	–	+	+
Improved Doccumentation	+	+	+
TOTAL	0	2	4

Table 3 : Attractive Factors

Indifferent	Concept 1	Concept 2	Concept 3
Brings Organization	+	+	+
Technologically Enabled	+	–	+
TOTAL	2	1	2

Table 4 : Indifferent Factors

Concept 3 received the highest score based on the factors we identified. We discussed it further with experts and conducted group interviews with slum dwellers to refine the concept.

4.7. Building on the Concept further

Based on the analysis of all the factors, Concept 3 earned the highest score. We discussed it further with experts and had group interviews with slum dwellers to improve on the concept.

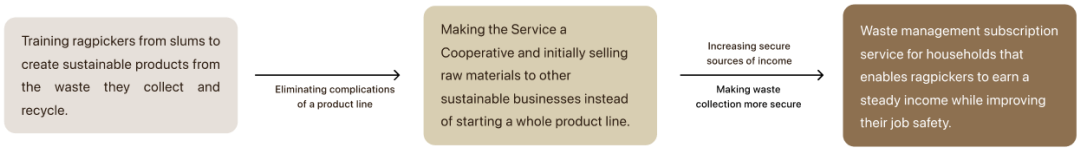

Figure 6 : Concept Evolution

4.8. Concept Description - Sambhav:

Sambhav aims to improve the well-being of ragpickers in Indian slums by providing upskilling, resources, and a supportive community. It offers reliable waste collection services to households, making waste procurement safer and consistent for ragpickers, while creating a sustainable supply chain of materials for recycling companies.

4.9. Scenario

Figure 7: Concept Scenario

4.10. Deliverables

Figure 8 : Deliverables

4.11. Service Blueprint

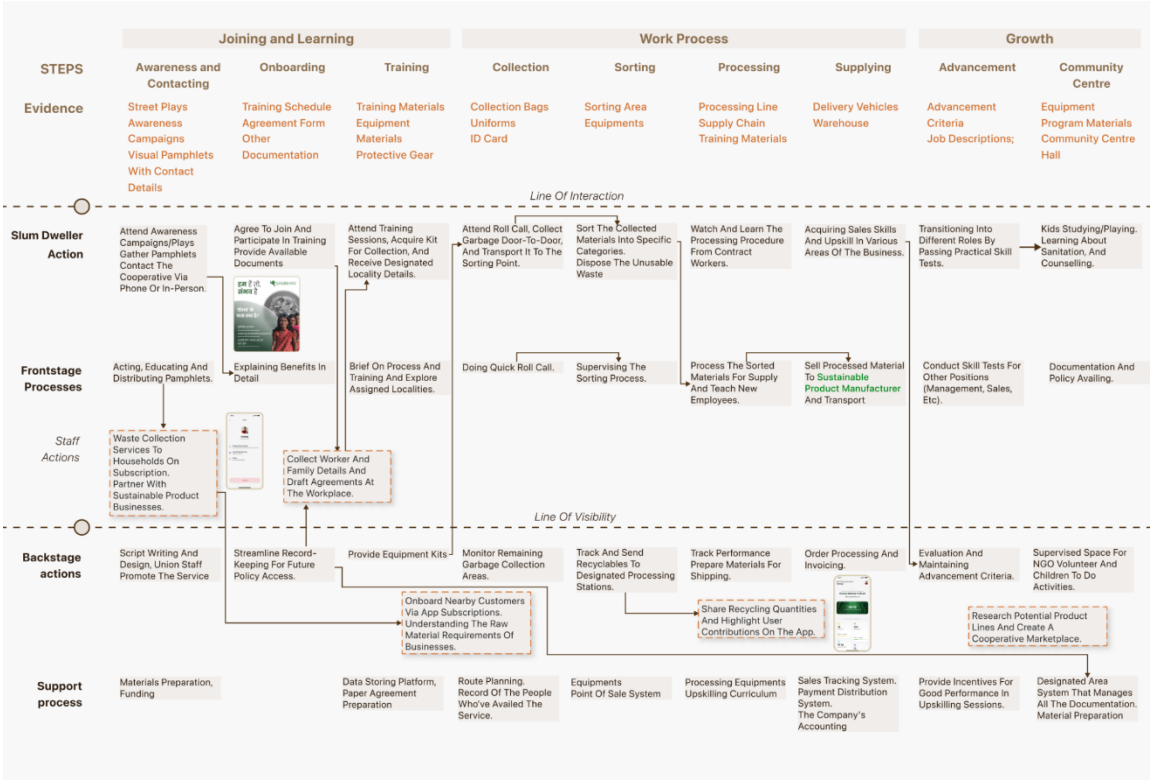

Figure 9 : Service Blueprint

4.12. Business Model Canvas

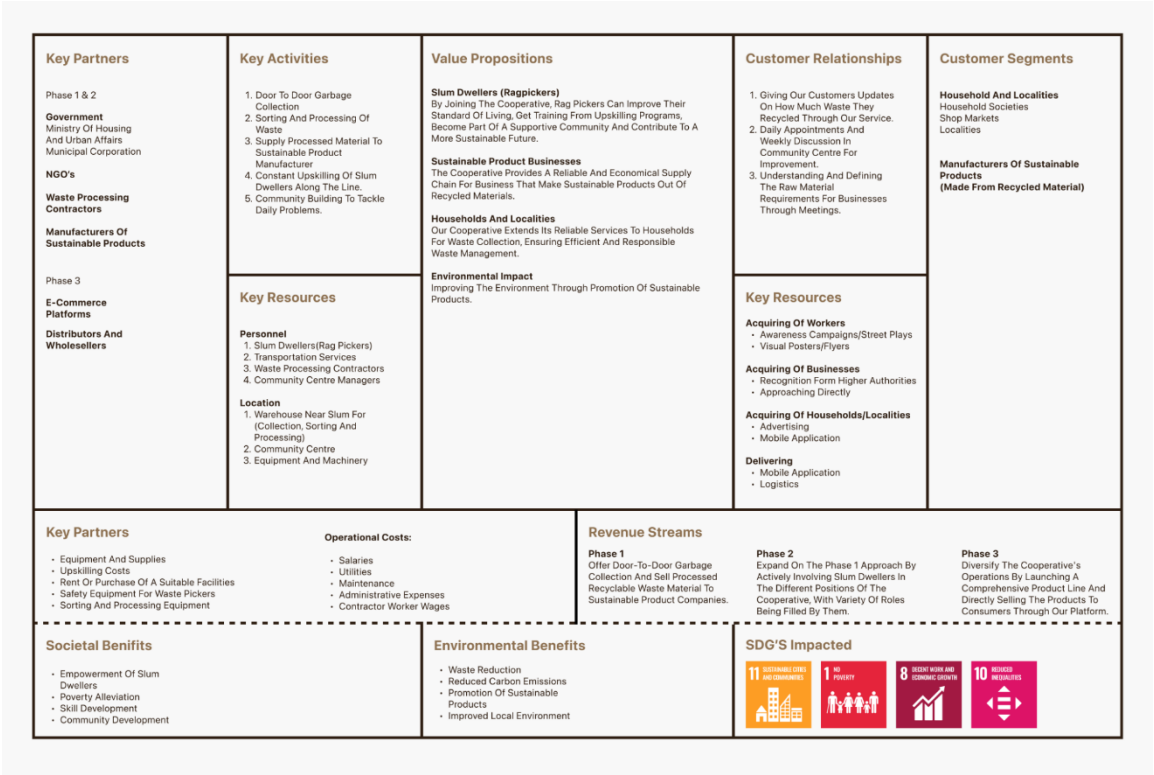

Figure 10 : Business Model Canvas

Closing Remarks

"Participating in the Challenge was a transformative journey for our team. Engaging with slum dwellers fostered empathy and meaningful connections that fueled our personal growth as we iterated and built on our approach to have a positive change. This experience emphasized lifelong learning, adaptability, and the power of collaboration for personal and collective growth."

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Exploring Challenges Encountered by Senior Citizens When Managing Luggage During Train Journeys in India: An In-Depth Review

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Abstract

For elderly adults embarking on journeys within India, the task of transporting and managing their luggage often transforms into an intimidating and physically arduous endeavour, considerably diminishing the overall travel experience. As per the Indian Railways, most train travellers are between the ages of 19 and 45 years. The 46-60 year olds and 60+ year olds each constitute approximately 10% of total train passengers. Despite their sizable numbers, this demographic often struggles with the complex duty of conveying and organizing their baggage, exacerbated by the challenges of navigating platforms, comprehending routes, and identifying pathways that could facilitate their luggage handling efforts. This burden goes beyond physical exertion, impacting

those with limited mobility attempting to manoeuvre train stations alongside their luggage. The emotional toll of these impediments manifests as feelings of helplessness and exasperation. Underscoring the compelling need to tackle these multifaceted difficulties faced by elderly people during their Indian travel journeys, this paper illuminates the pressing issues necessitating attention.

Introduction

Travelling is an activity that enriches the human experience, furnishing opportunities for exploration, engagement, and the creation of cherished memories. Moreover, train travel is a prevalent mode of transportation in India, owing to its affordability, accessibility, and extensive network coverage. However, for elderly citizens in India, the act of venturing from one location to another is often fraught with myriad challenges, especially regarding the management of their luggage. India's ageing population is burgeoning swiftly. As stated in the 2023 India Ageing Account from a global reproductive health organization, 149 million seniors currently reside in India, forming 10.5% of the total inhabitants. This figure is predicted to surge to 347 million by 2050, constituting 20.8% of the people. The ageing Indian populace carries numerous consequences, including regarding welfare, healthcare, and transport. It is vital to grasp the troubles confronted by elderly individuals and cultivate policies and programs to resolve these dilemmas.

Aged people may find luggage management burdensome owing to various influences, including their bodily strength, mobility, and cognitive faculties. They may also struggle to navigate railway terminals and locate their train. Additionally, the atmosphere of

the train can be taxing for seniors, with its narrow aisles, lofty steps, and mobs. This can impede elderly people's ability to manoeuvre and organize their luggage. The COVID-19 pandemic has further exacerbated the challenges confronted by senior citizens when travelling by train. Due to the pandemic, numerous elderly individuals are reluctant to travel by train, and those who do venture may be disinclined to seek assistance from railway personnel or fellow passengers. This fundamental aspect of travel, while seemingly mundane, assumes supreme significance in the context of senior citizens' journeys. Luggage handling bears not only physical repercussions, contributing to bodily strain and unease, but also emotional ramifications, engendering feelings of powerlessness and exasperation. This research will concentrate on the difficulties experienced by senior citizens when organizing luggage during their train voyage in India. The research will utilize data from diverse sources, encompassing interviews with senior citizens, railway personnel, and other stakeholders. The research will also re-examine the extant literature on this subject. Identifying and articulating the challenges faced by senior citizens during travel will elevate awareness and propel efforts to refine their travel experiences. This will render travel more inclusive and enjoyable for this vital segment of our population.

Literature Review

The challenges confronted by senior citizens when travelling by train have been thoroughly documented in the literature. A study conducted by the National Rail Passengers Association (NRPA) discovered that elderly people are more prone to endure difficulties such as mounting and descending trains, locating their seats, and hoisting luggage. The study also found that senior citizens are more susceptible to falling victim to criminal offences

on trains. Another study, executed by the Indian Railways, ascertained that elderly individuals are more likely to grapple with issues of train timetables, delays, and cancellations. Additionally, the study established that senior citizens are less conscious of the various concessions and amenities accessible to them.

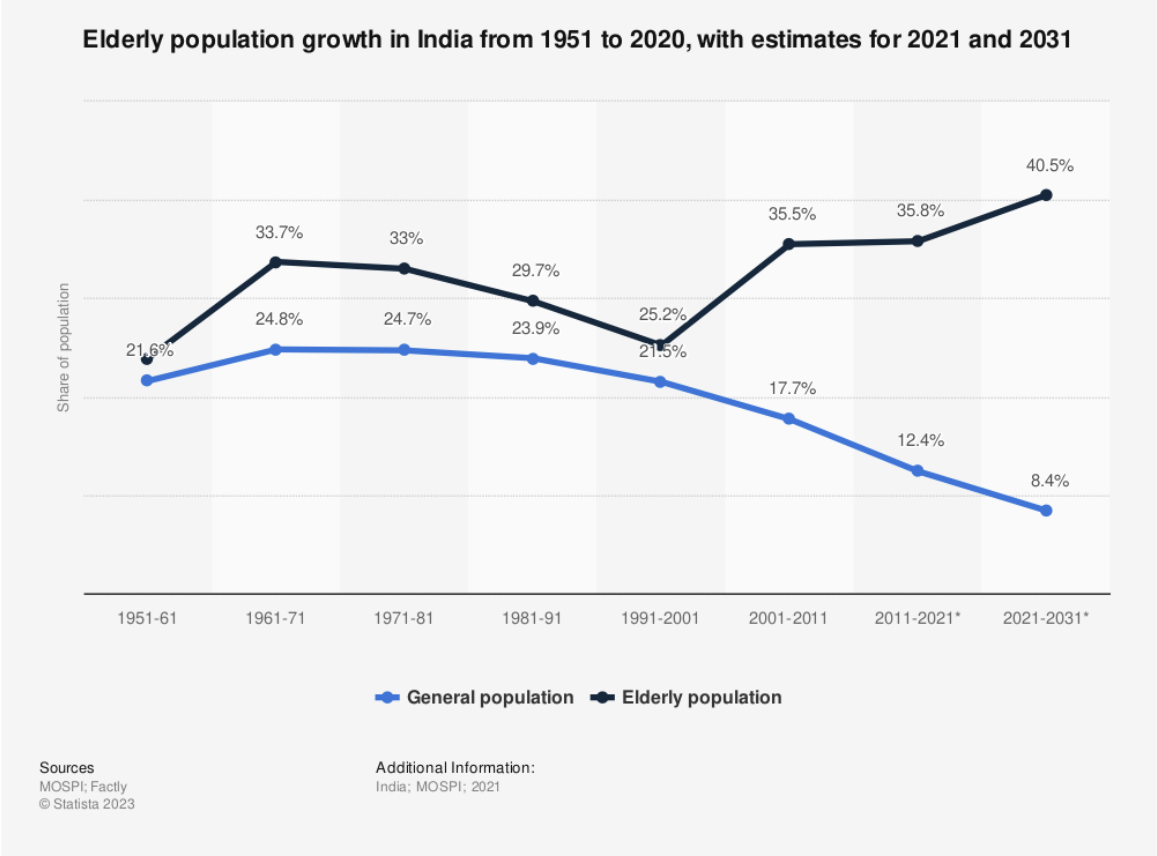
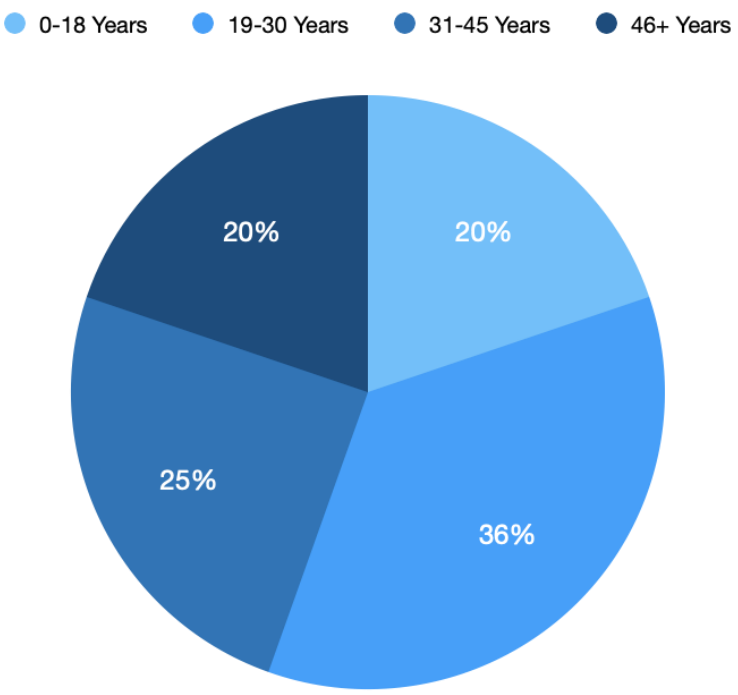


Fig. 1 Graphical Projection of Elderly Population in India

As per the India Ageing Report 2023, published by the United Nations Population Fund (UNFPA) in September 2023, there are



149 million elderly citizens in India, constituting 10.5% of the total population. The senior citizen demographic in India is proliferating at a more expeditious pace than the overall population. This is attributable to various factors, including dwindling fertility rates and augmenting life expectancy.

Fig. 2 Age Group Distribution of Train Travellers in India

The distribution of the populace of train travellers in India is heavily lopsided towards the younger age cohorts. As per the Indian Railways, the majority of train voyagers are between the ages of 19 and 45 years. The 46-60 year olds and 60+ year olds each constitute approximately 10% of total train passengers.

There are several rationales for this skewed age dissemination. One reason is that train travel can be physically taxing, especially for elderly citizens with mobility impediments. Another reason is

that senior citizens may be more reluctant to embark on long journeys by train, owing to trepidations regarding their health and safety.

The Indian Railways has undertaken various measures to render train travel more accessible and affordable for the elderly. For instance, senior citizens are entitled to fare discounts and priority boarding as well as seating arrangements. However, further efforts must be channelled towards addressing the challenges confronted by senior citizens when travelling by train.

Methodology

This questionnaire is designed to garner comprehensive discernment into the challenges endured by elderly individuals during train travel in India, specifically revolving around baggage management. The inquiries aim to capture personal experiences, illuminating difficulties faced during various stages of the journey, such as mounting, descending, and the overall travel encounter. The participants will be prodded to recount specific occurrences and moments that exemplify the challenges they confront, with a distinct emphasis on prevailing luggage storage and handling facilities.

Additionally, the questionnaire solicits perspectives on the suitability of diverse luggage varieties for train travel and investigates the decision-making process for senior voyagers when packing for an excursion. Furthermore, the participants will furnish feedback on the assistance received from railway personnel and fellow passengers and voice any safety concerns related to baggage during train sojourns.

Ultimately, the objective is to uncover invaluable insights that can inform design enhancements in the train travel system, rendering

it more accommodating and accessible for elderly passengers regarding luggage oversight. The assembled information will be instrumental in pinpointing areas for improvement and innovation, contributing to a more comfortable and secure travel experience for senior individuals in the context of train travel in India.

Key Insights from Interviews with Elderly Passengers

Elderly passengers face numerous challenges when organizing their luggage during train travel in India, encompassing the weight of the baggage, the scarcity of space on the train, the number of steps to ascend, the lack of lifts at train stations, the unavailability of porters at train stations, the absence of information about luggage handling services, the expenditure of luggage handling services, and deficient security for luggage.

Common suggestions from senior voyagers for streamlining train travel include furnishing more luggage trolleys at train stations, mitigating overcrowding in train compartments, installing more lifts at train stations, employing more personnel to assist with baggage, appointing more porters at train stations, instituting a unified point of contact for details regarding luggage handling services, decreasing the rates of luggage handling services, and elevating security for luggage at train stations.

One vital insight from the interviews is that elderly passengers often struggle to convey their baggage owing to the weight and numerous steps they must climb. This indicates the necessity for more luggage trolleys and lifts at train stations. Another key revelation is that senior travellers are frequently baffled by the various luggage handling services and accompanying rules and

regulations. This implies the need for a centralized hub for information about luggage handling services.

By tackling the cardinal challenges and implementing the suggestions of elderly passengers, Indian Railways can transform train travel into a more affirmative experience for all travellers, especially the elderly.

Persona

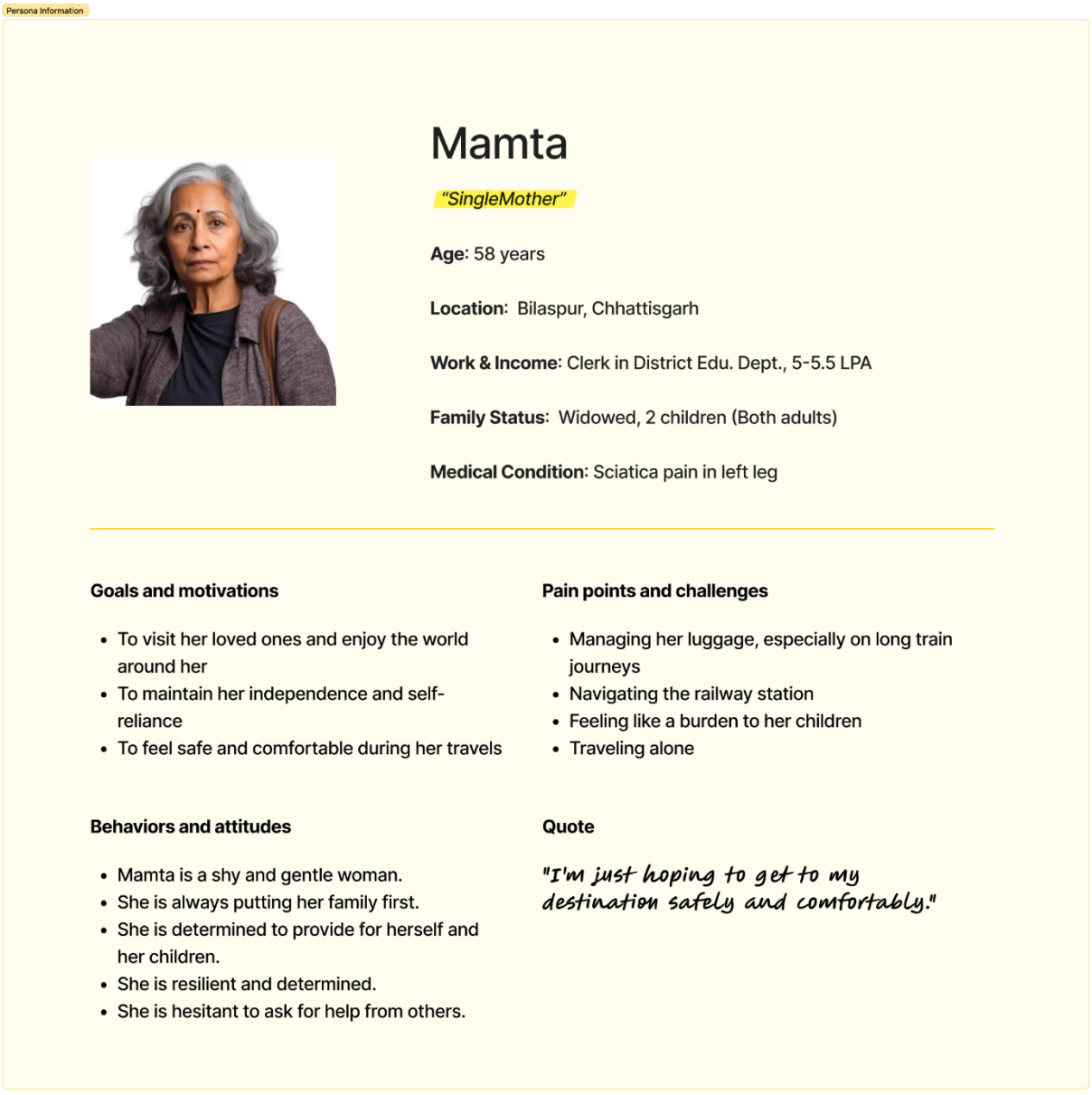


Fig. 3 Persona of a 58 years old, kind and gentle-hearted single mother

Figure 3 shows Mamta, a woman in her late 50s, who suffers from a medical condition that doesn't allow her to pick up any sort of heavyweight. She is reluctant to travel by train, carrying heavy luggage. Mamta's persona can be used to study the problems that women travelling alone by train face and to create solutions to these problems.

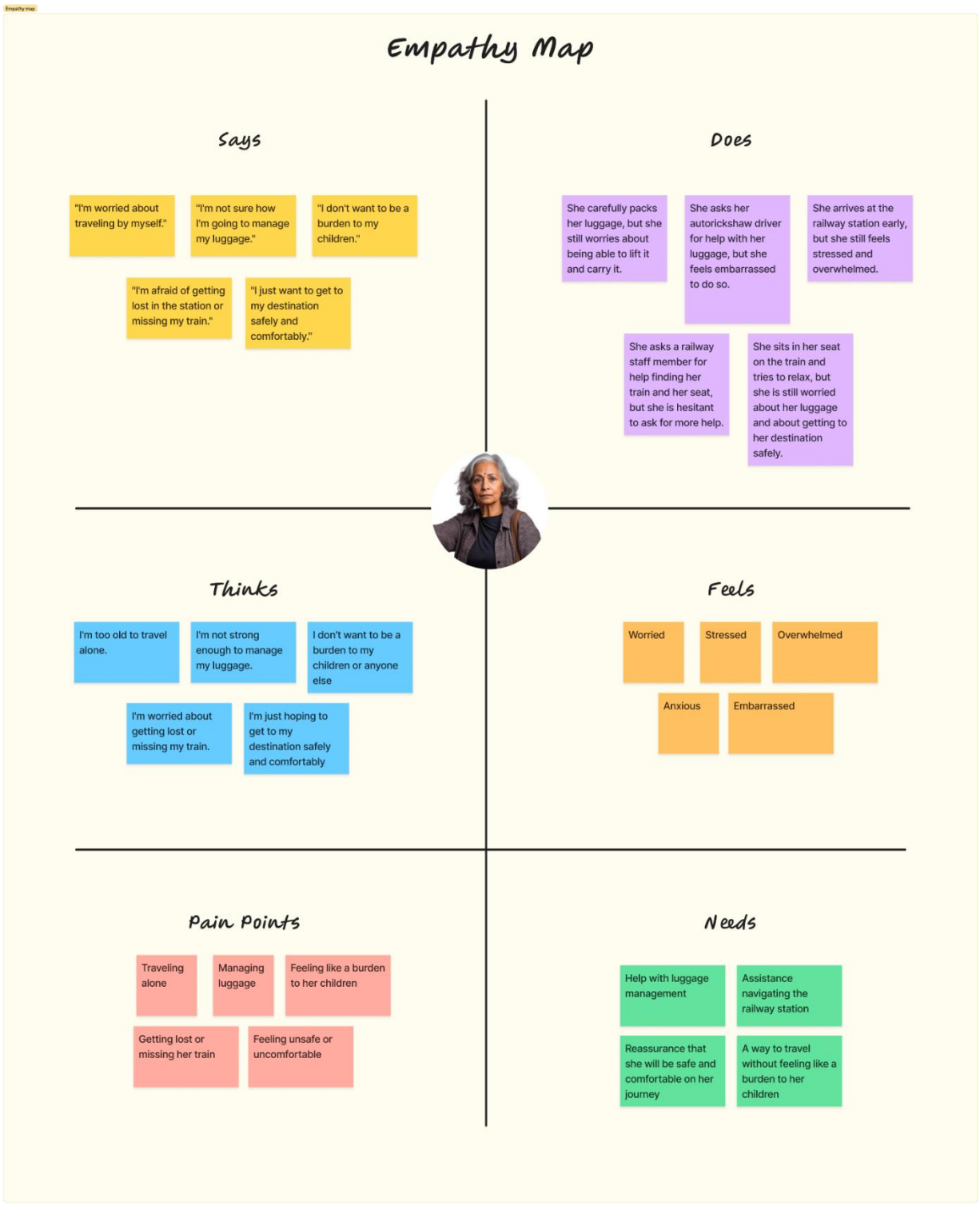


Fig. 4 Empathy Mapping of Mamta

Journey Mapping

Pre-Journey

- **Mamta packs her roller trolley as lightly as possible, however, she must still convey certain indispensable items and her metal chain and lock as a safety precaution, which amplifies the weight of her baggage.**
- **She is primarily apprehensive about the security of her luggage and frets about it throughout the excursion.**
- **Mamta arrives at the railway station two hours prematurely so that she possesses ample time to navigate the station and pinpoint her train.**
- **She searches for signage directing her to her platform and train.**
- **Mamta is reluctant to request assistance from railway personnel, but eventually implores a staff member to aid with loading her baggage onto the train.**
- **Once her luggage is stowed, Mamta locates her seat and attempts to unwind. However, she remains anxious regarding the safety of her baggage.**

During the Journey

- **Mamta expends the journey attempting to relax by reading, viewing movies, and conversing with her fellow passengers.**
- **However, she is yet unable to completely unwind owing to the disquietude surrounding her luggage.**
- **Mamta verifies her baggage frequently and does not slumber well during the voyage.**

Arrival at Destination

- **Mamta arrives at her destination securely and on time.**
- **She is relieved to observe that her luggage is unharmed and intact.**

- **Mamta is gratified that she was able to conclude her journey, but is also drained from the absence of sleep.**

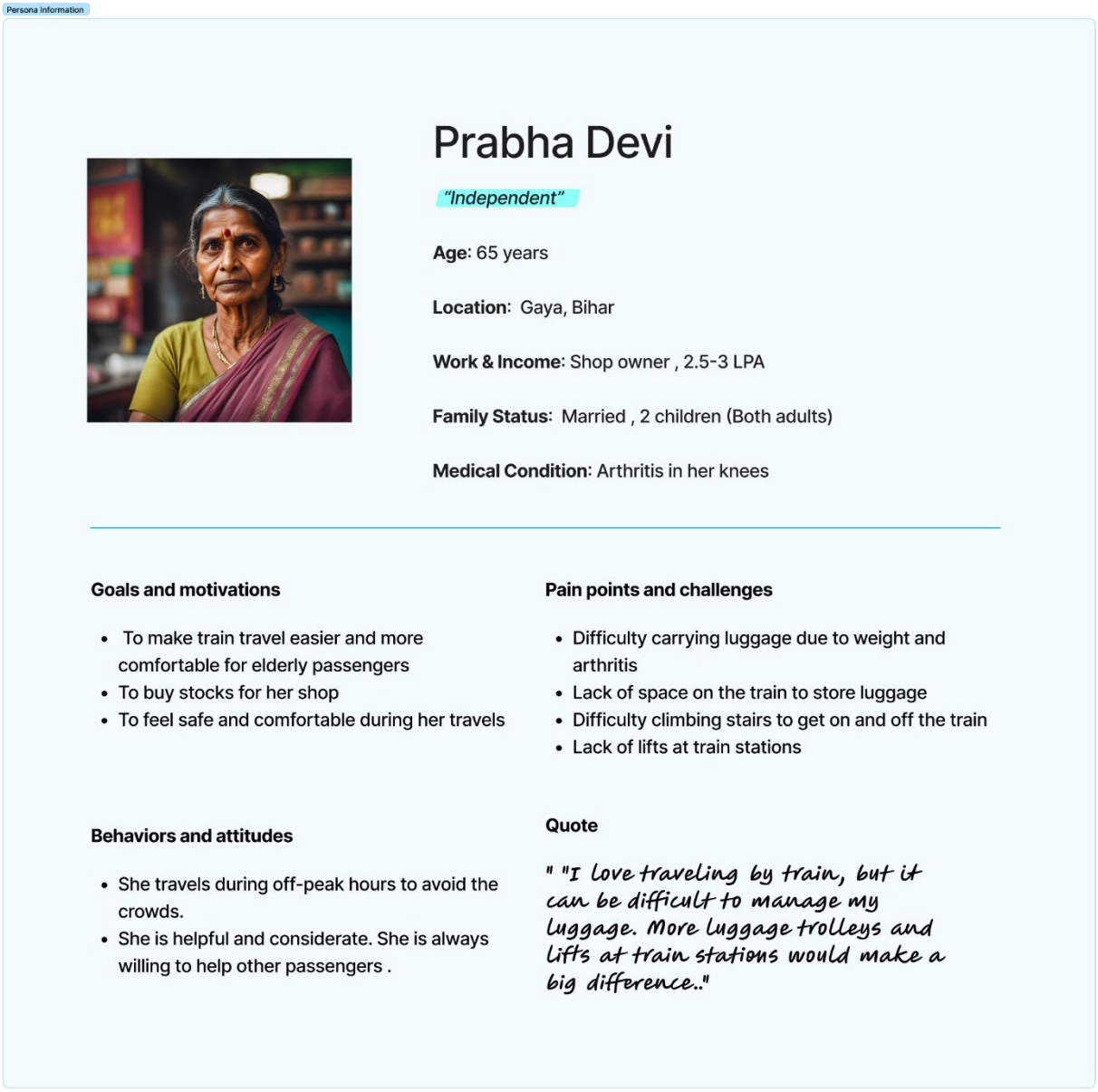


Fig. 5 Persona of a 65-year-old, self-reliant, hardworking woman

Figure 5 shows Prabha Devi, a woman of lower-middle-class. She is of age 65 and frequently travels by train to bigger cities, to purchase goods wholesale for her shop. She faces several challenges, including physical strain, stress and anxiety, and financial burden.

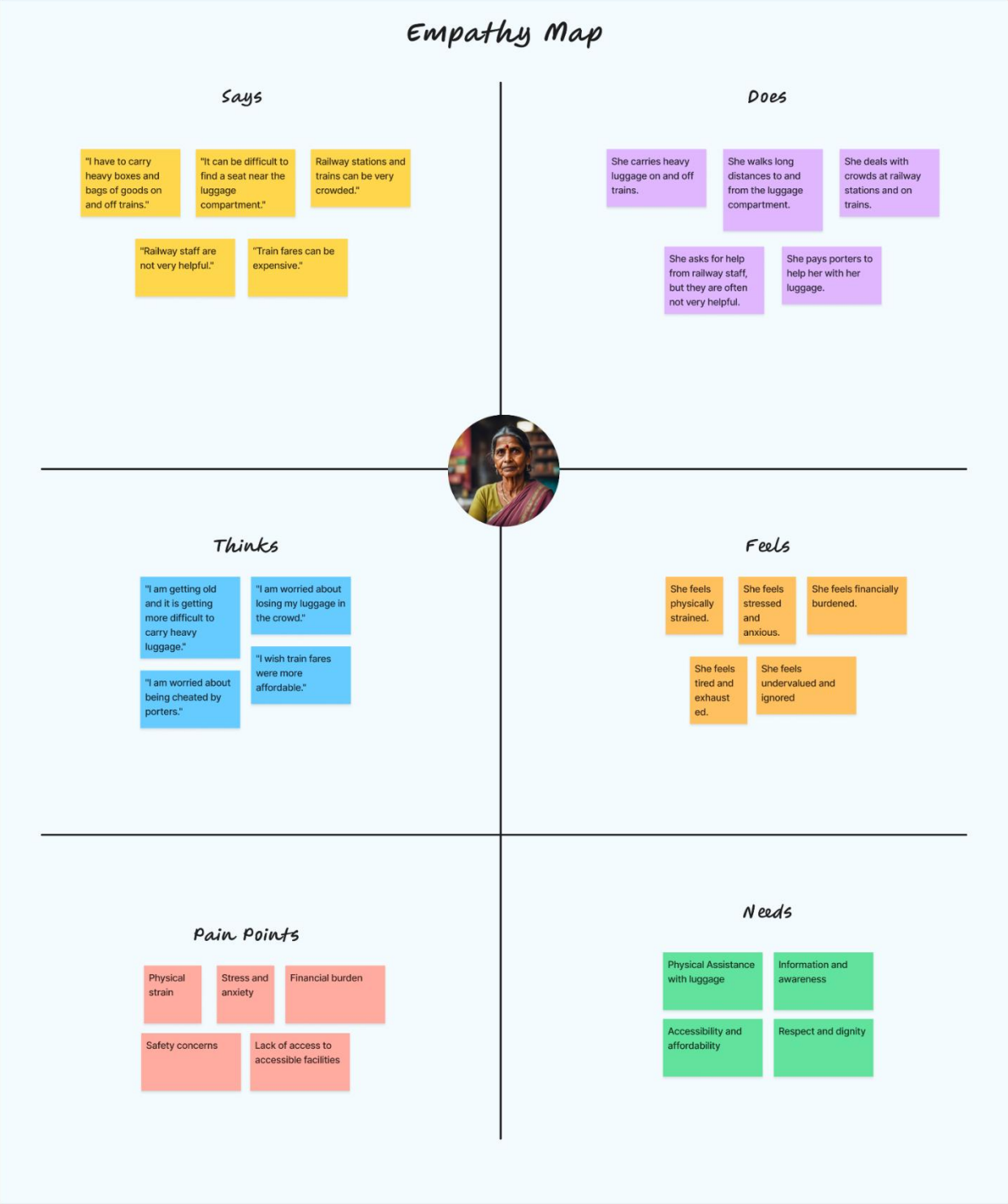


Fig. 6 Empathy Mapping of Prabha Devi

Journey Mapping

Pre-Journey

- **Prabha Devi becomes cognizant of the wholesale market from other vendors, companions, and family.**
- **She contemplates the expenditure of venturing to the metropolitan area and the prospective profits from retail of the merchandise she procures.**
- **She attempts to garner further insights regarding the market by conferring with individuals who have visited previously.**
- **The woman borrows capital from her family or allies to address the costs of travel and goods.**
- **She reserves a train ticket from the reservation counter at the railway station and packs a light bag with her essentials.**

Journey to the City

- **Prabha Devi handily locates a seat on the train, since she possesses less baggage.**
- **She can unwind and relish the train voyage since she is unencumbered by cumbersome luggage. However, she still frets about her return excursion.**
- **She reaches the city and asks for directions to the market.**
- **She searches for the most economical transportation to the market. She decides to proceed by foot.**
- **She arrives at the market mildly fatigued. She purchases all the requisite merchandise she desires.**

Return Journey

- **Prabha Devi gathers all her commodities and seeks an auto-rickshaw to return to the train station.**
- **She arrives at the train station and implores the driver to assist in reaching the platform and conveying her baggage.**

- **She awaits the train's advent. She is troubled regarding loading the luggage onto the train.**
- **As the train pulls in, she hesitantly requests aid from nearby individuals and has her luggage stowed on the train.**
- **She looks for a seat with more room for her belongings. She finally secures a seat and relaxes briefly. She is already drained and is anxious about arriving at her shop.**

Arrival at Destination

- **Prabha Devi arrived at her destination without incident and in a timely fashion.**
- **She is relieved to observe her luggage is undamaged and intact.**
- **Prabha is gratified to have completed her journey but is also exhausted from the exertion.**

Challenges Faced by Elderly Passengers

Aged travellers on Indian Railways encounter several difficulties managing luggage, including health restrictions, little help from others, crowded cars, and poor luggage storage. These issues heavily impact the elderly physically and emotionally.

Health Restrictions

As seniors age, they often lose strength and mobility, making lifting heavy bags taxing, especially for overhead storage. A study by a Delhi research group discovered over 70% of elderly riders struggle with storing luggage above.

This can strain muscles, cause tiredness, and other health problems. Seniors also risk injury if unable to load baggage safely.

Little Help From Others

Many ageing passengers lack assistance from fellow travellers and railway personnel. Studies indicate limited awareness and availability, with only 20% of seniors receiving help with their bags.

This leads to aggravation and unease for the elderly. They may feel embarrassed or powerless when forced to manage alone, making future train travel unappealing.

Crowded Cars

Packed trains hinder ageing riders from moving around and stowing their luggage. For those with impairment, this introduces risks like falling, wounds, and breathing issues. A global health watchdog found overcrowding a common Indian railway problem, endangering older travellers.

Poor Luggage Storage

Storage racks on trains are often too narrow or too high, without room for large baggage. A railway system analysis discovered just half of the compartments have adequate senior luggage capacity.

This causes hassle and trouble for the elderly. They may need to carry bags throughout journeys, proving tiring and difficult.

Impact on Elderly

The luggage challenges ageing passengers face heavily impact them physically, including fatigue and injuries, and emotionally, including distress, seclusion, and travel avoidance.

- **Physically, elderly passengers may experience fatigue, muscle strain, and other health problems. They may also be at risk of falls and injuries.**
- **Emotionally, elderly passengers may experience distress, frustration, and isolation. They may feel embarrassed, helpless, and discouraged from travelling by train in the future.**

The Beginning of Their Challenges

Senior citizens encounter luggage handling issues from the instant they exit their residences to navigate to the railway station.

They frequently need to lift and carry their baggage up and down staircases, load and unload items from automobiles, and traverse bustling civic spaces.

At the railway station, senior citizens often must queue to pay for tickets, check in luggage, and embark on the locomotive. They are also required to negotiate jampacked platforms and railcars.

On the train, senior citizens regularly need to hoist and haul their baggage to and from their seats as well as store belongings in overhead containers. They also must steer luggage through cramped passageways and portals.

Existing Solutions to These Problems

There are a few existing solutions intended to reconcile the luggage handling obstacles for senior citizens in Indian Railways:

Luggage Carts – Luggage carts are available at most railway stations but can demonstrate difficulty to manoeuvre for senior citizens, especially those possessing limited mobility. The carts

are recurrently substantial and unwieldy, potentially unable to contain all luggage varieties.

Porters – Porters can be commissioned to assist with luggage handling, but may prove expensive and unreliable. There have been occurrences of porters overcharging senior citizens or seizing their possessions.

Railway Personnel – Railway personnel are designated to endow assistance to senior citizens with luggage operations, but this does not unfailingly transpire. Workers may be engrossed or loath to help, or oblivious of senior citizen requirements.

Flaws and Ineffectiveness

The existing elucidations own the subsequent deficiencies and failings:

Luggage Carts – Carts can demonstrate difficulty to steer for senior citizens, chiefly those possessing limited mobility. They are habitually bulky and lumbering, potentially unable to accommodate all luggage varieties.

Porters – Porters can emerge as expensive and unreliable. There have been episodes of porters overcharging senior citizens or pilfering their belongings.

Railway Personnel – Railway personnel are presumed to endow assistance to senior citizens with luggage manoeuvring, but this transpires seldom. Employees may be engrossed or loath to help, or oblivious of senior citizen exigencies.

Proposed Solutions

To mitigate the challenges confronted by elderly passengers in luggage administration throughout Indian train sojourns, the consequent solutions could be executed:

Dedicated Luggage Assistance Services – One elucidation is purveying specialized luggage assistance amenities at railway stations. This would encompass trained functionaries who can endow support in hoisting and repository luggage for elderly passengers. This service would be distinctly beneficial for solitary elderly travellers or those possessing limited mobility. Studies display that dedicated luggage aid services can dramatically ameliorate elderly traveller satisfaction and prospective train utilization.

Enhanced Storage Capacity – Another solution is optimizing storage capacity within train cars. This could entail furnishing more extensive luggage racks, earmarked areas for larger luggage articles, and inferior overhead containers. This would render storing belongings simpler and more expedient for the elderly. Studies exhibit that augmented storage capacity significantly lessens senior citizen injury risks and augments elderly passenger travel satisfaction.

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Letter from the Chairman's Desk By Sunil Bhatia PhD

One day I was waiting for a bus at a newly constructed modern design bus shelter. A common person will appreciate such changes and will express a high opinion of the authority who built it. It was not a traditional bus stand where a normal roof made of iron sheets protects from sun and rain and passengers could wait by sitting at the long iron flat bench. I have noticed people who were aged or women who could not stand waiting for their specific bus were comfortable with that design of bench for sitting and never complained. The new design bus stand has replaced the traditional bench with two stainless steel tubulars placed one over another with some angle and distance.

A person can sit over the top large round tube pipe and rest his leg at the bottom place bar. It needs the skill mindset to sit on that tubular. A young man can sit comfortably but an aged person will fear sitting because he may fall because of a slippery round surface or imbalance while sitting because it is not a flat surface as they have used traditional bench. People's apprehension is visible when they prefer to stand rather than rest on sitting on the tubular.

Certain individual confidence is shaky in sitting on the tubular bench and that never encourages them to sit. It was not designed

for people who are age and not at all for women of any age. It was not designed keeping in mind differently-abled people. A woman's anatomy is such that it does not support the comfort of sitting over tubular.

Fear is the emotion that is the source of this hostile architecture. A dark area or low illumination in a public space discourages people from using the products placed in that area proving a hostile design. Illuminated area lowers the fear and support for the use of the products placed in that area. The discomfort element in the designed product forces the users to not use it for longer but in limit and discourages assembling as a crowd.

I was thinking about such a design and realized the designer was asked to make such a bus shelter where when it is not in use at night the homeless people should not sleep as they comfortably do on traditionally designed benches. The new design prevents users from doing so for rest by stretching their body by lying over the bench. It was a hostile design. In modern cities, they introduced obstruction not to use the bench for sleeping but designed for sitting comfortably by introducing either several ridges at the sitting area that discomfort in sleeping or segregating the bench seats with high bends armbar in the name of privacy should not disturb individuals. It is a recent concept to install the bench in a public place tilted toward the front that makes the person slip if not using his leg to prevent it. This leg force in preventing slip makes the person not sit for long as his physical energy is channeled in controlling his slip and that makes him tired.

Some vigilant citizens are becoming aware that Hostile architecture which is promoted as defensive architecture or exclusionary design is a new tool of an urban design strategy in which public spaces and structures are used to prevent certain activities or restrict certain people from using those spaces.

I wrote a letter to the authorities and requested them to introduce the traditionally designed bus shelter that has a better design. But authority proved deaf ears despite my using strong words of 'Design against humanity', and 'it is a crime against society' and it reflects authority is no longer concerned with the welfare of society in general but protecting the interest of a specific class. Elements like protection and comfort are essential to attracting users to a public space and in the case of the bus shelter protection elements are untouched in the new design but comfort is strategically lowered.

The idea of hostile design was disturbing and my anxiety calmed down as I brood over issues and realized it is from the day man comes into existence. I thought it was a primitive practice but acquired prominence with the concept of 'ownership'. 'Steal' / 'encroachment' is the word that has come into existence with the concept of ownership. These concepts make it express the philosophy of not to share with what they own. It is the height of selfishness that forces them to think not to allow others to use in their absence. Individuals used barbed wire around their owned plots of land and wherever possible space might occupied by anyone they designed such things that prevented them from using temporarily for their benefit. The idea of a knot has revolutionized society's progress but it was hostile for someone to limit the movement by tying with the rope for helplessness.

Social structure has a hostile design by caste, colour, and creed for drawing a line among groups not to cooperate and share but each group's superior qualities proved hostile for another group in the race of proving others inferior. At the psychological social norms designed the concept of promoting high values of 'virginity' in society is a kind of hostile design that prevents married women from going for divorce because she is no longer a virgin and will not be accepted by others. The world lost the significance of virginity in society so divorce is on the rise. In financially hostile design was introduced in public transport when they compartmented by gender- 'ladies' and 'general coaches', according to distinction in fare by the 'executive' or 'general class' and introduction of the financial penalty with imprisonment if boarding in the wrong compartment. Sometimes authority hikes the fare just to be hostile to those who cannot afford and abandon traveling by specific transport means and it was implemented to lower the crowd in Delhi metro by such practice. Another example is the booking of hiring of car services at the peak hour charges differently compared to lean hours. It is a clear practice of hostile design for earning profits.

In primitive times the hunted prey was owned by the group but as other groups tried to snatch or steal, they designed various techniques and tools to prevent such actions and the idea of a hostile designed surface. It gained momentum with agriculture and the idea of erecting fencing with barbed wire to hurt those who tried to steal their assets was a kind of hostile design. The design of sharp tools for killing came into existence because of the concept of hostile design. As civilization progressed the idea of putting locks and latches is nothing but it comes under the

category of hostile design. The deterrent is another form of hostile design where notice of 'you are under the scrutiny of CCTV cameras' is a hostile design in present times. Modern architectures are making such designs for vacant space that can be encroached on by others for some nonsense business by creating discomfort design that prevents it from being removed and occupied by others. It is similar to capping the bottle to prevent foreign elements from attacking the contents for damage and remain edible for a long life. Adding preservatives to increase shelf life is a hostile design by controlling the attack of foreign elements from damaging the content. The idea of boiling or roasting was learned by our ancestors by observing nature after mastering the art of management of fire was the initial step of enhancing the life of edible items that do not come easily under the attack of other foreign elements that cause damage to the food proved hostile for them. The biggest man-made design was frying which was solely devised by humans by extracting the oil from seeds and frying to retain the edible products for a longer time compared to boiling and roasting. The design of frying was the ultimate hostile design in cooking and no one so far has designed any better design than this. The idea of pickles or jam is a by-product of hostile design.

When I was a small child and living in a government flat allotted to my father, a cow trap was designed at the main entrance of the colony by digging a pit covered with a strong iron frame has several GI pipes inserted in iron bars. As a stray cow or any animal steps in an attempt to cross the cow trap, bars rotate inward and trap the leg of the animal into the gap of two bars. The distance between the two tubes was enough not to allow slipping the adult human feet into that trap. My feet were small and my

father used to carry me in his arms as that entrance came. That was a hostile design. Even I remember my mother kept a certain jar of special sweets at such a height of shelf where our hand as a child cannot reach but any adult reach was easy. It was a hostile design for us. We tried our level best to reach by placing some stool but fall will hurt us in experiment with high rise stool prevents us and ultimately plead to adult members to help us in enjoying that sweets. We were at mercy of others.. In the present time at the entrance of the park, the gate is designed in the H shape of a fixed iron passage to prevent the entrance of animals. This is good for preventing big animals but dogs can twist their body so it is not a hostile gate for them.

What is hostile design? What I think is 'when any product is designed it has various functions but limiting it to one specific objective and eliminating other possibilities is hostile design'. The degree of hostile design is based on the value of the assets to be protected. Another significant factor of hostile design is not compatible with our sensory senesces and aversion makes it hostile. A foul smell creates such that it turned hostile design and to counter air freshener of fragrance lower its degrees.

It is in built phenomenon in nature. As long the fruit is not ripening and needs to hide from the possible attack of damage before maturity it devising various techniques of carrying the same colour of the leaves not to be different for notice. Some Plants have prongs/thorns that are sharp enough that protect the fruits and as someone tries to pluck it hurts. Similarly, prey does not have to be food for attackers by changing their skin color or releasing unpleasant hormones or harmful liquid juices. Mouse is a nuisance in the urban areas and controlling is a big challenge.

The mouse trap is designed and placed where it is frequently visible and once trapped it proves hostile design. Some people place a cake to kill the mouse and as they eat and find their life in danger they start striking the left legs with force on the floor as well as urinate to signal about danger and hostile place to other mice in the locality.

The concept of hostile design is used for physiological pain and discomfort that we noticed in the bus stand bench design. This is used for punishment also. A jail room is designed so small that a person cannot sleep comfortably and living in discomfort makes him mentally and physically weak over time. It is one kind of torture that is hostile in design. It is used for safety by threatening the attacker by showing an open big knife for attack or a pistol for fire from a distance.

There is psychologically hostile design was devised by fear of entering an extremely unclean, dirty, locked room for a long time. Even the fear of slipping proves hostile with the high possibility wherever slippery tiles or nature-developed moss that scares anyone from wading into that area. It is noticed that dark areas invite anti-social action by someone to generate fear of untoward among common people not to wade into that area unless it is urgent and no other alternative is possible. That area proves hostile and authorities deliberately lower the intensity or make it completely dark for hostile design so as not to attract people. It reminds the design of ultra violet mosquitoes repellent that makes hostile for insects in that area. Another way of designing mosquitoes repellent is heat the platform with electricity for placing the cake for releasing the fumes for repulsion or burn the incense stick for hostile design. That is another way of designing

hostile designs installation of ugly figures in public places is one kind of hostile design. I remember as a child we used to play in the rainy season by catching frogs and as we held them in hand they urinated or secret some hormones that scared us and later on we stopped disturbing them. It was a hostile design. We used to avoid slippery places due to rain or green moss that might hurt is a kind of hostile design if authority deliberately grows that area like that.

The counter of hostile design is the reason for the design of better useful products as initially the cot was designed with hard wooden planks for resting and element of discomfort was inbuilt that need of lowering for comfortable sleep. When designing the cot for sleeping with wooden plank it was very hard and gave discomfort for sound sleep. They devised various techniques to lower the degree of hostile design by replacing it with weaving rope in place of flat wooden horizontal and ultimately by placing mattresses over it. The escalator is to make the place accessible. I have found on many occasions in metro train services that some women were scared to step into it and ultimately preferred climbing the stairs. It is hostile because of fear generated due to lack of knowledge and no experience of uses. If someone meets with an accident while using the escalator that person will fear using the same in future. It is a good design product but the lack of proper instruction and communication makes it a hostile design. The introduction of speed breakers on the road for the movement of vehicles and governor fixed in vehicles limiting speed at specific points or in general for smooth traffic on the road is achieved because of hostile design.

I remember unemployed students were protesting against government policies of employment and there was a crowd of more than 50 thousand sitting in protest. They were using a nearby public toilet and the water supply was from drinking water kiosks. The authority first removed all the facilities of public convenience from nearby sites of protest. They created barricades and police personnel were deployed to control them by using tear gas, plastic blisters, and hitting with wooden sticks. It was an attempt to limit, disperse, and end their agitation out of frustration.

I witnessed farmers' agitation against three laws enacted by the Indian Government to stop the march of the farmers who had been agitating for more than a year, the authority used the most inhuman process of installing a series of nails barbed wire then cemented walls and heavy police deployed with arms. It was an extreme example of hostile design.

Hostile designs are specifically oriented toward the objective, not for inclusiveness. They are made specifically to exclude, harm, or otherwise hinder the freedom of a human being. Quite often they aim to remove a certain section of a community from a public space. Window sills or parapets with spikes are used to control for sitting the rock pigeons. Rock Pigeons are a problem in urban settlements and people use nets, chemical coating on the outer surface of the building and sometimes paste glued paper to trap them. I noticed in my childhood that people were fixing broken glass with cement on the top edge surface of the boundary wall to prevent unwanted people should entering illegally. It is now replaced with barbed wire and as part of a hostile design.

People in the corporate world noticed that staff spend longer time than usual duration in toilets. It affects their productivity. They install the commode seating in front tilted so that the user will use force not to fall which prevents them from sitting for a longer time. It is a hostile design. The idea of enacting the law of Right to information (RTI) by the Indian government was a welcome attempt to lower the degree of hostile nature of citizens for transparent government functioning.

Why do our designers or authorities fail to understand the importance of the presence of a person who is earning his livelihood for his family by selling in the streets or on the pavements? Why do they think hostile design for such people should not disturb the traffic or aesthetic value of the city? In my opinion, the presence of small shopkeepers who wished to earn with fair means as other civilized people do makes society better. Second, he is not at all interested in the crime world but wishes to spend his life with decent values of the society. Their most important contribution is his presence prevents others from indulging in crimes. The presence of two eyes makes a difference on the road or in open space. They should learn from the automobile where two headlights and two eyes communicate with other vehicles. I question 'what a financial loss or no extra cost would be incurred for the government if someone used the bench of the bus shelter at night for sleeping'.

Everyone should remember ancestors' past who were living on trees for shelter in the night and they devised various hostile design techniques not to allow others to occupy their shelter. It took millions of years to gain confidence in living on earth after getting down by leaving trees for shelter. Earth turned his home

as his knowledge progressed. It is foolishness on his part those trees once provided safety, the same humans treat them as their biggest enemy. He does not hesitate for a moment in ruthlessly cutting it and forgets that it took years to mature and grow he destroys it in seconds to meet its selfishness. It is inbuilt human nature to the destruction of those who helped in his growth. Modern man now devised various hostile techniques not others occupied his territory. Bus shelters are made with public money and no one has the right to design products for exclusive and privileged people. The entire earth and its commonwealth are not for exclusive specific groups.

The readers will conclude with this write up that hostile design is justified. My answer is it is in the nature and our immune system is reason of our survival. It keeps death away as long it is active hostile design.

I am highly honoured as Prof Dr Ravindra Singh, Design Department, Delhi Technical University accepted our invitation and informed us that his students have won the international competition and will focus on that area in special issue.

Lambert Academic publication for celebration of the 150th special issue by publishing a book by compiling editorials "Design For All, Drivers of Design" was translated into eight different languages from ENGLISH to French, German, Italian, Russian, Dutch, and Portuguese. Kindly click the following link for the book. "Morebooks", one of the largest online bookstores. Here's the link to it:
https://www.morebooks.de/store/gb/book/design-forall/isbn/978-613-9-83306-1

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Enjoy reading, be happy, and work for the betterment of society.

With Regards
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Forthcoming Issues

December 2023 Vol-18 No-12

Prof Manoj Majhi

With a Bachelor's Degree in Industrial and Production Engineering, a Master's Degree in Visual Communication along with a Doctoral Degree in Design added with 8 years of using it in the Broadcast medium of Satellite Television, with at least 15 multimedia promotional, published every week a probing question kept nagging the creative mind, why am I doing this, who benefits from this etc. and around over a decade in design education. A decision to impart the knowledge I had acquired from my professional career to equip the education system to bridge the lacuna .The feel we have not yet explored the Iceberg of the information that is available in the Media, we seem to be at the beginning tip of the iceberg . This does inspire a creative person to try out things that have not been explored yet. Instead of re-inventing the wheel, we designers should be inventing innovative utility of the wheel for today's context. The research areas are primarily in Communication Design area (Graphic Design such as Animation), Interaction design and Product design.

January 2024 Vol-19 No-1

Dr FarnazNickpour

ISSN: 2582-8304

Dr FarnazNickpouris an inclusive and human-centred design researcher and educator. Sheis a Reader in Inclusive Design and Human-Centred Innovation and director of The InclusionariesLab at The University of Liverpool. Farnaz has a track record of excellence in design research, teaching and pedagogy, with 40+ peer-reviewed publications and awards.Sheis the External Examiner to the joint MA/MSc Global Innovation Design (GID) programme at the Royal College of Art and Imperial College London, and University of Brighton BSc and BA Design programmes. Sheis a reviewer for the Journal of Engineering Design, Journal of Design Research, Strategic Design Research Journal, and Building and Environment Journal; Scientific committee of Design for Inclusion (AHFE) Conference; Fellow of the Royal Society of Arts (FRSA); Fellow of Higher Education Academy (FHEA); Member of Institute of Engineering Designers (MIED); and Professional member of British Industrial Design Association (ProBIDA).

Farnaz'sresearch explores critical and contemporary dimensions of design for inclusion and human-centred innovation acrosshealthcare and mobilitysectors, with a core focus on advancing four strategicresearchthemes.

March 2024 Vol-19 No-3

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Prof Dr.Ketna Mehta

She is Founder Trustee & Editor (One World), Nina Foundation, a 22 years young NGO for rehabilitation of people with spinal cord injuries in India. She is an Author of two books; 'Nano Thoughts on Management' & 'Narratives of Courage, Lives of Spinal cord injury survivors in India'.

As editor, 36 issues of 'One World - Voice of people with spinal cord injury' has published since 2001 (www.nina foundation.org)

She is a thought leader on social and inclusive development of persons with disabilities, transformational change and leadership. She was invited to contribute a chapter in the popular book 'Chicken Soup For the Indian Spiritual Soul' !India's very first literary festival by the highest circulated newspaper group The Times of India on 'Disability is a state of Mind.' Her action oriented, innovative and bold opinions on disability has been published in over 100 research papers, articles, book chapters, columns, blogs and interviews in the media. She has been invited as a Guest Editor for Success& Ability's first and only thematic issue on Spinal Cord Injury in 2012, two issues of 'DesignForAll' international publication focusing on 'Improving Quality of life of people with spinal cord injuries' & 'FutureSpeak SCI Rehabilitation' in 2021 & 2019.

She has been a Regional Consultant for WHO's first Research Report IPSCI (International Perspective on Spinal Cord Injury'. For the very first Rehab Exhibition, Nina Foundation was invited as the NGO Partner where a demo workshop of how Scoop Stretchers during the Golden Hour prevents a devastating spinal

cord injury. Several Public Forums on spinal cord injury have been curated by her for spreading awareness.Since 25th June 2009 Nina Foundation has initiated a spinal cord injury awareness day. Their grassroots free SCI OPD &multi disciplinary camps have successfully gifted equipments, medicines, hope and solutions for living a life of dignity. In April 2017 was invited by UC Berkeley, California as a faculty jury to evaluate international live student projects on Universal ReDesign from various countries. She was invited as an Expert Speaker for CIVIL20 (G20) by Rising Flame for 'Women with Disabilities' Panel on 17th June 2023, American Consulate, Mumbai. Nina Foundation is also a PAB Member for SPINE20 (G20) as Speaker & Observer 10-11 Aug 2023.

Ketna is a spinal cord injury survivor since 27 years and lives in Mumbai India.

April 2024 Vol-19 No-4

Dr.ShatarupaThakurta Roy has studied Fine Arts in VisvaBharati

University Santiniketan and did her doctoral research in Visual Culturefrom the Department of Design, Indian Institute of Technology Guwahati.

She is currently working in the Discipline of Fine Arts, Department ofHumanities and Social Sciences as an Associate Professor engaged inteaching and research in the area of Art and design.

She is a painter andprintmaker with many national and international exhibitions to her credit.

June 2024 Vol-19 No-6

Per-OlofHedvall*works as Director of Certec, Department of Design Sciences, Lund University, Sweden. His research deals with accessibility, participation, and universal design, with a particular interest in the interplay between people and technology. Working closely with the disability movement, he focuses on people's lived perspectives and how human and artefactual aspects of products, services, and environments can be designed to support people in fulfilling their needs, wishes, and dreams. Hedvall has a background in computer engineering and has a particular interest in people's empowerment and opportunities for participation in their lives.*

Per-OlofHedvall often bases his work on Cultural-Historical Activity Theory. In 2009, Hedvall defended his doctoral dissertation in Rehabilitation Engineering and Design, "The Activity Diamond – Modelling an Enhanced Accessibility", where he developed a model for planned, lived, and long-term aspects of accessibility, as a prerequisite for participation.

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New Books

it is available on www.morebooks.de one of the largest online bookstores. Here's the link to it: https://www.morebooks.de/store/gb/book/design-for-all/isbn/978-613-9-83306-1

The Ultimate Resource for Aging in Place With Dignity and Grace!

ISSN: 2582-8304

Are you looking for housing options that are safer and more accommodating for independently aging in place? Do you want to enjoy comfort, accessibility, safety and peace of mind – despite your disabilities, limitations and health challenges? The help you need is available in the Universal Design Toolkit: Time-saving ideas, resources, solutions, and guidance for making homes accessible.

This is the ultimate resource for individuals and professionals who want to save time, money and energy when designing, building, remodeling or downsizing a home. The Universal Design Toolkit will help you take the steps to design homes for your clients or yourself while eliminating the costly trial and error challenges you'd inevitably encounter if faced with this learning curve on your own.

Rosemarie Rossetti, Ph.D., teamed with her husband Mark Leder in creating this unique Toolkit. They bring ten years of research, design and building expertise by serving as the general contractors for their home, the Universal Design Living Laboratory– which is the highest rated universal design home in North America.

Within the Toolkit's 200 richly illustrated pages, you'll find: Insights that distinguish *essential* products, services and resources from the *unnecessary*.

Proven, realistic tips for finding the right home.

Home features you need to look for. Nothing is assumed or left out.

Handy home checklists and assessments.

Interview questions to help you hire industry professionals with knowledge and experience. Photographs that provide a frame of reference to inspire, clarify and illuminate features andbenefits.

Valuable resources to save you time, money and energy.

Helpful sources of funding.

Space planning dimensions for access using assistive devices such as wheelchairs andwalkers.

And so much more!

If you want useful, dependable advice and easy to implement ideas from respected experts who know the ropes, you'll love Rossetti and Leder's perspective. As a speaker, author and consultant who uses a wheelchair, Rossetti has helped hundreds of people design their ideal homes. Now her comprehensive Toolkit is available to help and support you! Get the Universal Design Toolkit now to start your project!

Disability, Rights Monitoring and Social Change:

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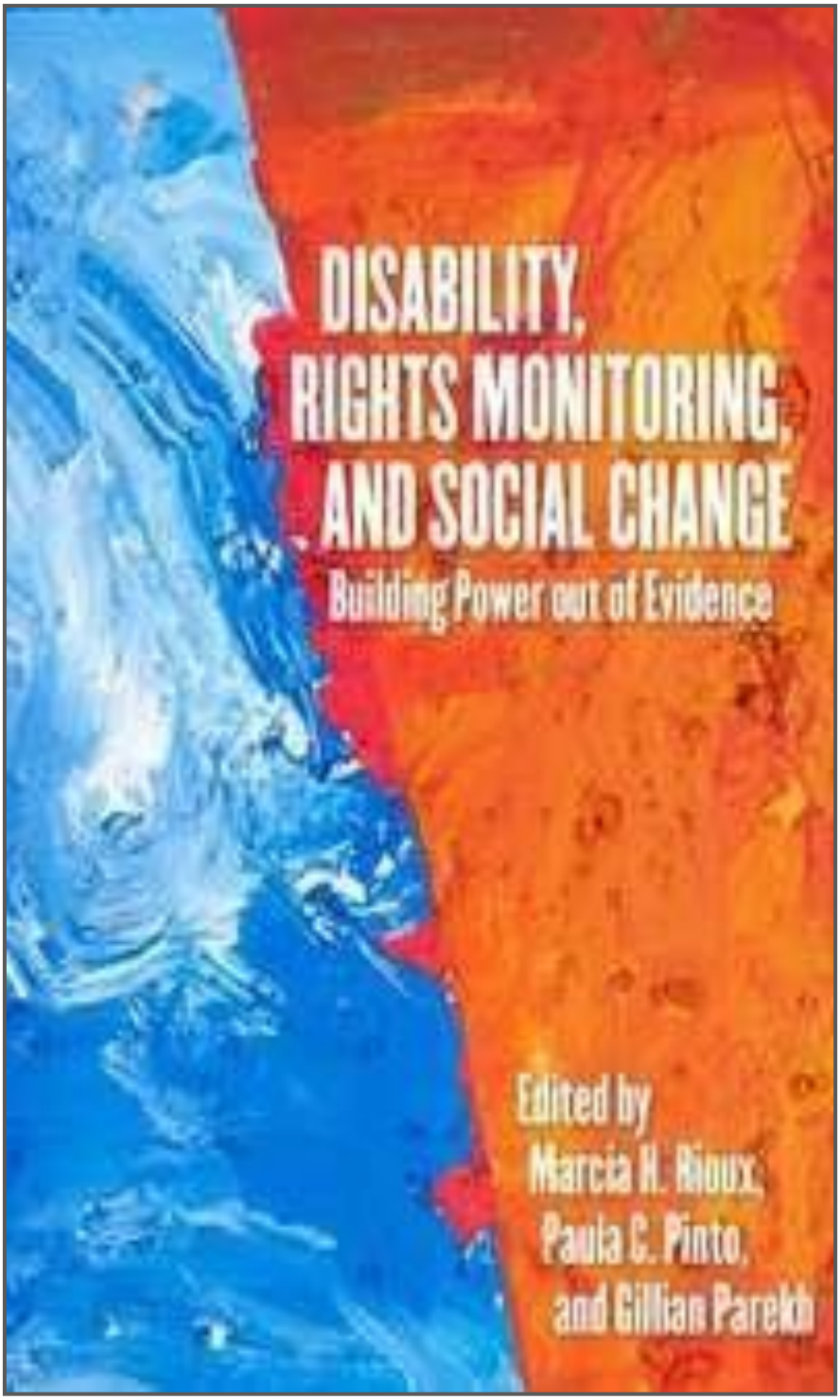
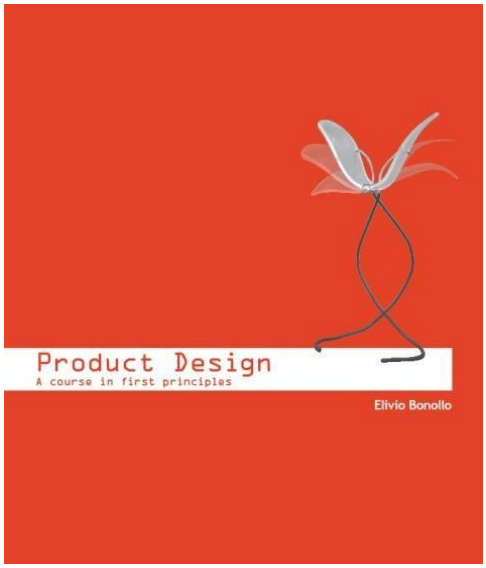


New Update: ELIVIO BONOLLO (2015/16) PRODUCT DESIGN: A COURSE IN FIRST PRINCIPLES



Available as a paperback (320 pages), in black and white and full colour versions (book reviewed in Design and Technology Education: An International Journal 17.3, and on amazon.com).
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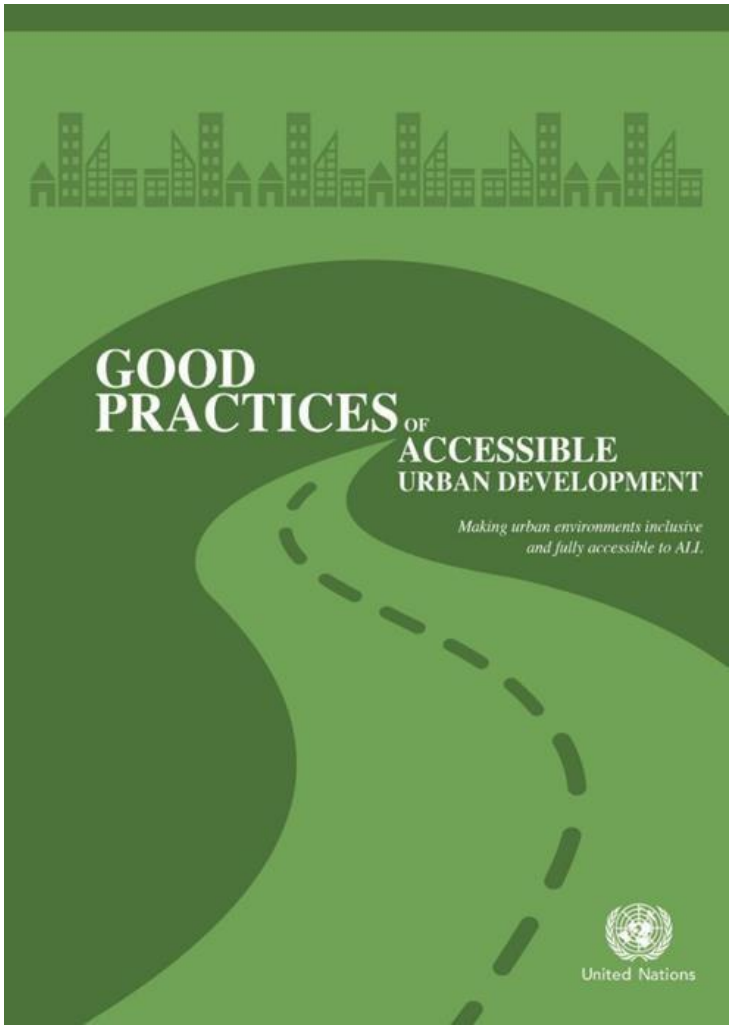

In light of the forthcoming United Nations Conference on Housing and Sustainable Urban Development (HABITAT III) and the imminent launch of the New Urban Agenda, DESA in collaboration with the Essl Foundation (Zero Project) and others have prepared a new publication entitled: "Good practices of accessible urban development".

The publication provides case studies of innovative practices and policies in housing and built environments, as well as transportation, public spaces and public services, including information and communication technology (ICT) based services.

The publication concludes with strategies and innovations for promoting accessible urban development. The advance unedited text is available at:http://www.un.org/disabilities/documents/desa/good_practices_urban_dev.pdf

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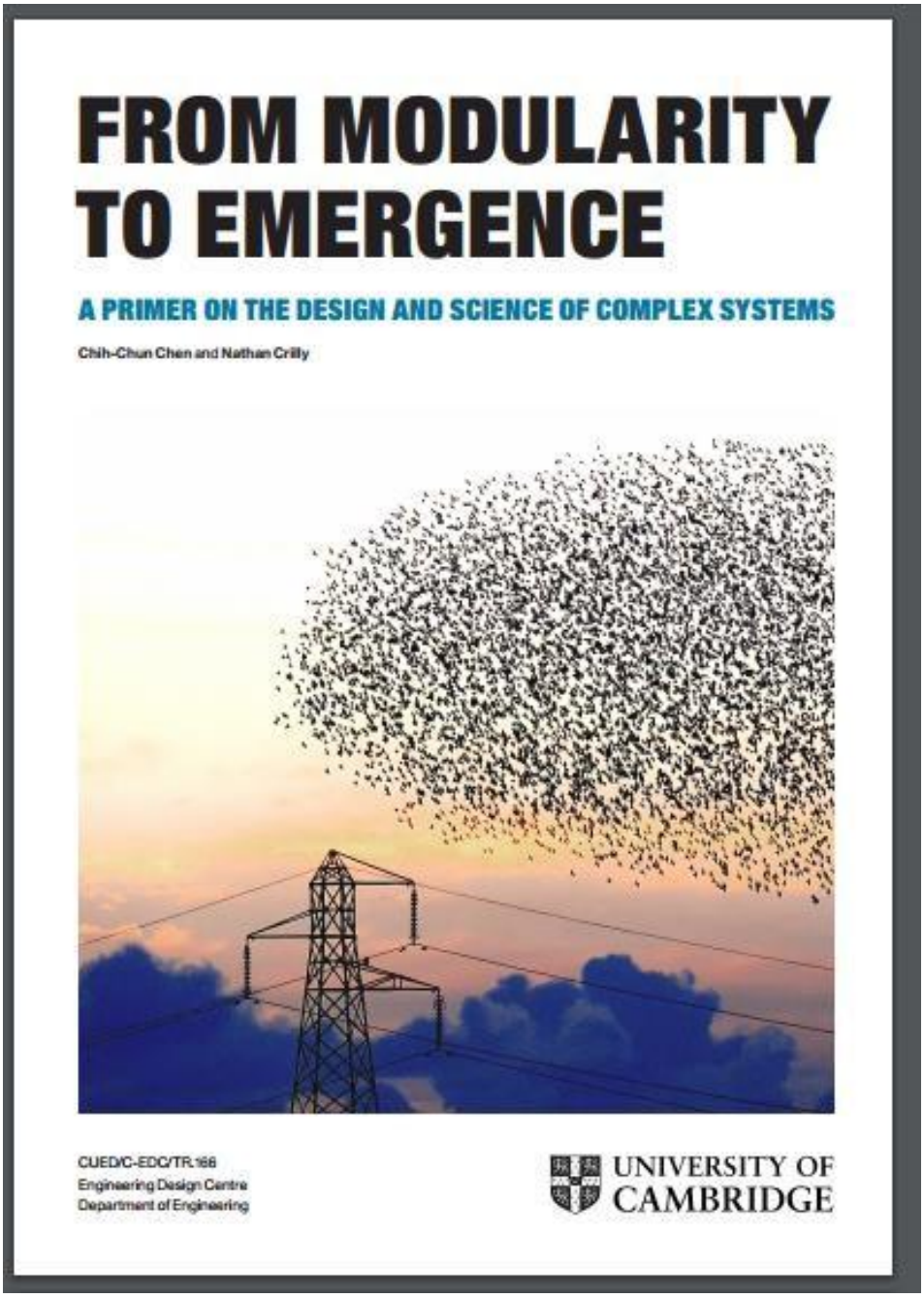

Dr Chih-Chun Chen and Dr Nathan Crilly of the Cambridge University Engineering Design Centre Design Practice Group have released a free, downloadable book, _A Primer on the Design and Science of Complex Systems_.

This project is funded by the UK Engineering and Physical Sciences Research Council (EP/K008196/1).

The book is available at URL: http://complexityprimer.eng.cam.ac.uk

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Changing Paradigms: Designing for a Sustainable Future

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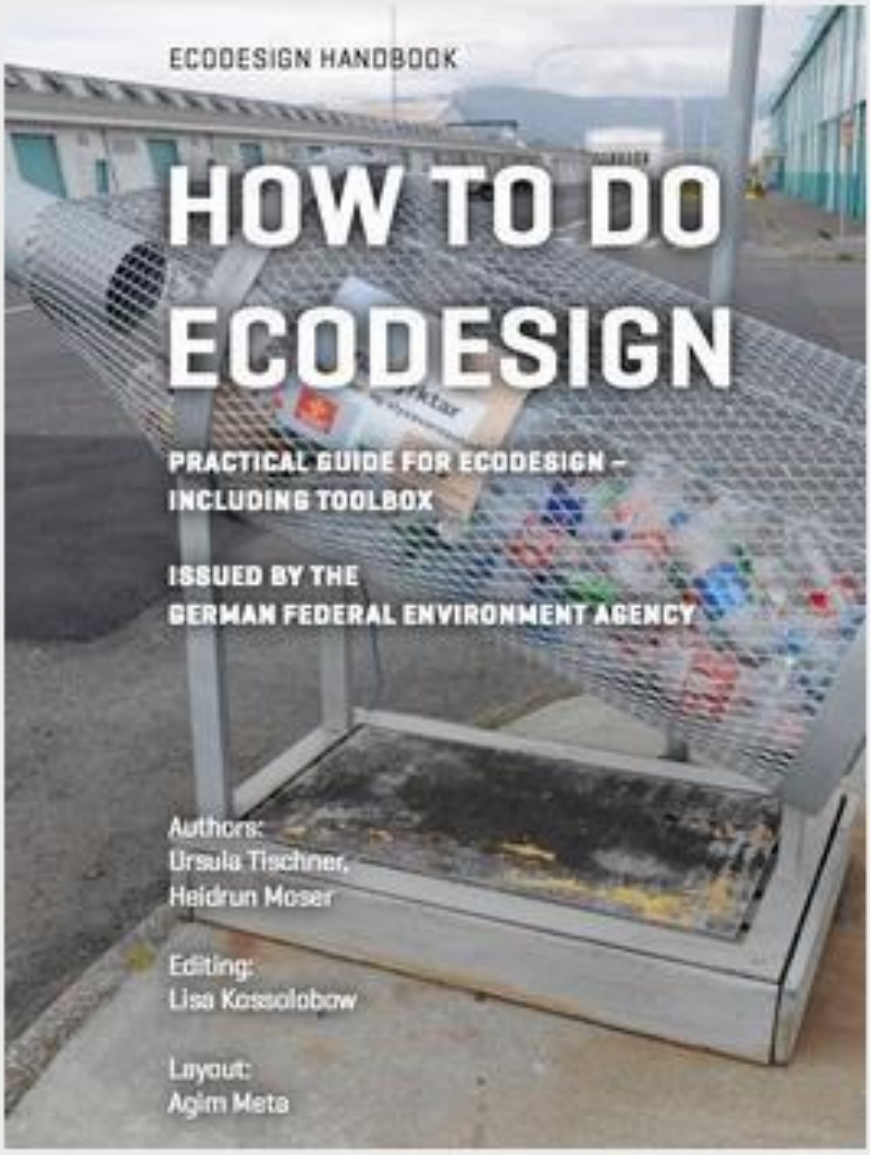
New iBook / ebook:
HOW TO DO ECODESIGN



Practical Guide for Ecodesign – Including a Toolbox
Author: Ursula Tischner

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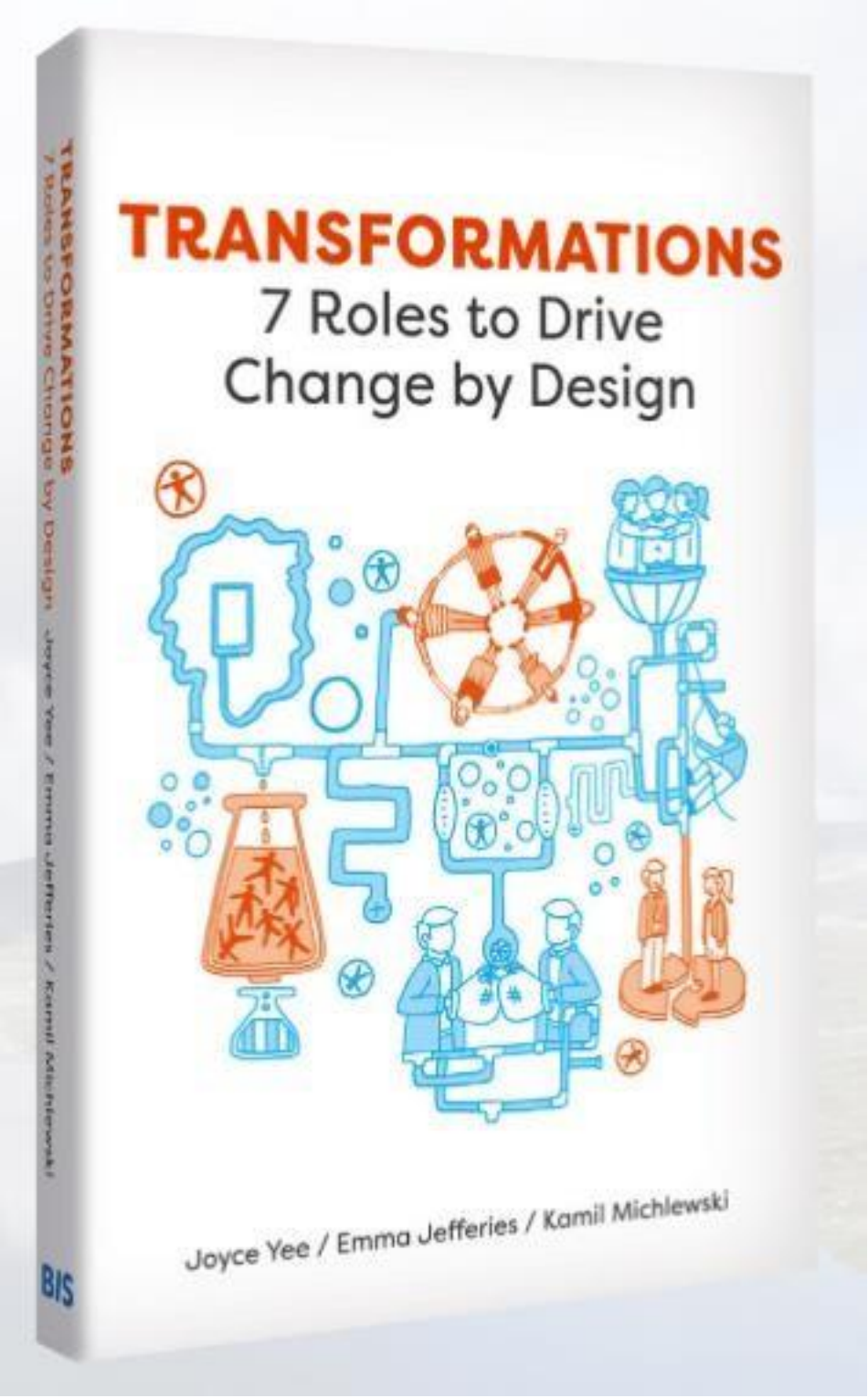

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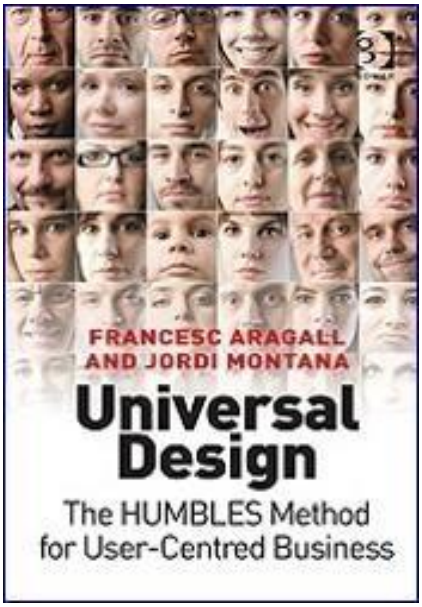

"Universal Design: The HUMBLES Method for User-Centred Business", written by FrancescAragall and Jordi Montaña and published by Gower, provides an innovative method to support businesses wishing to increase the number of satisfied users and clients and enhance their reputation by adapting their products and services to the diversity of their actual and potential customers, taking into account their needs, wishes and expectations.

The HUMBLES method (© Aragall) consists of a progressive, seven-phase approach for implementing Design for All within a business. By incorporating the user's point of view, it enables companies to evaluate their business strategies in order to improve provide an improved, more customer-oriented experience, and there by gain a competitive advantage in the marketplace. As well as a comprehensive guide to the method, the book provides case studies of multinational business which have successfully incorporated Design for All into their working practices.

According to Sandro Rossell, President of FC Barcelona, who in company with other leading business professionals endorsed the publication, it is "required reading for those who wish to understand how universal design is the only way to connect a brand to the widest possible public, increasing client loyalty and enhancing company prestige". To purchase the book, visit either the Design for All Foundation website

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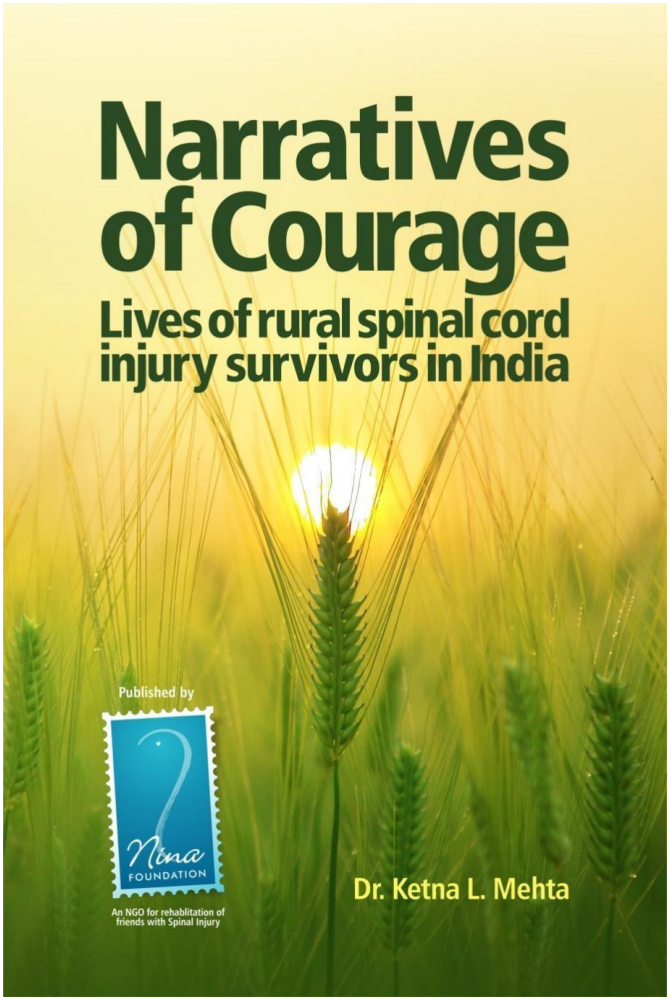


NOW AVAILABLE
Case Studies in Applied Behavior Analysis for Individuals with Disabilities (Second Edition)
Keith Storey, Ph.D., BCBA-D
Linda Haymes, Ph.D., BCBA-D
This book responds to a critical need for highly qualified personnel who will become exemplary professionals because of their advanced knowledge, skills, and experiences in working with students and adults that have varying disabilities, including Autism Spectrum Disorders (ASD). Since Board Certification for behavior analysts was introduced, there has been an expansion of training programs in Applied Behavior Analysis to meet the demands from school districts, health insurers, and families. In spite of these developments, a case studies book has not been available that uses the Behavior Analyst Certification Board Task List, Fifth Edition (BACB) guidelines for educating individuals receiving their BCBA, or for those in the field such as teachers, and service providers. The goal of this book is to fill that need. In this newly revised second edition, eighteen case studies are provided—case studies with complete analysis, case studies with partial analysis, and case studies without analysis. The format, readability, and detailed description of instructional methodology makes this text a valued resource for instructors and behavior analysts responsible for improving the skills of people with disabilities.
Charles C Thomas, Publishing is proud to announce the release of this second edition.
For more information, or to order your copy, scan the QR code below!
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$59.95 [eBook] ISBN 978-0-398-09401-0
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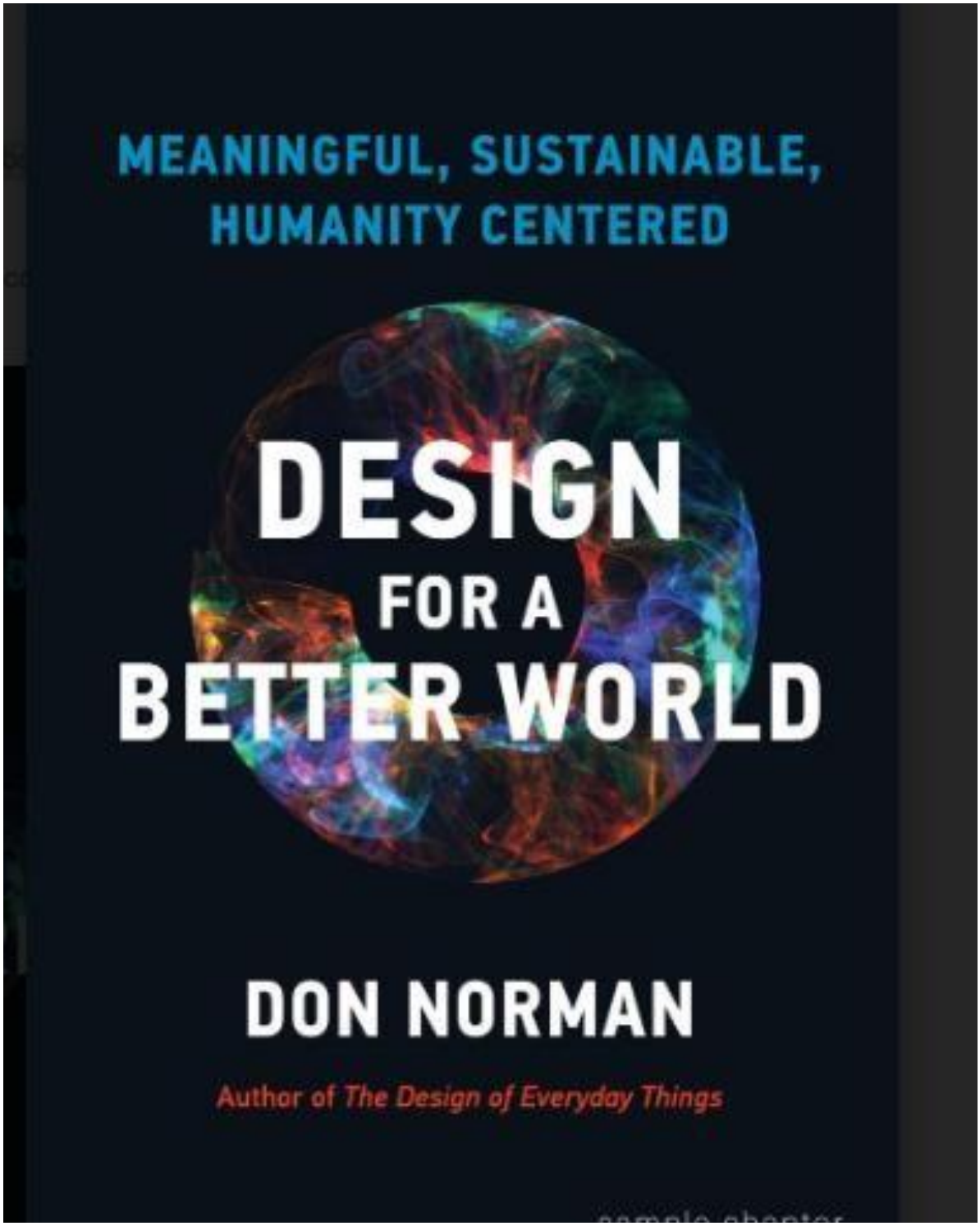

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News

1.How's Asia doing on disabilityaccess ?

Empowering every ability through accessibility

Many cities are a nightmare for people with disabilities to navigate. So what's Asia doing about it? Let's take a Deep Dive.

Accessibility means making cities more usable for people with disabilities, but can also be extended to include areas including education, employment, communications technology and the challenges disabled people have accessing them.

It's related to the idea of universal design, where cities and their components are designed in ways that make them usable by the widest number of people.

Common features of accessible design include ramps, automatic doors, lifts, signs in Braille, audio signals, tactile paving and low-floor public transport vehicles, along with as few steps and barriers as possible.

BY THE NUMBERS

700 million There are more than 700 million people with disabilities living in the Asia-Pacific region.

34.9% In India, only 34.9 percent of disabled people in cities are employed, rising modestly to 38.4 percent in rural areas.

$265 billion The UK government estimates the retail industry in the country could grow by £212 billion, or $265 billion, if it were fully accessible to disabled people.

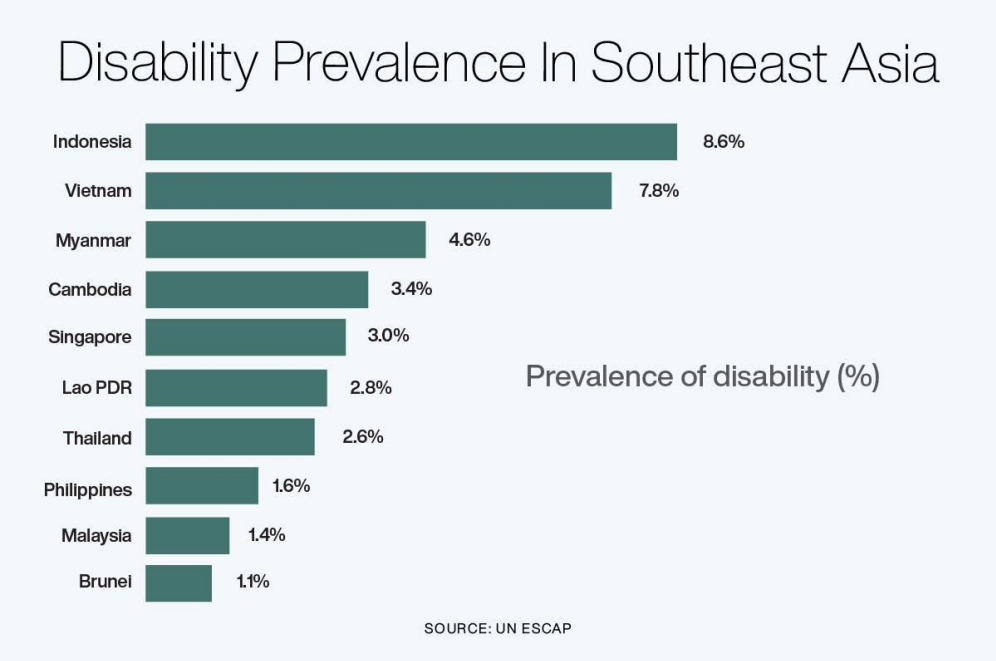
Accessibility rights are technically protected by a UN human rights treaty. The Convention on the Rights of Persons with Disabilities, which came into force in 2008, specifies that its signatories—187 states plus the European Union—must ensure people with disabilities enjoy full equality in access and employment.

THE EDIT

Asia's most accessible city. This guide to wheelchair-accessible cities in Asia ranks Hong Kong top of the tree.

Or maybe not. This list, though, ranks Shanghai, Singapore and Tokyo as the three most accessible cities in Asia and among the top ten globally.

Ceylon the case. One country that's a perhaps surprising champion of disability rights in Asia, with public building accessibility enshrined in law since 2011 is Sri Lanka.



Indonesia has the highest disability prevalence in Southeast Asia while Brunei has the lowest.

(Courtesy: Tatler)

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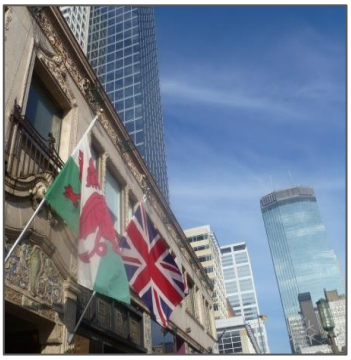
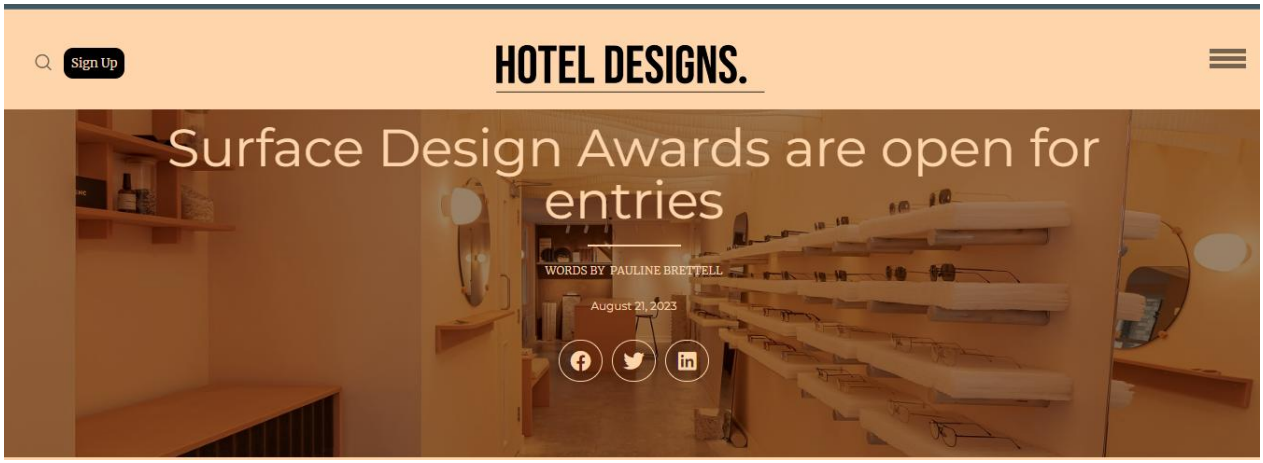


Programme and Events



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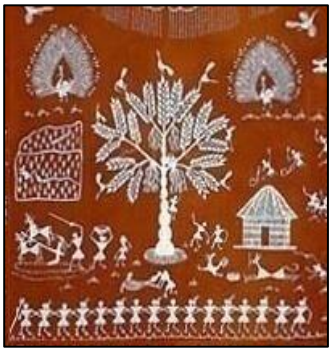

Job Openings

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