



GUIDELINES FOR DEVELOPING

ICT-A BASED CLIMATE DIGITAL SOLUTIONS

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1. Guiding Principles based on Ready Reckoner



Overview

The objective of this document is to present guidelines that can assist stakeholders, who have shown interest to develop digital solutions to tackle the infrastructural and operative challenges faced by their respective cities and populations using citizen centric design thinking processes.

As the name suggests, the guiding principles lay the foundation and framework under which the design, research, implementation and execution of digital solutions can take place. The guiding principles keep in mind human values, technical end goals, financial budgets, project objectives, resources etc. to create a harmony of the sorts between different departments for smoother functioning of the same. The guiding principles are simple pointers to be kept in mind at all times while taking bigger decisions regarding the project. The aim of the guiding principles is to steer the project in the right direction.

Here, we shall be talking in great detail about the guiding principles that have driven the development of Mu City Savior for the city of Bhubaneswar in Odisha and Flood Free Kochi for the city of Cochin in Kerala, two distinct digital solutions envisioned by GIZ in close cooperation with the respective state governments of Odisha and Kerala.

Background of the solution

The global warming is now getting accelerated due to rapidly changing climate, affecting coastal cities and large populations the world over. Incessant rains, flash floods, hurricanes, cloud bursts and land-slides have become more common than ever, leading to massive loss of lives and property worth billions of dollars each year across the globe, especially in the developing world.

Science and technology are together playing an important part in mitigating some of the effects of these problems for the citizens of different countries. The information and communications based digital tools that can be easily used by citizens, authorities and governments to address both the problems at hand but also help in developing long term strategies by collecting data is the need of the hour.

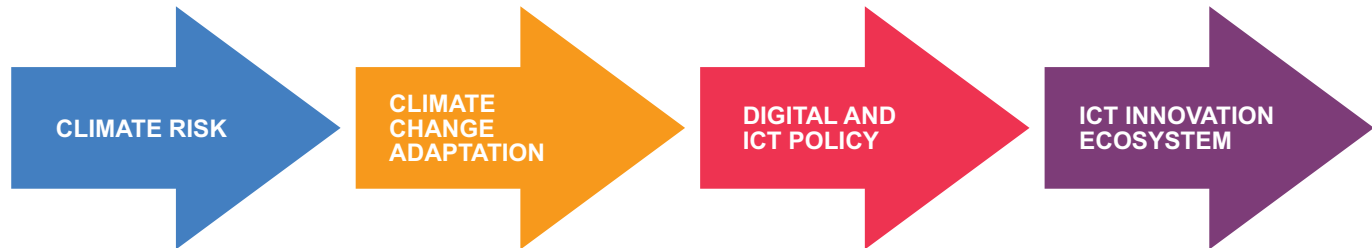
Mu City Savior and Flood Free Kochi are two such smart digital solutions developed with the stakeholders of Bhubaneswar and Kochi, two Indian cities that are encouraging technology to address the daily problems of their citizens. The solution can be downloaded by users in the respective cities and water logging issues can be reported to a central command center, which uses a complex algorithm prioritises the complaints on the basis of urgency. This helps the local city municipality to allocate its limited resources, on the ranking of priority, saving time, effort and resources and prevents any mis-happenings at the most critical spots in the city.

The ICT base solutions are a big part of the SMART cities being developed in India. These cities are future looking, climate change resistant and provide services for human consumption in state of the art efficient manner. The ICT based digital solutions can also be applied to the existing cities to ease their civic issues.



2. Steps to develop a similar solution

2.1 City selection



All cities may be candidates for developing the ICT based solutions to address a given problem but not all cities would be ready to host or operate technically for the solution. Therefore it is extremely important to select the most relevant cities based on various parameters that can efficiently create and operate the ICT based digital solutions.

City selection must be based on primary and secondary research with pre- identified indicators. The selected cities also must be approved by the concerned authorities like concerned ministries or state departments. Other key factor for city selection is 'similar' climate challenges or development challenges. It means each city must have similar challenges or development issues. Under ICT-A project during rapid study for city selection, the below mentioned components were considered.

A.) Climate risk (and data availability)
C.) Digital and ICT policy by city government

B.) Climate change adaptation policy in the city
D.) ICT Innovation ecosystem in city and region

Each category needs to be divided into multiple subheads and a rapid desk based assessment needs to be made by giving points on each subhead. The total points can be then assessed so as to clearly achieve one or two desired winners. The Rapid Assessment needs to be followed up with scoping and verification trip to the actual city under assessment to ascertain the finding of the rapid assessment report.

2.2 Identify the various stakeholders

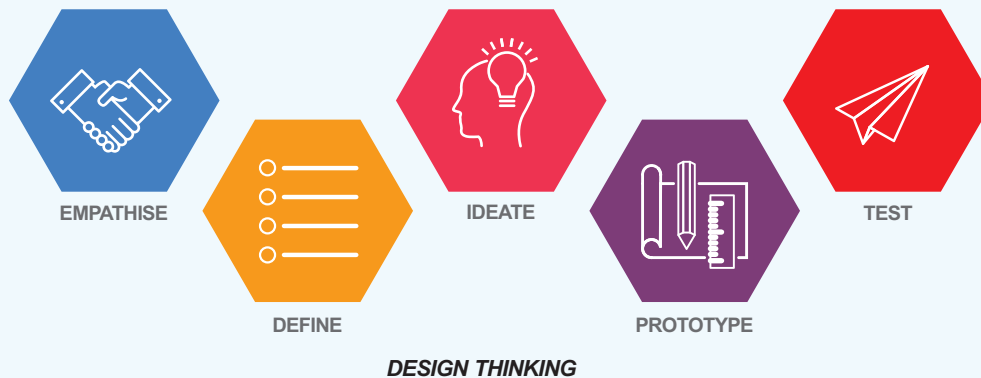
Once the city is selected, the next step is to identify the stakeholders. Some of the most important stakeholders for developing a similar solution to the above mentioned problem could be:

1. Civil Society: Individuals, experts of repute, subject experts among others.
 - a) Resident Welfare Associations: finding willing RWA's that would cooperate during the entire research, brainstorming and testing phase of the application.
 - b) Private Citizens: Individuals who are passionate about global warming, climate change, flood mitigation, communication experts, IT specialists among others need to be included in the project
 - c) Urban Farmers: farmers are one of the most affected community due to global warming
 - d) NGO's: working in the field of climate change, digitization, urban flooding etc.
2. International Agencies: International agencies that are working in the similar field, that are partners in the project or are knowledge suppliers.
3. Private Sector Enterprises: These would include relevant startups, companies, IT corporations among others.
4. Academic Institutions: Reputed academic institutions like the IIT's and IIM's can also be roped in for existing studies, experts and long term study of impact of the solution in the city.
5. Public Sector Enterprises: Local municipal corporation, land development agency, disaster mitigating agency, fire departments, public works department, are some of the key public sector agencies.

3. Design Thinking process:

Design Thinking is an iterative creative problem solving process which seeks to understand the user (stakeholder), challenge the assumptions of participants and redefine the problems by utilizing elements from the designer's toolkit like empathy and experimentation, in an attempt to identify alternative strategies and innovative solutions. It is extremely useful in tackling problems that are ill-defined or unknown, by re-framing the problem in human-centric ways, creating many ideas in brainstorming sessions and adopting a hands-on approach in prototyping and testing. Design Thinking uses many frameworks and models to achieve better and more human centric results.

One of the most commonly used frameworks for this process is by Stanford d.School (California). The method consists of 5 phases- Empathize, Define, Ideate, Prototype and Test (d.school bootleg, 2018), which are explained as follows:



4. Guiding Principles: Empathise

This involves immersing oneself in the problem area through observations, unstructured interviews etc. to understand the user's experiences, expectations and motivations. Empathy research is about understanding the larger eco-system, socio cultural context and irrational attitudes and behaviours in order to identify unmet/latent needs and deep human insights.

4.1 Key consideration for empathy research:

Practice empathy: Make a conscious effort to observe those around you and empathise with how they might be feeling. The more you practice empathy in the outside world, the easier it will be to put yourself in the user's shoes when it comes to the design project.

Facial expression: When engaging in conversations or observing the users, try mimicking their facial expressions as a way of building empathy.

Listen, don't judge: Set aside assumptions, this is absolutely critical when it comes to building empathy. However, these can hinder our ability to build empathy. One can think of it as a mental reset; assume a "blank" mindset, free of any preconceived ideas and beliefs.

Body language: From the way a person stands and where their arms are positioned to the tiniest of micro-expressions, there is much to be deduced from body language alone. This goes a long way in becoming an empathetic person.

4.2 Techniques to develop empathy:

Empathy interviews: The key to an effective empathy interview is to structure it as an open conversation; don't try to steer the session with a set list of questions. Remember, the goal is to uncover as much insight as possible—not to confirm or negate a preconceived notion by asking non-binary questions, encouraging storytelling and paying attention to nonverbal cues.

Immersion and observation: It is also extremely useful to observe users in action, be it in their natural environment or immersed in a certain situation. Observing users, either by photographing or videoing them, helps to identify needs, motivations, or challenges that they're not aware of and therefore not able to articulate.

Curiosity: Throughout the empathise phase, one should constantly be considering the what, how and why of users' behaviour. The what-how-why framework can help you translate your (assumption-free) observations into more abstract user motivations.



5. Guiding Principles: Define

Here all the insights collected at the time of listening and observing people during the empathise stage are combined. We start to synthesize and face the challenge ahead of us. Design thinking proves vital in framing a problem in a clear manner so that devising solutions and exploring opportunities has a clearly defined pathway.

The relationship between the empathise and define stages can best be described in terms of analysis and synthesis. In the empathise phase, we use analysis to break down everything we observe and discover about our users into smaller, more manageable components—dividing their actions and behaviour into “what”, “why” and “how” categories, for example. In the define stage, we piece these components back together, synthesising our findings to create a detailed overall picture.

5.1 Steps of defining the problem:

A problem statement, or point of view (POV) statement, frames the problem (or need) at hand in a way that is actionable for designers. Problem or POV statements can take various formats, but the end goal is always the same: to guide the design team towards a feasible solution.

Let's take a look at some of the ways one might frame a design problem:

- a) From the user's perspective: The user has to define the problem at hand he faces in his own words.
- b) From a user research perspective: What the actual facts and ground level situation says about what the user has defined as his problem.
- c) Based on the four Ws- Who, What, Where and Why: Why the situation has turned the way, it has.
- d) Each of these statements addresses the same issue, just in a slightly different way.

5.2 Pointers to create a meaningful problem statement:

Focus on the user: The user and their needs should be front and center of problem statement.

Keep it broad: A good problem statement leaves room for innovation and creative freedom.

Make it manageable: Problem statement should guide and provide direction. If it's too broad in terms of the user's needs and goals, it will create trouble in finding a suitable solution.

5.3 Steps to create a meaningful problem statement:

Space saturation and group: One of the first steps in defining a problem statement is to organize findings from empathize phase in one defined space saturation and group is a popular method used by design thinkers to collect and visually present all observations made in the empathize phase in one defined space. As the name suggests, one will literally “saturate” a wall or whiteboard with Post-It notes and images, resulting in a collage of artifacts from user research. This method should involve anyone who took part in the empathize stage of the design project, and should take no longer than 20-30 minutes.

5.4 The four Ws:

Asking the right questions will help put finger on the right problem statement. With all your findings from the empathize phase in one place, ask the four Ws: Who, What, Where and Why?

Who is experiencing the problem? In other words, who is the target user; who will be the focus of the problem statement?

What is the problem? Based on the observations you made during the empathize phase, what are the problems and pain-points that frequently came up? What task is the user trying to accomplish, and what's standing in their way?

Where does the problem present itself? In what space (physical or digital), situation or context is the user when they face this problem? Are there any other people involved?

Why does it matter? Why is it important that this problem be solved? What value would a solution bring to the user, and to the business?

Approaching observations with these four questions in mind will help to identify patterns within user research. In identifying the most prevalent issues, the team will be one step closer to formulating a meaningful problem statement.

6. Guiding Principles: Ideate



In the Ideation stage, design thinkers spark off ideas — in the form of questions and solutions. This step also involves sharing ideas – however wild and impractical they maybe. This ensures continuation of the ideation process using each other’s ideas as triggers. The goal is to brainstorm on as many solutions as possible to the problem at hand.

A SPRINT is a great way to work on a short notice to gather maximum information in precise and planned manner. A SPRINT as the name suggests is a tight run program strategy adopted to achieve the desired goal within a short span of time. It is usually undertaken for not more than a period of 1 month. The SPRINT may involve field visits, discussions, brain storming, strategising, creating etc. It is always followed by a rigorous round of feedback from the participants and stakeholders, that helps further the project as well improve upon the work done in the SPRINT. It also helps in identifying the need of another SPRINT for the same project if any.

Sprint 1:

Key ideation techniques

Here are some of the most common ideation techniques used by designers:

Analogies: By definition, analogy is “a cognitive process of transferring information or meaning from a particular subject to another.” An analogy provides a comparison between one thing and another, serving as a means of explanation or clarification.

Body-storming: The body-storming technique gets one to physically experience a situation in order to spark new ideas. If one is struggling to get close to the problem, body-storming is a great way to generate genuine user empathy. How does it work? One needs to set up a physical experience resembling the problem one is trying to solve, using people, props, or a digital prototype.

Brainstorming: Brainstorming is one of the oldest tricks in the book when it comes to generating new ideas as a group. In a brainstorming session, you verbally bounce ideas off of each other in the hopes of finding a blended solution.

Brain-writing: An alternative to traditional brainstorming is brain-writing. Instead of verbally sharing ideas, participants write down their ideas before passing them on to someone else. The next person reads these ideas and adds their own, and so the process continues until each person’s ideas have done a full rotation. All ideas are then collected and placed in front of the group for discussion.

Brain-walking: This is the more dynamic, physical version of brain-writing. Instead of passing pieces of paper around the room, the designers themselves move between different “ideation stations”. Just like brain-writing, they’ll add their own ideas before moving on to the next station.

Challenging assumptions: As we know, challenging assumptions is crucial to breaking conventional thought patterns and coming up with new ideas. A popular ideation technique is to come up with a number of assumptions that are inherent to your design challenge.

7. Guiding Principles: Prototyping

Prototyping is giving a concrete shape/visualization to a certain idea. Rapid prototyping can take many forms like: storyboarding, role plays/ or body storming, works like/ feels like models (paper prototypes, cardboard models etc.)

Prototypes can vary in terms of the following:

Form: It determines the form of the prototype whether it is hand drawn or digitally.

Fidelity: Fidelity deals with detailing of the prototype. A high-fidelity prototype will have a lot of details and low-fidelity will have low details.

Lifecycle: Is the prototype a quick, disposable version that will be replaced with a new and improved version? Or is it a more enduring creation that can be built and improved upon, potentially ending up as the final product?

Interactivity: How functional is the prototype? Can the user click on it or interact with it, or is it view-only?

Based on the above descriptions, various types of materials may be needed to create the prototype

Sprint 2:

Key consideration prototyping:

Before creating a prototype, one must consider the progress made in the design process. It is also a good time to have a look at the time and resources available. Low-fidelity prototypes make sense in the early stages; one would want to move on to complex prototypes, closer to the finishing stages of the product.

Set concrete goals: Having a clear idea of what the prototype is trying to achieve is extremely essential part of the design process. In other words, what one wants to find out when testing prototype is central to goal setting. Remember to focus on user needs and keeping problem statement in mind at all times will definitely help.

Use the right tools: Find the tool that meets one's needs in terms of features and functionality, and familiarize with the interface before starting to prototype. This will make the prototyping process much easier.



8. Design Thinking: Testing

In Design Thinking, the testing stage is where the solution gets tested by users in their real-life setting. For the design thinker it is a time to observe how users react to a product and listen to their feedback on different aspects.

Key consideration before testing phase:

Set an objective: Setting a clear objective will help build the right kind of prototype and will help choose the most appropriate user testing method. For example: If one is designing an e-commerce app, one's objective might be to test how easy it is, for users to add an item to their wish-list.

Document findings: Throughout each user test, be sure to document the findings. One will need a thorough record of each test in order to analyze observations and compare the results of each session.

Gather all the necessary equipment: Having recruited participants, one is ready to get the session underway. Recording software if one is conducting remote testing, pens and paper for taking notes, and, of course, the prototype!

Recruit participants: Another crucial aspect of user testing is recruiting the right participants. One wants to test on users who represent the target audience. A digital solution meant for the garbage disposal has little audience with people who are seeking to get married.

Create a plan: For the sake of consistency, it's important to create a plan for user testing session. The plan should include objective or question; the method one intends to use to test the prototype; the number of users test will be carried out with; a list of all the equipment needed; The plan should also include on how the documentation will be done and how the findings will be measured.

Build your prototype: If one is in the very early stages of testing an idea, one should stick to low-fidelity prototypes. Once the concept is decided, one would want to test the finer details like information architecture or microcopy, using mid and high-fidelity prototypes.

9. Solution Concept : (Gamification)

The solution concept must be developed based on the ideation process and ideated digital solution. It must include detailed information of each component of the digital solution with specific role of each stakeholder, target group, detailed analysis plan and utilization of gathered data.

The gamification concept is a part of the solution concept to ensure engagement of target users' groups. The gamification concept must include clear storyline and objects of the game. The gamification concept notes need to have detailed information about game type as well as ranking or point details. The other thing that needs to be done here is deciding on the gaming title, objectives of the gamification and type of play which is basically deciding on the fact as to whether to keep it in a 'free play' or 'challenge mode' for the users.

The gamification is an important aspect of the whole ICT based solution because the whole solution is gamified to increase user engagement, therefore forming the core of the solution.





10. Transfer to other Cities

The digital solution is made in such a way that it is available to other cities using web-based hosting services so that they can easily modify and customise it to their specific needs, capacities and IT requirements.

The world has gone digital and is rapidly moving towards Artificial Intelligence based solutions. Mu City Savior and Flood Free Kochi, both applications with certain city specific modifications can be replicated all across the globe and citizens, respective municipalities and governments can reap their benefits.

Mu city Savior and Flood Free Kochi both are open source technology and therefore fully replicable. An exhaustive interactive documentation package has been prepared to transfer and upscale the platform to other international cities. The idea is to make the platform available using web-based hosting services.

The Flood Free Kochi and Mu City Savior digital solutions come after ICT based solutions for 2 pilot cities had already been developed and implemented. These cities are Trujillo and Chiclayo in Peru. The aim of the project is to support local municipalities and local governments in achieving climate resistant cities while achieving Sustainable Developmental Goals. The project's innovative approaches to data collection, analysis and dissemination will enable public administration and decision makers to integrate climate change adaptation measures into their urban development plan.

Developing citizen partnerships by actively engaging them in the development process, addressing local climate challenges, contributing to the existing and new urban planning processes by way of extensive and continuous collection of data are some of the strategic principles of the ICT based solution that offers a wide variety of benefits like optimum resource utilisation, emergency city management during flood times, streamlining work of the massive workforce in maintaining the cleaning of the city and strategic level benefits by providing extensive data bank over a period of time.


11. Conclusion



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