Feasibility Study Report

Objective: To Assess the technical, operational, and economic viability of the Localized Disaster Volunteer Coordination System.

Abstract

The localized Disaster Volunteer Coordination System promises in delivering the solution for easy and optimal coordination process for the disaster volunteers that takes care of the equal and balanced distribution of the human resources and the necessary goods and services for the disaster victims. The main idea is to automate and digitalize the process of coordinating the volunteers and rescuers in less time to overcome the confusion during the chaos and deliver the necessary aid in time. The feasibility report provides clear information about the project's viability in terms of technology to be used to build the project, operations such as workflow, schedule, time, and effort to build the product and product usage in day-to-day work, and finance which includes the analysis of cost to build, revenue generation and the Return on Investment (ROI).

TECHNICAL FEASIBILITY

Localized Disaster Volunteer Coordination System is a platform and an application where the team of volunteers can be organized instantly and coordinated them through the process of volunteering during a disaster situation. Hence, the platform should be scalable, secure, fast and should have high availability, low latency with strong network infrastructure for faster message transfers across the volunteers in action. The mentioned concepts are discussed in detail.

1. *System Architecture:*

A robust, scalable, and well-designed system architecture to support the volunteer coordination system is necessary for coordinating the volunteers in real time and allocate the right set of tasks with right geo location of the disaster. To keep the platform active and provide the information and communication to coordinate in real time, best approach is to use the cloud computing services such as AWS, Azure which are reliable, scalable, fault tolerant and secure.

Along with the cloud services usage of microservices is a great option to keep the system active and fault tolerant by dividing the platform services/functionalities into different microservices that reduces the risk of platform downtime due to service being down.

2. *System Development:*

The system developed majorly focuses on providing the communication channel for optimized coordination between the volunteers and must be flexible and cross platform compatible with availability over the mobile phone, tablet, smart watch and through website. Hence, a wide range of technology stack is utilized to build the platform which are:

- *For the website*: The frontend is built with an attractive and informative user interface with easy navigation for the users. The major technologies and languages used to build will comprise HTML5, CSS (CSS3, tailwind or bootstrap), JavaScript frameworks (React or Angular) along with python for

dashboards and other functionalities. The Backend is built using hybrid approach by combining JavaScript (Node.js, Express.js) for backend microservices orchestration and Spring Boot for APIs (Geolocation detection, Payment gateways, other data APIs) handling along with secured data related activities. For the database to store data and render the information is carried out using the databases MongoDB (unstructured data), PostgreSQL (Structured data), Redis and Elastic search (for caching and data streaming).

The entire system and the flow are kept active with the help of cloud services.

- *For the portable devices*, such as mobile phones and tablets that majorly works on two operating systems, Android and IOS. The platform will be built in the form of application compatible for both android and iOS and available on both app store and play store. The major technologies to build the applications is through android development that uses java and android kit with other necessary technologies for data handling and security. Similarly, for the iOS development uses swift and related technology stack for the application.

3. *Features:*

Some of the key features of the system are real time communication and co-ordination, public profile with the volunteer's tag with specific skills for volunteer work. Implementation of multi-language support with AI for volunteer coordination. Government and NGO work as admin to monitor the volunteer work digitally with necessary funds and equipment's for the volunteers. Donors and philanthropists can donate and check latest volunteer works done for disaster recovery. Additionally, to keep the volunteer's interest and their ability active, an incentive is provided along with necessary compliance trainings and courses to upskill the volunteer work.

Some of the key tools and technologies used to achieve the above functionalities are:

- For building the features such as Geo-location identification and mapping, is done through the third part APIs utilization such as Google Maps API that gives the accurate location of the disaster which can be transmitted as a message to the volunteers nearby to act on the situation and APIs for payment gateways for the donors and the government fund distribution for the volunteering work.

- Real-time communication and co-ordination is carried out through the web sockets and cloud messaging as they can be reliable and helps in reaching the messages swiftly in the form of messages or notifications which holds information such as the required volunteer work, location, intensity of the disaster and the location to report for the volunteer activity, and reduces the delay in information transfer for the volunteers to act fast on the required task to help the victims.

- Training Management to keep track of the compliance of the volunteers with respect to their interest and potentiality over the time for the volunteering work through regular trainings and skill up challenges. Each volunteer is ranked based on the amount of volunteer work done and provided incentives to keep the volunteering interest active.

- Hardware support such as servers are necessary to keep the platform active. Usage of cloud services keeps the system secure and active with less downtime which is utmost priority for the volunteer co-ordination process.

- During the process of building the platform necessary standards and protocols will be maintained for a better and safe product development which holds standard coding practices such as OWASP, IEEE. Data security and privacy standards such as HIPAA (for medical related volunteer operations) and GDPR. APIs and Database management protocols, secure web browsing protocols HTTPS, along with Web performance and accessibility standards WCAG (Web Content Accessibility Guidelines). AI laws along with user and volunteer work data privacy standards along with the governmental rules and regulations will be incorporated.

Assessment of the Feasibility of Implementing the Required Technology:

Following are the key points drawn from the assessment of the technical feasibility of implementing the project with the required technology:

- The Identified technology stack is on par with the current industry standards and are frequently used in building the technical solutions to the new problems. The technology stack identified is proven to be a better fit with respect to the scalability, security, fault tolerant with ability to deliver robust solution.

- The technical risk associated with the stack and the problem statement majorly deals with the human resource with less knowledge over the technologies or the technologies chosen might have some compatibility issue with respect to the versions or the connectivity. Such potential risks are documented and monitored during the software development.

- Alternative approach is to use the similar technologies with better compatibility and look out for newer developments and innovations in the technologies, frameworks, and tools that are better compatible and have better performances in accordance with the industry standards and protocols in building the software.

- Over the analysis of the problem statement, iterative development method is more feasible. To add, developing prototypes and testing to validate the developmental progress and the technological compatibility makes it easy to identify the potential challenges and obstructions during the project development.

- *Risk vs Reward analysis:* Although there are wide range of tools and technologies available to choose from, it is up to the team to identify the technology stack based on certain parameters such as resource knowledge, ease of development and the cost effectiveness in using the tools. For example, microservices are better in terms of achieving the fault tolerance when compared to monolithic development. Further, Elastic search is found to have the ability to process the data

stream in real time and parallel when compared to other databases. Cloud services have shown that it is most reliable and easy to use over setting up traditional server racks and maintain its stability and latency.

OPERATIONAL FEASIBILITY

The operational feasibility deals with the analysis and assessment of potential impact over the development of the proposed localized disaster volunteer co-ordination system on existing processes in terms of operational challenges and benefits with introduction of the proposed solution. It also assesses the acceptance and usage by the users in terms of daily operations.

Operational Impact on Existing process:

- *Volunteer work and co-ordination*: Traditionally the process of volunteering at the disaster site is through manually reaching out the volunteers through NGO campaigns and assign the work / task manually and provide the information about the work which is time consuming.

- *Management of supplies*: The process of managing the required supplies, medicines and human resources at the disaster site often results in imbalance supplies and is tedious task to manage the co-ordination in terms of supplies.

- *Lack of documenting the work done*: Most of the time it is difficult to document the work done by the volunteers and appreciate their work done with certain incentives and motivational encouragements to keep up the good work in terms of honoring and showcasing the work done.

  With the above major concerns to deal with, the proposed solution can improve the existing process with following enhancements by introducing the platform.

- *Productivity gains*: With the Localized Disaster Volunteer Co-ordination system it is easy to manage, monitor and optimize the work done by the volunteers by managing the supplies equilibrium across the disaster site and to overcome the supply deficit. Also, the application helps in keeping track of the work by the volunteers and providing the right recognition for the humanity work.

- *Training and Adoption*: The users that includes public, volunteers, NGOs, and the government should undergo basic training to adopt the system for the operational purpose. The training is all about understanding the workflow of the system and can also help in testing the application in terms of training the users who use the system and provide feedback that are necessary to identify the malfunctioning of the system due to bugs or ambiguous development.

Potential challenges in terms of Operational context:

- *Resistance to change*: Since the disaster volunteering is a tedious task and part of people in the process are less likely exposed to the technology. People resist to the introduction of technology in the existing process. Proper training and advertisement of the technology to the concerned people by providing the experience of using the technology and providing the statistics of the ease of volunteer work management help in mitigating the risk of resistance to the change.

- *Technical and Integration Issues*: The new system may cause technical issue over the time as the system is used in the operations. Some of the key technical issues are downtime, connectivity issues, compatibility with the operating systems and updates. Integration issues is about integrating the solution to the traditional system in use which can be a legacy system and has thin exposure to the latest technologies.

- *Data Security and Privacy*: The system should consider the data security and privacy of the user and volunteer work related data to be secured. To maintain the confidentiality and secure the sensitive information, standard rules, and regulations to be drafted and followed with privacy agreements transparently issued to all the users of the platform with the necessary agreement acceptance before joining the platform.

- *Scalability*: This is yet another potential challenge to be considered as the system is all about coordinating volunteers through disaster prone site, scalability and message transmission should be up all the time and should be made sure that the system should not crash anytime during the process of volunteering.

Potential Benefits in terms of Operational Context:

- *Improvised volunteer coordination*: The Localized Disaster Volunteer Coordination System optimizes the volunteer deployment process by efficiently matching skilled volunteers to disaster-prone areas based on the specific needs of each disaster scenario. This streamlined approach accelerates the relief efforts, ensuring that aid reaches disaster victims promptly and without unnecessary delays**.**

- *Optimized Resource allocation and utilization***:** The supplies and human resource required to help the disaster victims can be optimally allocated and utilized by delivering the right resource at right time during the volunteer work. This can be achieved by using the volunteer coordination system.

- *Improved communication with enhanced transparency:* With the coordination system, the communication processes amongst the volunteers strengthens by coordination them accurately to do the required rescue and aid works to help the victims. Also, ensures the transparency by providing the accurate information about the investments and the funds raised for the disaster recovery and other aid works.

Transition plan and change management strategy.

It is very important to have a transition plan to introduce the system developed to the end users to adopt the system to the existing operational process there by improving the process. The plan majorly deals with the necessary training programs, user adoption strategies and the operational support plans.

- *Pilot Testing*: The fully developed volunteer coordination system with the dedicated scope and objective is released as a beta version for user testing, providing the required training and knowledge about the system use. Later, the user feedback is analyzed for any improvements in the system if needed.

- *Training Programs*: Once the process of beta testing is done, the final software developed is handed over to the user with necessary training initiatives undertaken to train the users and generate the interest towards using the system in daily operations. The training programs should be well structured and designed with information that attracts the users and keeps them active while getting trained.

- *User adoption strategies*: Encourage end users by providing information and statistical analysis of the improvements in the operations with introduction of the developed coordination system. Also, brief about the necessity of the software developed along with mandatory training to use the system. Mention regarding the financial aspects, cost benefits and incentives for the volunteers and ultimately how this system looks forward to keep the city safe.

- *Operational Support*: Post the delivery of the software product developed, there should be a support team to maintain the software with necessary measures taken priorly during the development to understand and document all possible risks post development. Also, there should be a chatbot and community forum to handle the issues faced by the users while using the software system.

ECONOMIC FEASIBILITY:

Although the Disaster volunteer coordination system is built for social cause, helping disaster victims with right services and necessary artifacts, the system still maintains an economical impact and holds cost benefits and return on investment that are discussed in brief.

Estimation of Economic Viability:

The economic feasibility is broadly classified into two streams, where in the one aspect deals with the funding and the estimation drafted for the software development process that includes development, testing, maintenance, and operational expenses along with consideration of short term and long-term expenses. The other part is about generating the revenue in terms of return on investment from the developed operational system.

Cost Structure and Breakdown:

- Development cost: The first investment will be redirected to the developmental work of the system that initially starts with the planning, design, and the development of the system with the agreed technology stack for web and mobile applications, database, and security management along with integration of third-party services and APIs. In terms of short-term expenses deals with the cost of development of the system and the long-term expenses deals with addition of changes and updates to the system post developed and operational.

- *Infrastructure cost*: Is the fees that occurs from the utilization of third-party services which are used to build the system. Short-term expenses are the developmental services used for the construction of the product and long-term expenses are the maintenance and subscription fees incurred during the product being operational that uses the third-party services. For instance, the cloud services that we have considered for the solution.

- *Maintenance and Operational cost*: Maintenance is important to keep the developed system active, during the development phase maintenance and operations are short term expenses that keeps testing the system for the functionalities and for the long-term it is the bigger expense that continuous until the system is employed in action.

- *Marketing and Sales cost*: It is the cost incurred during the marketing and selling the product to governments and NGOs to include in their operations for disaster management. Also, do campaigns and advertisements for the users to be part of the social cause by joining the platform and staying active. It majorly constitutes for long-term expenses while reaching different level of customers and organizations.

- *Future expenses on scaling*: Improving the system with new updates and expansion of solution with multiple feature enhancements can be considered with increased volume of usage by the users and organizations to be documented.

Consideration of resource availability:

- *Financial Resources:* Getting the funds from government grants, venture capitals and sponsors from the philanthropists, loans and other means that determines the economic and financial feasibility of the solution or product development and introduction to the operations.

- *Technology resources:* Identifying the right technology stack with optimal subscription fees while providing all the necessary services that are utilized in developing the product.

- *Human Resources:* Find the employees with right skills and motivation for developing the product is necessary to reduce the risk of delayed development with lack of desired skills and motivation. Employees with the industry standard designation and salary should also be considered.

Potential Return on Investment:

Potential return on Investment projections is documented based on market analysis, feasibility study in terms of operations and finance. Standard pricing should be set in accordance to the services provided to the users and organizations and the number of times the services are used to work on the disaster recovery volunteer work. Expected to receive a decent return on investment over a long-term based on the user and organization acceptance and the ability of the product with high availability.

Payback period: The payback period is an estimation of timeline that is required with metrices such as user acceptance and product in operations which determines the duration that ensures the payback on the initial investments over the product development and marketing. In general, a good payback period is presumed to be small to recover the investment in the earliest and switch the gear on profit from the product. In our case, the profit margin is very thin as the product is developed with consideration of social cause that leave us with very few revenue streams, majorly focusing on government funds and minimal registration fees from the NGOs and a part of donations to run the system activities.

Cost Benefit Analysis:

Cost Benefit analysis provides an estimation on the possible cost structure and the potential financial projections for the software product.

- *Service and license fees*: Introducing the service fee for the NGOs and the government for using the software to synchronize the process of coordination amongst the volunteers for disaster management is a way of cash flow through the software product which can be a part to maintain the software and use for incentivizing the volunteer works.

- *Stakeholders and partnerships*: Providing the stakes and partnership to bigger firms and ultimately government who can run the software with necessary funds for maintenance and operations is yet another cost benefit.

- *Profitability Analysis*: Profit analysis includes evaluating the profit margins, return on investment and other useful metrices to identify the product operational ability and convenience for the users. This ultimately leads to optimizing the user cost and prices for the services provided.