SAVING HANDS

A website for helping people in a Natural disaster

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INTRODUCTION:

When a disaster occurs, the damages caused by it affect the society and the environment. In order to protect a particular area from disaster, the recovery planners must identify the vulnerabilities caused in a particular area and provide appropriate services. Taking into consideration the damages caused by a disaster, this paper describes the application of the Assignment Problem in a form of a website which helps the people affected by a disaster. This website provides the affected people the capability to seek help when a disaster occurs. We have incorporated various web technologies like HTML ,ASP.NET and C# for developing our website. In order to store the records we have made use of MySQL database. This paper primarily focuses on how Agile software development plays an important role in developing our website. The website also provides users the capability to register either as a volunteer or an organization. When the affected people notify about help on the website, the system allocates the appropriate volunteer by using the Assignment Problem method. The organization registered on the website has the capabilities to create an event, add needs to an event and merge events. The goal of this paper is to indicate how Agile software development methods can be used to develop a disaster recovery website.

STATEMENT OF THE PROBLEM:

The important problems faced during any natural disaster are the shortage of resources and the shortage of volunteers. These are the major problem which is faced by people during situations like Drought, Floods, Earthquakes, Hurricanes, Tornadoes, Winter weather, Wildfire etc. At this point, people will be in need of basic and advanced necessities in worst cases. Lending them hands at this time is a tedious work as people are not co-located and have no means of contacting other people for help. Time, Location, Resources and Tracking the needy plays a vital role in this kind of situation. In order to bring a solution to this problem, we must find an efficient way to help the needy during their adverse situation. The proposed project allows volunteers from any location to help the needy by tracking the details posted in the website. Interested people can register themselves as volunteers and will be notified of the nearby situation and they get an opportunity to help the people by providing their necessities. This project also allows the volunteers to lend help virtually like donating money if they could not make it in person.

METHODOLOGY:

This project involves 3 main methodologies, each served during different phases of the project. The methodologies which were used are Scrum, Kanban, Extreme Programming.

Scrum Methodology:

The Scrum way to deal with venture administration empowers programming improvement associations to organize the work that issues most and separate it into reasonable pieces. Scrum is tied in with teaming up and discussing both with the general population who are taking the necessary steps and the general population who require the work done. It's tied in with conveying regularly and reacting to criticism, expanding business esteem by guaranteeing that clients get what they really need.

With in the agile development, Scrum teams are supported by two specific roles. The first is a Scrum master, who can be thought as a coach for the team, helping team members use the scrum process to perform at the highest level. The Product Owner(PO) will be the other role represents the business, customers or users and guides the team towards building the right product.

The most popular way to create a product backlog in Scrum methodology is to populate it with the user stories, which are short descriptions of functionality described from the perspective of a user or customer. The sprint backlog is the list of tasks the team needs to perform in order to deliver the functionality it committed to deliver during the sprint

Kanban Methodology:

Kanban is a technique for managing the creation of merchandise with a stress on continuous delivery whereas not over burdening the event team.We used kanban in our project mainly because of the 3 basic principles. They are

1. Visualize what you do today(workflow)
2. Limit the amount of work in progress (WIP)
3. Enhance flow

This methodology promoted continuous collaboration and encouraged active, ongoing learning and improving by defining the best possible team workflow. It was helpful in operational environments with high degree of variability in priority. This methodology helped in reducing the waste and removing the activities that don't add value to the team. Also, it involved rapid feedback loops which enhances more the chances of being motivated, empowered and higher performing team members.

Extreme programming :

It is a framework which centers around software engineering principles and focuses on ensuring delivery of high quality software. They allow the team to work collaboratively in short development cycles and are flexible and adaptable to change. They utilize user stories and frequent small planned releases.

In this project extreme programming was used as it allows pair programming in which two programmers work together at one workstation. One, programmer is the driver who writes the code while the other programmer is the observer or the navigator who reviewed each line of code as it is typed in. The two programmers switch their roles frequently. This method increased code quality which reduced the risk of error.

USER STORIES

1. As a user I want to register so that i can use the system.
2. As an organizer, I want to create an event so that the volunteers get notified.
3. As a user, i want to add new information so that the information is available to all.
4. As an organizer, I want to add needs to an event so that help can be provided.
5. As a user, I want to tag my location so that the resources can be allocated.
6. As a volunteer, I want to confirm that i have arrived to help so that the organizers are notified.
7. As an organizer, I want to prioritize the need of the user so that the help is provided.
8. As a volunteer, I want to add resources, so that i can help the users.
9. As an organizer, I want to merge events so that we can combine resources
10. As a volunteer, I want to specify the time available so that notifications are not sent.

Analysis, Prioritization and Selection

In this phase, the improvement ideas and identified potential agile practices are analyzed and prioritized at improvement meetings. Then, the most high-priority improvements are selected for the next cycle for team's process improvement.

For prioritization of the tasks, the team used MoSCoW and DEEP techniques. MoSCoW categorized the user stories under 4 categories. They are

- Must have
- Should have
- Could have
- Would have

Must have:

These provide the Minimum Usable Subset (MUS) of requirements which the project guarantees to deliver. This may be defined using some of the following:

- Cannot deliver on target date without this
- No point in delivering on target date without this; if it were not delivered, there would be no point deploying the solution on the intended date
- Not legal without it
- Unsafe without it
- Cannot deliver the Business Case without it

The user stories 1,2 and 3 comes under the must have category.

Should have:

Should have requirements are important to project success, but not necessary for delivery in the delivery time box. Should have requirements are often not as time-critical as Must haves. Should Have requirements may also allow for another way of satisfying the requirement, so can be held back until a future delivery time-box.

- Important but not vital
- May be painful to leave out, but the solution is still viable
- May need some kind of workaround, e.g. management of expectations, some inefficiency, an existing solution, paperwork, etc.

The user stories 4,5,6,7 and 8 comes under the must have category.

Could have:

Could have requirements are less critical and maybe often seen as nice to have. A few easily satisfied Could requirements in a delivery can increase customer satisfaction for little development cost.

- Wanted or desirable but less important

- Less impact if left out (compared with a Should Have)

The user stories 9 and 8 comes under the must have category.

Would have:

These are requirements which the project team has agreed it will not deliver. They are recorded in the Prioritised Requirements List where they help clarify the scope of the project and to avoid being reintroduced 'via the back door' at a later date. This helps to manage expectations that some requirements will simply not make it into the delivered solution, at least not this time around.

In this project no user stories comes under would have category.

DEEP

A product backlog could have many hundred or a lot of work things, therefore the signifier DEEP. Work things will be comprised of stories, defects and check sets. DEEP is additionally logical structure of a product backlog.

- **Detailed Appropriately :** User stories on the merchandise backlog which will be done shortly have to be compelled to be sufficiently well understood that they'll be completed within the coming back sprint. Stories which will not be developed for for a while ought to be represented with less detail.
- **Estimated:** The product backlog is over a listing of all work to be done; it's conjointly a helpful designing tool. as a result of things any down the backlog don't seem to be similarly understood, the estimates related to them are less precise than estimates given things at the highest.

- **Emergent:** A product backlog isn't static. it'll modification over time. As additional is learned, user stories on the merchandise backlog are further, removed, or reprioritized.
- **Prioritized:** The product backlog ought to be sorted with the foremost valuable things at the highest and also the least valuable at all-time low. By continually operating in priority order, the team is in a position to maximise the worth of the merchandise or system being developed.

ASSIGNMENT PROBLEM:

The Assignment problem is a special case of Transportation problem, which in turn is a special case of min-cost flow problem, so it can be solved using the algorithms that solve the more general cases.

MEANING OF THE ASSIGNMENT PROBLEM:

An assignment problem is a particular case of transportation problem where the objective is to assign a number of resources to an equal number of activities so as to minimise total cost or maximize total profit of allocation.

The problem of assignment arises because available resources such as men, machines etc. have varying degrees of efficiency for performing different activities, therefore, cost, profit or loss of performing the different activities is different.

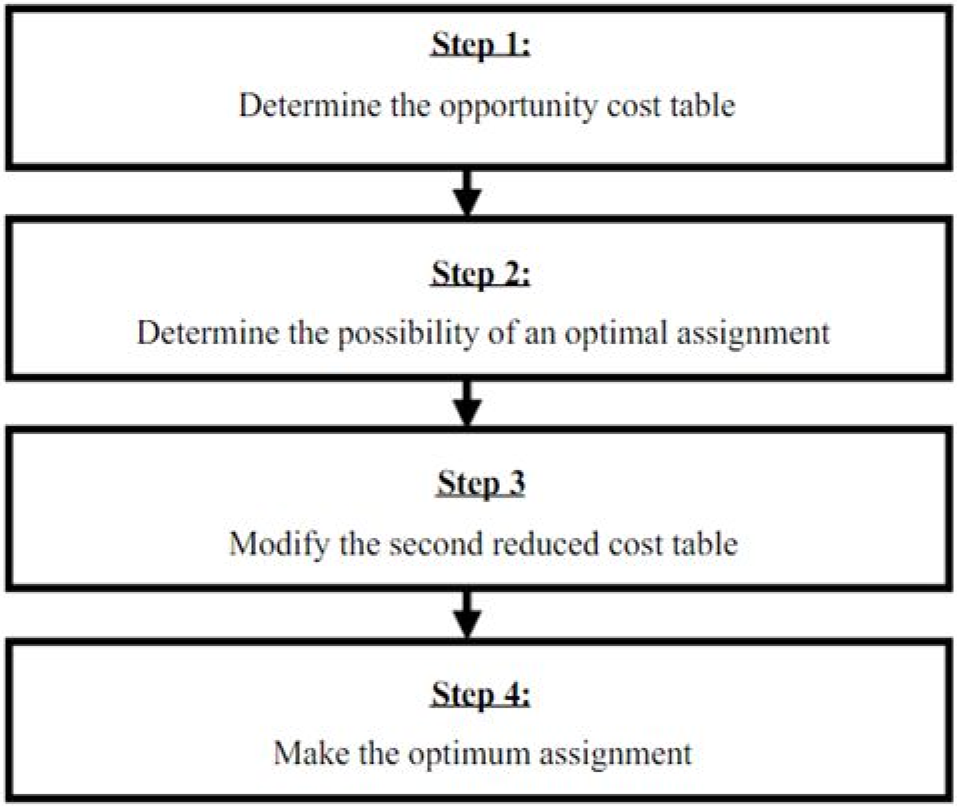
DEFINITION OF THE ASSIGNMENT PROBLEM:

Suppose there are n jobs to be performed and n persons are available for doing these jobs. Assume that each person can do each job at a term, though with varying degree of efficiency, let cij be the cost if the i-th person is assigned to the j-th job. The problem is to find an assignment (which job should be assigned to which person one on-one basis) So that the total cost of performing all jobs is minimum, problem of this kind are known as assignment problem.

ASSUMPTIONS IN ASSIGNMENT PROBLEM:

1. Number of jobs is equal to the number of machines or persons.
2. Each man or machine is assigned only one job.
3. Each man or machine is independently capable of handling any job to be done.
4. Assigning criteria is clearly specified(minimizing cost or maximizing profit).

ASSIGNMENT AND TRANSPORTATION THEORY:


Step 1:
Determine the opportunity cost table
Step 2:
Determine the possibility of an optimal assignment
Step 3
Modify the second reduced cost table
Step 4:
Make the optimum assignment

HUNGARIAN METHOD FOR SOLVING ASSIGNMENT PROBLEM:

This method is developed by D.Konig, a Hungarian Mathematician and is therefore known as Hungarian method of Assignment Problem.

The Hungarian method of assignment provides us with an efficient method of finding the optimal solution without having to make a-direct comparison of every solution.This method is also a combinatorial optimization algorithm that solves the assignment problem in polynomial time and which anticipated later primal-dual methods.It works on the principle of reducing the given cost matrix to a matrix of opportunity costs.

The number in the table would then be the costs associated with each particular assignment. Opportunity cost show the relative penalties associated with assigning resources to an activity as opposed to making the best or least cost assignment. If we can reduce the cost matrix to the extent of having at least one zero in each row and column, it will be possible to make optimal assignment.

STEPS INVOLVED IN HUNGARIAN METHOD:

1. Develop the cost table from the given problem.
2. Find the opportunity cost table.
3. Make assignment in the opportunity cost matrix.
4. Optimality Criterion.
5. Revise the opportunity cost table.
6. Develop new revised opportunity cost table.
7. Repeat step 3 to step 6 until optimal solution is obtained.

TIMELINE:

Milestone	**Start Date**	**End date**
Sprint 1: Creating pages for website using html	**03/13/18**	**03/23/18**
Sprint 2: Define views / Design Database Tables	**03/24/18**	**03/27/18**
Sprint 3: Link Database and registration	**03/28/18**	**03/31/18**
Sprint 4: Create Events	**03/31/18**	**04/04/18**
Sprint 5: Create Reporting Feature	**04/05/18**	**04/17/18**
Sprint 6: Assignment problem application	**04/18/18**	**04/30/18**

Sprint 1:

In this sprint, we started developing the front end of the of the website. HTML code was used to implement the front end part of the website. Database for the website has been established.

What went well in this sprint?:

The team succeeded in developing the front end using WIX tool. The source code was extracted from the tool. The team succeeded in creating the database.

What did not go well and why?:

The team faced a problem in accessing the website. It was because the tool used to create the website could not publish the page.

How the problem was resolved?:

As the website was not able to access by the team, the code was written using HTML.

SPRINT 2:

In this sprint, we started developing the front end of the of the website. HTML code was used to implement the front end part of the website. Database for the website has been established.

What went well in this sprint?:

The team succeeded in developing the front end using HTML.The team succeeded in creating the database.

What did not go well and why?:

Linking the back end (database) with the front end of the website (Webpage) was not successful.

How the problem was resolved?:

The problem was resolved in the next sprint by improvising the database tables and connecting it with the front end.

SPRINT 3:

In the third sprint, registration and login forms were successfully created.

What went well in this sprint?:

Forms for the login and the registration for the volunteers were created and the user was able to navigate to that page from the home page.

What did not go well and why?:

The team succeeded in reaching the milestone set during the initial stage. There were no failures in this sprint.

How the problem was resolved?:

There were no problems to resolve.

SPRINT 4:

In the fourth sprint, events were created successfully.

What went well in this sprint?:

The page for creating an event for the disaster was created successfully..

What did not go well and why?:

In the registration form ,the Date of the Birth field from the form has been asked to be removed by the product owner, as it was not necessary for the registration.

How the problem was resolved?:

Small changes were made in the code as well as in the database and the mentioned field was removed.

SPRINT 5:

In the fifth sprint, User were able to access the website and create the events.

What went well in this sprint?:

The volunteers were able to mention area of interest in volunteering. The users were able to create events for the disaster and request for help. A various categories for request help has been included such as, donating blood, food, clothes, money. Both user and volunteer can create an event.

What did not go well and why?:

The team managed to achieve the milestone.

How the problem was resolved?:

There were no problems to resolve.

SPRINT 6:

In this sprint, the assignment problem has been implemented and the look and feel of the website has been improved.

What went well in this sprint?:

The implementation of assignment problem in the project was successfully achieved. Hungarian method is used. The name of the volunteer was displayed on the top of the page when he successfully logs in.

What did not go well and why?:

The team managed to achieve the milestone.

How the problem was resolved?:

There were no problems to resolve.

TESTING:

Testing methods used in this project are:

- Unit Testing
- Acceptance Testing.

Here, the Unit testing was done by the Developers during the implementation of the project and the Acceptance test is developed by the testers.

CONCLUSION:

The main objective of this project is to help the people during disaster by creating a website which would be flexible and easily accessible by the people who needs help. This project has been implemented using Agile Methodology which gave us a high quality software product. Also, the Assignment problem guided us in allocating the resources for the needy people which plays a crucial part in the project.

FUTURE ENHANCEMENTS:

The future enhancements of the project are

1) To structure the events in a more detailed way- by connecting the similar events in the vicinity which would make the assignment of the resources easy.
2) To improve the volunteer's profile- by adding additional field during the registration which makes it more specific for the allocation.
3) To include GPS to track the location of the user- this way volunteers can track the people who needs help in a more efficient way.

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