

Engineering Method

Algorithms and Data Structures

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Identifying the problem

Context

WeTrust, a worldwide company, had a crisis recently. As a world leading company when it comes to “trust”, it can certainly not allow a trust issue among its employees. For this reason, the manager of this incredible company is asking for help. He is astonished by the fact that his employees are not trusting each other. Nonetheless, he cannot do anything about it until he has been able to identify the source of this lack of trust. He needs this information to be able to improve.

Problem

It is required to identify the relationship of trust within the company. See where it is failing, how this is affecting communication and people who feel more distrust in the company.

Requirements

Requirements				
Requirement	Name	Description	Entries	Result
R1	Load employees	It allows the user to load the employee's information through a text file provided.	File path	The file is read correctly, and the information is loaded.
R2	Employees diagram	It allows the user to see the diagram of the employees who answered the surveys.	-	The employees are shown respectively.
R3	Show trust levels	It allows the user to see the trust levels between each employee in the company accordingly.	-	The trust among the employees is shown.
R4	Best path company	It allows the user to see the best path that a message could follow throughout the whole company (minimum spanning tree).	Graph G	The best path is shown on the screen.
R5	Best employee	It allows the user to choose 1 employee and see the best employee for them to communicate avoiding conflict or misinterpretation.	Employee e1	The best employee is shown on the screen with his/her corresponding information.
R6	Worst Employee	It allows the user to choose 1 employee and see the worst employee for them to communicate. Giving a signal to where the trust for that employee must be worked the most.	Employee e1	The worst employee is shown on the screen with his/her corresponding information.

Research

In order to address the problem correctly, we might need some concepts.

- **Trust:** In order to define “trust” we had to do some proper research. Taking in consideration different sources. First, according to (Changing Minds, n.d.) trust is “... both an emotional and logical act. Emotionally, it is where you expose your vulnerabilities to people, but believing they will not take advantage of your openness. Logically, it is where you have assessed the probabilities of gain and loss, calculating expected utility based on hard performance data, and concluded that the person in question will behave in a predictable manner.”.

Secondly, another source says that “Trust refers to a person’s confident belief that another’s motivations are benevolent toward him or her and that the other person will therefore be responsive to his or her needs.” (Psychology, n.d.).

Since we found some relationships between other sources, we decided to leave just the two definitions from above.

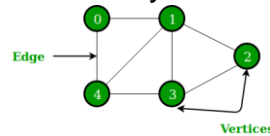
Furthermore, we shall understand why trust is important for communication. We found that “When there is no trust, naturally, no one will voice out their opinions or ideas and there will be little or no team cohesion. Often, the outcome is that the organization will not grow as a team. Thus, we will never get to a level of a high performing team nor result in growing a successful business.” (Quek, n.d.). Indeed, we found that trust is not only crucial in communication, but in team and business performance as well.

On the other hand, we needed to look for some already existing programs which could help with the problem. We found the following:

- **IBM SPSS:** “IBM® SPSS® Statistics is the world’s leading statistical software used to solve business and research problems by means of ad-hoc analysis, hypothesis testing, and predictive analytics. Organizations use IBM SPSS Statistics to understand data, analyze trends, forecast and plan to validate assumptions and drive accurate conclusions.” (IBM, n.d.)
- **Microsoft Excel:** “Microsoft Excel is a spreadsheet developed by Microsoft for Windows, macOS, Android and iOS. It features calculation, graphing tools, pivot tables, and a macro programming language called Visual Basic for Applications.” (Wikipedia, 2019)

In addition, we thought about creating a computer program using some data structures. In order to do so, we needed to find different existing structures.

- Graphs: “A Graph is a non-linear data structure consisting of nodes and edges. The nodes are sometimes also referred to as vertices and the edges are lines or arcs that connect any two nodes in the graph.” (GeeksForGeeks.org, n.d.)



- These graphs can be represented in different ways. We have found some different options as these:

- Adjacency Matrix: “For a graph with $|V|$ vertices, an adjacency matrix is a $|V| \times |V|$ matrix of 0s and 1s, where the entry in row i and column j is 1 if and only if the edge (i,j) is in the graph.” (Khan Academy, n.d.)

	0	1	2	3	4	5	6	7	8	9
0	0	1	0	0	0	0	1	0	1	0
1	1	0	0	0	1	0	1	0	0	1
2	0	0	0	0	1	0	1	0	0	0
3	0	0	0	0	1	1	0	0	1	0
4	0	1	1	1	0	1	0	0	0	1
5	0	0	0	1	1	0	0	0	0	0
6	1	1	1	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	1	1
8	1	0	0	1	0	0	0	1	0	0
9	0	1	0	0	1	0	0	1	0	0

- Adjacency List: “Representing a graph with adjacency lists combines adjacency matrices with edge lists. For each vertex i , store an array of the vertices adjacent to it. We typically have an array of $|V|$ adjacency lists, one adjacency list per vertex.” (Khan Academy, n.d.)

0	→	1	6	8		
1	→	0	4	6	9	
2	→	4	6			
3	→	4	5	8		
4	→	1	2	3	5	9
5	→	3	4			
6	→	0	1	2		
7	→	8	9			
8	→	0	3	7		
9	→	1	4	7		

Creative Solutions

Brainstorm

1. Since we are asked to show how the trust is working within the company, we thought about creating a conference program. Which means, having one conference weekly to have a constant record of how the trust is improving or deteriorating. This would take about a month.
2. We also thought about creating some statistics with the information given by the surveys and generating some graphics with the program called “IBM SPSS statistics 26”. Finally, creating a file with all the information to hand it to the manager.
3. As we mention before, there is a data structure called “graph” which can represent the company’s trust levels by creating a model based of the employees who

answered the surveys. Implementing this graph would allow us to create a program that will satisfy the needs of the manager. We would use both ways of representing the graph mentioned in our research.

Preliminary Design

Rejected alternatives

- × The conference program would take too much time and effort. Also, the manager is not requesting for a long-term solution. He is asking for something more specific, he is looking for a way to understand how the trust is working inside the company.

Accepted alternatives

- ✓ The statistics creation using IBM SPSS could represent the information that was given to us correctly. The surveys would provide all the variables needed to create the database in the program and create the whole report.
- ✓ The graph implementation was found to be a great alternative when it comes to store data and manipulate it. For this reason, we concluded that it should be accepted.

Evaluation and Selection of the best solution

Criteria

- A. Time consumption: The solution must not take more than a month to create/implement.
- B. Time request: Taking into consideration that the manager has not much time, the solution must be self-explanatory, not needing a presentation and/or a heavy explanation.
- C. Aesthetics: We take aesthetics into account because if the solution is not attractive, it will not completely satisfy the client and it will not generate the image we want.

All criteria will be evaluated in a scale from 1 to 10. Being 1 the worst and 10 the best.

Evaluation

Alternatives	Time Consumption	Time Request	Aesthetics	Total
IBM SPSS	5	3	1	9
Graph implementation	5	9	9	23

Selection

According to the results, we decided to choose the graph implementation alternative. This is mainly because it will take less time to implement, it will not require a presentation due to the user-friendly interface of the program we will create and this same interface will be as aesthetic as possible.

Reports

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