Topic Analysis and Synthesis Report

Software Project Management (SOEN 6481)

"Topic 27: Effective Strategies for Initiating New Projects with New Teams and Technologies"

by
Krishna Vamsi Rokkam (40237902)

Under the Supervision of
Professor: Pankaj Kamthan

Department of Computer Science and Software Engineering

Contents

1 Abstract

Initiating a new project with a new team or implementing novel technologies presents a unique set of challenges and opportunities. This report delves into the strategies and best practices for effectively launching such projects, emphasizing the establishment of strong relationships within the team and the seamless integration of new technologies or processes.

The initial step in fostering successful team dynamics is the utilization of project start-up workshops or launches, creating an environment for team members to get to know each other. Face-to-face interactions are invaluable in understanding team dynamics, as well as in defining and assigning roles and responsibilities. Collaborative planning and decision-making contribute to the perception of the project as a collective effort, rather than a collection of individual contributions. Involving the team in decisions about how the project will be run is pivotal, promoting a sense of ownership among all members.

In addition to project-related activities, extracurricular team-building experiences can be powerful in bringing the team closer together. However, it's essential to ensure that all team members are willing participants in such activities. Shared meals are a universal bonding experience, and providing snacks at meetings or organizing team lunches can foster rapport and cooperation. Encouraging the team's input into meal choices is a simple yet effective way to build connections and ensure that everyone's preferences are respected.

Dealing with new processes and technologies requires open communication with project sponsors and stakeholders. Technology challenges may demand adjustments in expectations, particularly in terms of the learning curve. Adequate time, resources, and funding are often necessary to overcome these hurdles. The adoption of new technologies and methods can be framed as opportunities for team members to enhance their knowledge and skills, motivating those interested in self-improvement. For team members resistant to change, mentoring and involving them in less technology-dependent project components can ease their transition.

The report concludes by highlighting the value of innovation in project initiation. Embracing new approaches to work can make projects more engaging and exciting for the team. In summary, this report offers a comprehensive guide to launching projects with fresh teams and emerging technologies, focusing on relationship-building, technology adoption, and the benefits of innovation.

Purpose

To *develop within the given time limit from 26th September 2023 to 24th November 2023*, the *artifacts of a comprehensive system capable of taking a random set of data values as input* and generating the following descriptive statistics:

1. Minimum (m),
2. Maximum (M),
3. Mode (o),
4. Median (d),
5. Mean absolute deviation (MAD), and
6. Standard deviation (σ).

in order to *provide a numerical description of an arbitrary set of data values.*

Perspective

Examine *the accuracy of Descriptive Statistics from a technical user's (researchers, analysts, and data scientists) perspective.*

Environment

In the context of the *development and testing phase of a project's lifecycle.*

2 The goal in terms of a SMART Goal:

Specific

By the end of the project duration, we would have developed the METRICSTICS Descriptive Statistics System, which will accurately calculate key statistical measures (minimum, maximum, mode, median, mean absolute deviation, and standard deviation) for input datasets, both real and artificially generated, through an intuitive user interface.

Measurable

We will measure the success of this goal by using metrics mentioned in section 1.2

Achievable

To achieve this goal, we will allocate adequate resources, including a dedicated development team, a testing resource, and project management oversight.

Relevant

Developing the METRICSTICS Descriptive Statistics System is directly aligned with our team's mission to address the growing need for efficient and accurate descriptive statistical analysis, essential for technical users such as researchers, analysts, and data scientists across various industries.

Time-Bound

We will complete the development, testing, release, and documentation of METRICSTICS within the next 3 months. This timeline allows for comprehensive development, testing, refinement, and documentation while ensuring timely delivery to meet user needs.

By adhering to this SMART goal, we aim to deliver a valuable tool that enhances the capabilities of technical users to perform descriptive statistical analysis quickly, accurately, and efficiently.

3 Questions and Metrics

1. Is it possible to complete the project within the allotted time limit?
   - M1: Task completion rate.
   - M2: Burn down chart.
   - M3: Leadtime [2] (time required to go from idea to delivered software)
2. Does the existing functionality align with the expectations of a technical user?
   - M4: Technical User's Heuristic Assessment
3. What are the program's dimensions?
   - M6: Storage capacity needed to run the software application.
   - M7: Lines of Code (LOC)
4. Is the code efficient and well-optimized?
   - M8: Number of duplicated Lines of Code
   - M9: The computational time complexity of functions
5. Is the program easy to maintain?
   - M10: Documentation [3]
   - M11: Maintainability Index [4]
6. How efficient is the team's performance?
   - M12: Velocity
   - M13: Average Cycle Time [5]
7. What is the level of satisfaction among the project's stakeholders?
   - M14: Team Satisfaction
   - M15: Customer Satisfaction
8. Do all the functions produce the expected output?
   - M16: Unit test code coverage
9. Are there any defects during the development?
   - M17: Bugs and defect count
10. Is the project equipped to handle errors and invalid inputs during its execution?
    - M18: Robustness Index [6]
    - M19: Function robustness [6]
11. What are the user stories' priority?
    - M20: User Story Point
12. Is the code designed to be independent of any specific IDE (Integrated Development Environment)?
    - M21: Portability [7]

4 Use Case Model

Using the given description, construct a use case model for DESCRIPTIVE STATISTICS.
Note. There can be several use cases, including saving data in memory, restarting a session, and so on. A statistical calculator could be used as a motivation to 'elicit' necessary use cases.

4.1 Use Case Model Diagram

Following the use case templates [8] and use case diagram example [9] we get the following:

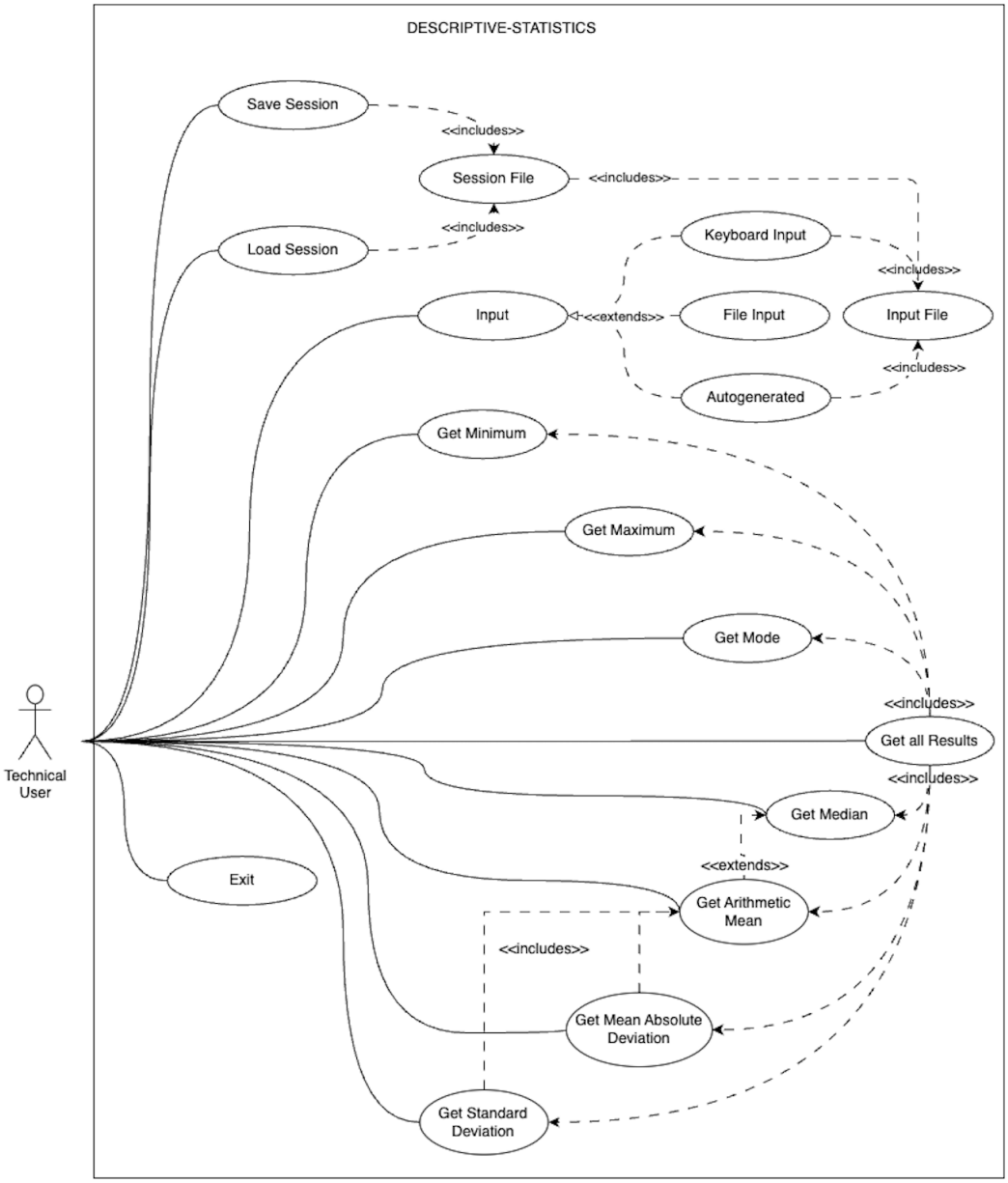

Figure 1: Use case model diagram for Descriptive Statistic

Actors

The actor is a technical user who can be a researchers, analysts, student or data scientists. They will use the system to obtain descriptive statistics for research, building models or assignment.

4.2 Use Case Model Tables

Use Case 1

Title	**Input data set**
Description	Provide a finite data set x_1, x_2, x_3, ... x_n as input from one of the below two sources: 1. Keyboard, 2. File and 3. Autogenerated.
Primary Actor	Technical User
Preconditions	1. The program must be running 2. The input source must be in proper comma separated values format 3. The input should be numbers 4. There should be at least 1 value in the input file
Success Guarantee	Data set is assigned to a variable
Main Success Scenario	1. User inputs a valid dataset 2. The system sorts the data in an ascending order
Extensions	An error message is showed indicating the data set given was invalid or in the wrong format.

Use Case 2

Title	**Get Minimum**
Description	Calculate the minimum value from the given data set.
Primary Actor	Technical User
Preconditions	1. The system must be running. 2. A valid data set must have been inputted into the system.
Success Guarantee	The minimum value is successfully calculated and displayed.
Main Success Scenario	1. The system retrieves the sorted data set. 2. The system identifies the smallest value in the data set as the minimum. 3. The system displays the calculated minimum value. 4. The user returns to the main menu of operations.
Extensions	If the data set is empty, an error message indicating that the input is empty is displayed, and the user returns to the main menu without minimum value calculation.

Use Case 3

Title	**Get Maximum**
Description	Calculate the maximum value from the given data set.
Primary Actor	Technical User
Preconditions	1. The system must be running. 2. A valid data set must have been inputted into the system.
Success Guarantee	The maximum value is successfully calculated and displayed.
Main Success Scenario	1. The system retrieves the sorted data set. 2. The system identifies the largest value in the data set as the maximum. 3. The system displays the calculated maximum value. 4. The user returns to the main menu of operations.
Extensions	If the data set is empty, an error message indicating that the input is empty is displayed, and the user returns to the main menu without maximum value calculation.

Use Case 4

Title	**Get Mode Value**
Description	Calculate the mode value(s) from the given data set which is the most frequently appeared value in the data set (mode value does not have to be unique).
Primary Actor	Technical User
Preconditions	1. The system must be running. 2. A valid data set must have been inputted into the system.
Success Guarantee	The mode value(s) is/are successfully displayed.
Main Success Scenario	1. The system retrieves the sorted data set. 2. The system analyzes the data set to identify the value(s) that appears most frequently. 3. The identified value(s) is designated as the mode value(s). 4. The system displays the calculated mode value(s). 5. The user returns to the main menu of operations.
Extensions	If the data set is empty, an error message indicating that the input is empty is displayed, and the user returns to the main menu without mode value(s) calculation.

Use Case 5

Title	**Get Median Value**
Description	Calculate the median value from the given data set. The median is the middle number if the number of data values is odd, and it is the arithmetic mean of the two middle numbers if number of data values is even.
Primary Actor	Technical User
Preconditions	1. The system must be running. 2. A valid data set must have been inputted into the system.
Success Guarantee	The median value is successfully calculated and displayed.
Main Success Scenario	1. The system retrieves the sorted data set. 2. The system checks the number of data values (n) in the dataset. 3. If n is odd: The system identifies the middle value as the median. If n is even: The system calculates the arithmetic mean of the two middle values, which is designated as the median. 4. The system displays the calculated median value. 5. The user returns to the main menu of operations.
Extensions	If the data set is empty, an error message indicating that the input is empty is displayed, and the user returns to the main menu without median value calculation.

Use Case 6

Title	**Get Arithmetic Mean Value**
Description	Calculate the arithmetic mean value from the given data set. $$\mu = \frac{1}{n}\sum_{i=1}^{n} x_i.$$
Primary Actor	Technical User
Preconditions	1. The system must be running. 2. A valid data set must have been inputted into the system.
Success Guarantee	The Arithmetic Mean value is successfully calculated and displayed.
Main Success Scenario	1. The system retrieves the sorted data set. 2. The system calculates the arithmetic mean by summing all the values in the data set and dividing by the number of data values. 3. The system displays the calculated arithmetic mean value. 4. The user returns to the main menu of operations.
Extensions	If the data set is empty, an error message indicating that the input is empty is displayed, and the user returns to the main menu without arithmetic mean value calculation.

Use Case 7

Title	**Get Mean Absolute Deviation Value**
Description	Calculate the mean absolute deviation (MAD) from the given data set. MAD measures the average absolute difference between each data value and the arithmetic mean. $$\mathrm{MAD} = \frac{1}{n}\sum_{i=1}^{n} \lvert x_i - \mu \rvert.$$
Primary Actor	Technical User
Preconditions	1. The system must be running. 2. A valid data set must have been inputted into the system.
Success Guarantee	The Mean Absolute Deviation value is successfully calculated and displayed.
Main Success Scenario	1. The system retrieves the sorted data set. 2. The system calculates the mean absolute deviation (MAD) using the formula. 3. The system displays the calculated mean absolute deviation value. 4. The user returns to the main menu of operations.
Extensions	If the data set is empty, an error message indicating that the input is empty is displayed, and the user returns to the main menu without Mean Absolute Deviation value calculation.

Use Case 8

Title	**Get Standard Deviation**
Description	Calculate the standard deviation from the given data set. The standard deviation measures the dispersion or spread of data values around the arithmetic mean. $\sigma = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(x_i - \mu)^2}$.
Primary Actor	Technical User
Preconditions	1. The system must be running. 2. A valid data set must have been inputted into the system.
Success Guarantee	The Standard Deviation value is successfully calculated and displayed.
Main Success Scenario	1. The system retrieves the sorted data set. 2. The system calculates the standard deviation by using the formula. 3. The system displays the calculated standard deviation value. 4. The user returns to the main menu of operations.
Extensions	If the data set is empty, an error message indicating that the input is empty is, and the user returns to the main menu without Standard Deviation value calculation.

Use Case 9

Title	**Get All Results**
Description	Display all calculated descriptive statistics, i.e., minimum, maximum, mode, median, arithmetic mean, mean absolute deviation, and standard deviation for the given data set.
Primary Actor	Technical User
Preconditions	1. The system must be running. 2. A valid data set must have been inputted into the system.
Success Guarantee	The calculated descriptive statistics are successfully computed and displayed to the Technical User.
Main Success Scenario	1. The system retrieves the sorted data set. 2. The system computes and displays the following descriptive statistics to the user: • Minimum • Maximum • Mode • Median • Arithmetic Mean • Mean Absolute Deviation • Standard Deviation 3. The system displays the calculated standard deviation value. 4. The user returns to the main menu of operations.
Extensions	If no valid descriptive statistics are available due to an empty data set or invalid result values, an error message indicating the same is, and the user returns to the main menu without displaying any statistics.

Use Case 10

Title	**Save Session**
Description	Save the input data reference and descriptive statistics to a session file if the user selects the 'save session' option.
Primary Actor	Technical User
Preconditions	1. The system must be running. 2. Input file exists.
Success Guarantee	The input data reference and descriptive statistics are saved in the session file.
Main Success Scenario	1. The system prompts the user to provide a session name. 2. The system adds an entry into the session file containing the session name, input data reference and descriptive statistics. 3. The system returns to the main menu.
Extensions	If the session name already exists, an error message indicating that a similar session name already exists is displayed, and the user returns to the main menu without saving the session.

Use Case 11

Title	**Load Session**
Description	Load the input data and descriptive statistics based on the session name selected by the user if the user selects the 'load session' option.
Primary Actor	Technical User
Preconditions	1. The system must be running. 2. Session file and input data file exists.
Success Guarantee	The input data and calculated descriptive statistics are loaded in the system based on user selected session name.
Main Success Scenario	1. The system displays a list of available session names. 2. The user selects the session name they want to load. 3. The system loads the input data along with the descriptive statistics. 4. The system returns to the main menu.
Extensions	None

Use Case 12

Title	**Exit**
Description	Exit the program if the user selects the exit option.
Primary Actor	Technical User
Preconditions	1. The system must be running.
Success Guarantee	The program terminates successfully.
Main Success Scenario	1. The program must end all its processes. 2. The user is no longer able to interact with the program.
Extensions	None