CATalyst Studios Makerspace Data Analysis - Trends & Data Visualization

Project Proposal & Statement of Work

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1. Executive Summary

This project focuses on analyzing student credit utilization at CATalyst Studios, a vibrant makerspace located within the University of Arizona Libraries. CATalyst Studios serves as a hub for innovation and creativity, offering students access to state-of-the-art tools like 3D printers, laser cutters, vinyl cutters, sewing machines, and multimedia equipment. These resources support interdisciplinary learning and hands-on project development. To facilitate equitable access, each student is provided a one-time $50 credit for the duration of their academic program to cover the cost of materials used in the studio.

The core issue addressed in this project is the lack of visibility into how students utilize their allocated $50 credit. There is little understanding of which students or departments are using the credit fully, whether there are trends in underutilization, and how credit use varies across academic groups and semesters. Addressing these questions is essential for improving studio resource allocation, identifying outreach opportunities, and maximizing student benefit.

The dataset was extracted from the central database of the University of Arizona Libraries. The dataset was processed using Python and Regular Expressions (Regex) to extract credit usage details from unstructured comments. The data was then analyzed to uncover trends related to fully used credits, average usage by department and semester, and total costs incurred. Final deliverables include a comprehensive report and an interactive Tableau dashboard for visualizing trends and insights.

Project Phase	Tasks Involved	Tools/Skills Applied
Data Collection & Cleaning	Extracting raw data from studio logs; cleaning and formatting text	Python, Pandas, Regex
Data Extraction	Parsing unstructured comments to extract credit balances	Regex, Text Processing
Exploratory Data Analysis	Analyzing usage patterns across semesters and departments	Python, Pandas, Matplotlib, Seaborn
Visualization & Dashboarding	Creating visualizations and interactive dashboards to present insights	Tableau, Python Visualization Libraries
Reporting	Summarizing findings in a structured report format	Report Writing, Analytical Thinking, MS Word

Table 1: Project Tasks and Tools Used

2. Literature Review/Market research

Makerspaces have emerged as key educational hubs within universities, fostering creativity, hands-on learning, and interdisciplinary collaboration. CATalyst Studios at the University of Arizona is part of this global trend, offering access to digital fabrication tools and materials. Studies such as Forest et al. (2014) and Wilczynski (2015) have explored the impact of makerspaces on student learning outcomes and innovation, emphasizing the importance of accessibility and equitable resource distribution.

However, one area that remains underexplored in existing literature is the analysis of how material credits are actually utilized. While many institutions allocate credit or subsidized material access to promote equitable use, few have studied whether this allocation meets real usage needs. In most cases, the evaluation of makerspace resource distribution is anecdotal or based on usage logs rather than deep, structured analysis.

This project fills that gap by focusing on a quantitative and visual exploration of credit usage patterns among students. Through structured data analysis, it aims to answer questions like: Are students using the $50 credit efficiently? Which departments or academic programs show higher usage? Do some groups tend to underutilize the credits?

In terms of user research, informal interviews with CATalyst Studios staff and frequent users revealed key insights:

- Many students are unaware of their available credit or how it can be used.
- Some programs with heavy project components (e.g., design, architecture) tend to exhaust their credit, while others barely tap into it.
- Staff are interested in having a visual dashboard to help them monitor usage and support targeted communication efforts.

This project is thus not just a data exploration exercise, it's designed to directly inform decision-making at CATalyst Studios by providing stakeholders with visibility into usage trends and helping optimize how materials are allocated and promoted.

3. Research Project Deliverables

3.1 Final Project Outcome :

This project aims to generate valuable insights into how students utilize their one-time $50 material credit at CATalyst Studios. The deliverables are structured to support practical decision-making, highlight usage disparities, and ensure the findings are reproducible and accessible to stakeholders.

The project will result in:

Written Report
A formal research report that includes:

- Introduction to the problem and context of CATalyst Studios
- Methods explaining data collection, preprocessing (including Regex), and analysis steps

- Results with key findings on average usage, full usage, department-based patterns, and anomalies
- Visuals (at least two charts/graphs) to illustrate insights clearly
- Recommendations for future credit planning, outreach strategies, or policy updates

Tableau Dashboard

- A dashboard that allows staff and decision-makers to explore credit usage trends by department, semester, and demographic segments
- Filters for customizing the view and identifying departments with full/partial usage

Data Pipeline Documentation

- Clear, reusable code snippets (in Python) showing how raw comment logs were cleaned and balance values extracted using Regex
- Documentation for replicating or extending the analysis

Presentation Slides

- A short slide deck summarizing key findings and recommendations—useful for internal reporting or staff briefings

3.2 Analytical Approach

The analysis includes:

- Regex-based text parsing to extract credit balance values from unstructured comment fields.
- Data cleaning and structuring using Python to convert raw text into usable, tabular form.
- Exploratory Data Analysis (EDA) to uncover trends and usage behaviors across semesters and departments.
- Descriptive statistics and visualizations to summarize the extent and variation of credit utilization among students.

3.3 Expected Accuracy and Validation

As a descriptive project, accuracy is primarily concerned with the correct extraction of balance values from messy or varied text entries. To ensure reliability:

- Regex patterns were iteratively developed and tested.
- A manual validation process was performed on a sample of entries.
- Extracted values were cross-checked against logical ranges and expected outcomes.

3.4 Handling Inconclusive Results

If no significant patterns emerge from the data, the project still adds value by:

- Delivering a reusable and well-documented data pipeline.

- Identifying gaps in current data formatting or recording practices.
- Offering a foundational framework that CATalyst Studios can build on in future semesters.

3.5 Data Availability and Access

There are no risks associated with data availability. The dataset is internally sourced from central database of the University of Arizona Libraries which includes student usage logs at CATalyst Studios. The project does not depend on external APIs or live scraping, ensuring full data access throughout the analysis.

4. Project Timeline & Gannt Chart

The project began in the first week of February and will continue until the first week of May. The goal is to complete all phases—data extraction, analysis, visualization, reporting, and dashboard development—within this window. Below is a detailed breakdown of major milestones and tasks that guide the project timeline.

Milestone	Target Date
Project kick-off and planning	Feb 06, 2025
Dataset collection and access	Feb 13, 2025
Regex extraction of balance values	Feb 20, 2025
Data cleaning and preprocessing	Feb 28, 2025
Initial exploratory data analysis	Mar 06, 2025
Feedback checkpoint with advisor	Mar 20, 2025
Development of visualizations	Mar 25, 2025
Draft dashboard design in Tableau	Apr 10, 2025
Refinement of visuals and filtering	Apr 15, 2025
Insights synthesis and report writing	Apr 20, 2025
Dashboard integration final	Apr 25, 2025
Full draft ready for review	Apr 30, 2025
Final review and polishing	May 02, 2025
Submission of project and materials	May 05, 2025

Table 2 : Milestone Schedule

The **Gantt chart** below shows the visual representation of the tasks mapped over time.

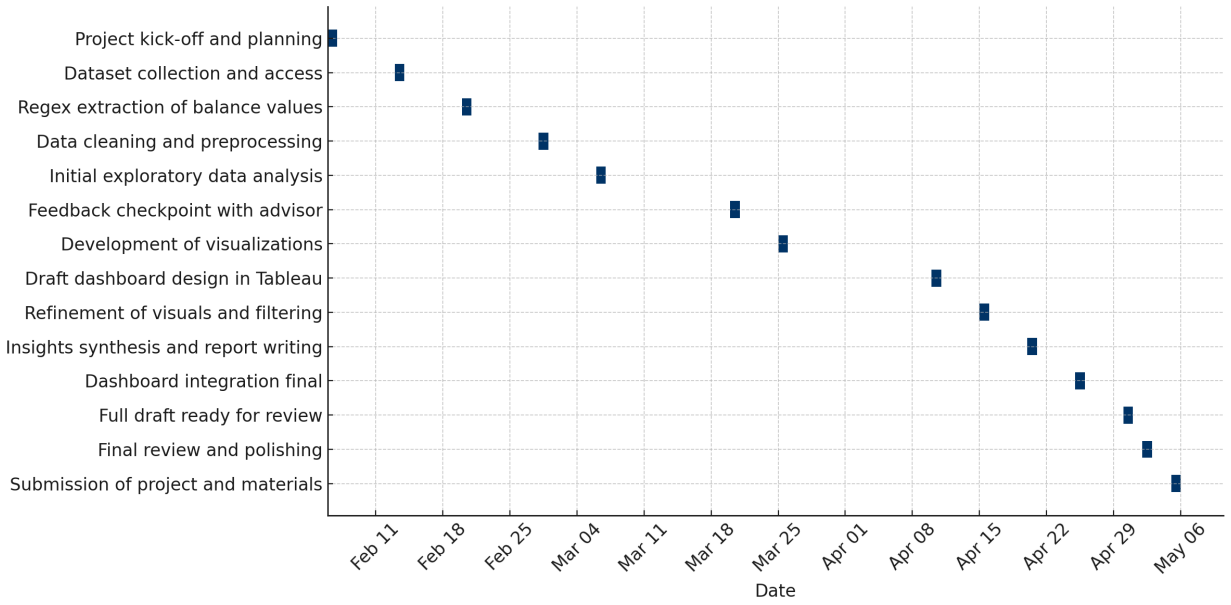

Figure: Gannt Chart showing the tasks mapped over time

5. Ethics

Ethical considerations were carefully reviewed throughout the lifecycle of this project. The dataset is anonymized and internal, containing no personally identifiable information (PII). The data was collected by CATalyst Studios as part of routine student engagement tracking and consists mainly of free-text comments and credit balance details.

Key ethical safeguards include:

- No private or sensitive information is exposed or analyzed.
- The project does not involve any surveillance, profiling, or automated decision-making about individuals.
- The outputs of this analysis (report and dashboard) will only be used to inform internal operational decisions.

A summary of the ethics self-assessment is provided below:

#	Question	Response
1	Could a user sell drugs or other illegal items on your platform?	No
2	Could a user of your platform engage in sex trafficking?	No
3	Could a user sell class notes or cheat on their homework on your platform?	No
4	Could a stalker use your project to find someone?	No

5	Could your app be used to spy on or track individuals?	No
6	Could your app/software access the camera or microphone and record things without users being aware?	No
7	If someone uses your platform, could they be re-traumatized or have their mental health impacted in some way?	No
8	Could your algorithm promote material that would traumatize or upset individuals?	No
9	Would your users be upset if the data you collect was given to someone else?	No
10	Could a data leak potentially lead to identity theft?	No
11	If your site was hacked, would users of that product potentially lose their job, spouse, or family?	No
12	Should there be an age limitation on your product?	No
13	Could someone use your product to find, contact, and potentially commit elder abuse?	No
14	If the data on your platform was breached, could it be used to blackmail the users?	No
15	Does the existence of your project imply that a particular racial group, gender, religion or other protected category is inherently bad, gross, or unwanted?	No
16	Could your product be used to commit hate crimes against a specific group?	No
17	Does the primary content of your game or algorithm focus on something considered deeply unethical?	No
18	Does your game or software contain race, gender, or other stereotypes?	No
19	Could users of your app scam other individuals?	No
20	Is your particular algorithm biased towards predicting correctly only for one race, gender, or other group?	No

21	Are the users of your project, players of your game, or those being surveyed for your data aware of how their data will be used?	No
22	What are the possible misinterpretations of your results? For example – would a white supremacist or misogynist be stoked about your results if they misinterpreted it?	No
23	Does the use or purchase of your data potentially contribute to a dangerous group or regime?	No
24	Could your virtual reality environment cause injury to the user?	No
25	Are your study participants or game players aware that their data will be collected and used?	No
26	Does your game or app contain addictive design elements without benefit to the user?	No
27	Does your survey contain an aspect of compulsion or unusually large incentive, that would command users to take it even if it was to their detriment?	No
28	Could your research outcomes harm an individual or entity?	No

Table 3 : Ethics Self Assessment

6. Approvals

The signatures of the people below indicate an understanding of the purpose and content of this document by those signing it. By signing this document, you indicate that you approve of the proposed project outlined in this Statement of Work, the division of work, the Ground Rules, and that the next steps may be taken to create a Product Specification and proceed with the project.

This SOW outlines the current scope and requirements of the CATalyst Studios Credit Utilization Analysis project. All deliverables and objectives are defined within this document.

Approver Name	Title	Signature	Date
Ashwini R Jannu	Team Member	*Ashwini R Jannu*	April 3rd, 2025
Jennifer Nichols	Advisor/ Mentor	*Jennifer Nichols*	April 3rd, 2025
Hana Lipke	Advisor/ Mentor	*Hana Lipke*	April 3rd, 2025
Dr. Greg Chism	Instructor		

Section	Word Count
1. Executive Summary	*284*
2. Table 1: Project Tasks & Tools	*80*
3. Literature Review/Market Research	*389*
4. Research Project Deliverables	*784*
5. Project Timeline & Gantt Chart	*228*
6. Ethics	*392*
7. Approvals	*96*
8. Appendix (Advisor & Responsibilities)	*330*
9. Ground Rules	*297*

Table 3 : Sections & Word Count

7. Appendix

A. Advisor Engagement

1) Project Responsibilities

- A weekly call/meeting will be set up with the Faculty Advisor. The Project Team will provide weekly status updates to the Advisor including upcoming deliverables, critical issues, and any adjustments to the Project Plan.
- Documents will be provided to the Advisor with adequate time for review and signature. The time necessary for review will be agreed upon with the Advisor. The minimum review time will be 3 days prior to the document due date.
- Design files will be provided to the Advisor as requested in a format agreed to with the Advisor.
- Support requirements will be clearly requested from the Advisor with the dates required and an adequate time for fulfilling the request.
- Modification requests to the Project Plan by Advisor will be reviewed and agreed to within 1 week of the request.

2) Advisor Responsibilities

- The Advisor will provide knowledge and expertise to help the group stretch their skills.
- The Advisor will participate in a weekly or bi-weekly call/meeting to review the project status, upcoming deliverables, priorities, issues, and progress to the agreed Project Plan.
- The Advisor will provide document review, feedback, and approval, rejection, and approval with contingencies with adequate time to meet the course due dates.

- The Advisor will provide feedback to requested support requirements. This includes feedback and guidance on design implementation decisions, design files, test plans, test procedures and test results.
- The Advisor shall provide technical advice and guidance to the Project Team answering inquiries approximately 1 hour per week.
- Modifications to the Project Plan will be resolved and documented within 1 week of the request.
- Grade the finalized project using a skill-based rubric

B. Ground Rules

Although this project is being completed individually, I am committed to following professional standards of project management and accountability. I will apply the following principles to ensure the successful and timely completion of my work:

- **Stay focused on objectives and goals**
  I will consistently align my efforts with the scope and intended outcomes of the project. At each stage, I will revisit the core questions I aim to answer and adjust direction if needed.
- **Track side issues without distraction**
  If unrelated or broader questions emerge during analysis or development, I will note them for later exploration rather than letting them derail progress.
- **Maintain thoughtful reflection and evaluation**
  While working independently, I will still reflect critically on decisions made, data interpretations, and alternative approaches to ensure rigor and clarity in my analysis.
- **Respect diverse perspectives**
  I will remain open to feedback from mentors, advisors, and CATalyst Studios staff. When feedback presents differing viewpoints, I will evaluate suggestions objectively and incorporate those that improve project quality.
- **Value idea exploration**
  Even working solo, I will explore new or unconventional ideas that arise during the process and consider their value before narrowing my focus.
- **Focus on forward progress**
  I will avoid spending time assigning blame to past setbacks. Instead, I will focus on identifying solutions and staying productive.
- **Document decisions and next steps**
  I will maintain a project journal or log of key decisions, challenges, and next steps to ensure that my process is transparent and progress is easy to track.
- **Accountability**
  As the sole contributor, I am fully responsible for all phases of the project—from data extraction to final report and dashboard. I will honor my timeline and deliverables and seek support when needed to stay on track.