PROJECT MANAGEMENT LESSON LEARNED WEB APPLICATION

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Abstract

This project seeks to improve how project managers capture, access, utilize, and benefit from project lessons learned to reduce risks and accelerate higher quality project outcomes. Individuals and organizations might benefit from consolidating project lessons learned into an easily accessible format. However, few organizations researched for this project have implemented such tools. Research conducted included surveys and interviews of project personnel to understand content, structure, and access and usability needs.

The project develops a structured web-based application that facilities capturing lessons learned information so that it can be easily accessed and used for current and future projects. The implementation of the web application 'Project Management Lesson Learned Web Application' (PMLLWA) was developed due to improve accessibility to lessons learned from previous and ongoing projects due to unformatted, inconsistent, and outdated templates. This application provides secure and central access from any browser and any device with access to the internet. It provides a flexible tool, capable of interacting with various sources to access project lessons learned. These tools will benefit on generating project lesson learned narrative, consistent insertion of lesson learned with brief explanation per section and will serve as an archive of uploading files related to the project lesson learned.

Keywords

Lessons Learned Processes; Lessons Learned Methods; Project Learning, Web Learning Application, Data Organizer, Category, Monitoring Control, Reduce Risk, Lessons Learned Database, Lesson Learned Repository, Lesson Learned Archive System, After Action Review Feedback, Best Practices Learning

Introduction

Project Background

For the past four years while working directly on managing projects there been many coworkers and colleagues in three ends: real-world projects, personal projects, and classroom projects being tracked in a computer system based on folder directory structure. While these projects live in an organized or unorganized structure, most of the time files can be a hassle to look for, find the last revision, replacement forms, and templates. Often when looking back for previous lessons learned to be applied to a new project, there is not input to be found when a project gets closed and archived. Organizing project documentation structure is one of the main logs that I can tell has been inputted on a lesson learned for future advice. At the same time lesson logs have been losing sight if you do not keep on following up on those lesson logs and working on the project narrative which helps to track all project lessons learned.

This has been a flaw of many co-workers, colleagues, and friends working on projects. Many of the mentioned persons have lacked training, experience, and confidence to do so. For upcoming new projects 4 times out of 5 we tend to recreate new templates or use outdated templates to set a baseline. This process is very tedious when going back to previous projects and retrieving files needed and disregarding what is not needed. When logs are written down; they can be forgotten when moving on to new projects. In addition, subconsciously we can lose track of files, especially of complex projects that have multiple child directories. This process lives mainly on each project manager's system and the problem that this can raise is no flexibility on consolidating the files and keeping them safe in one location to be shared with other team members. If the lessons learned and project files can be stored in one location per institute or organization, it will improve the integrity of correlation between files and provide one central location for all lessons learned.

PMLLWA was developed to target this gap of flaws to provide better project management and tracking lessons learned to minimize time consumed and provide analysis of risks. The use of the PMLLWA will also improve the precision and overall accuracy of managing projects and tracking lessons learned by using actual, historical data and promote project management maturity as it builds project managers' skills and confidence.

Project Description

PMLLWA is a product for easy access to project lessons learned through a web application interface for desktop or mobile. Access and permissions will be granted to the appropriate personnel to update, manage, and view a list of project lessons learned and their components/documents input by user roles and user account. Each area will incorporate a virtual portal with key performance metrics to provide a consistent methodology with which to measure ongoing or previous project health and status at

the same time giving dynamically positive and negative from final project closeout results (Prisha, 2020). PMLLWA will contain all schedules, budget data, assigned resources, risks, milestones, and the main component of a collection of lessons learned for each project. The scope of this project includes all requirements gathering, planning, design, development, and implementation of the PMLLWA tool. This Plan does not cover the processes used by the project to manage changes to the scope of work after they are final and baselined to design, develop, and implement. This project will help to prevent losses and streamline work effort for future or ongoing projects, minimizing risks and research time.

Project Objective

The main objective of this project is to support all upcoming projects from small businesses to big corporations by providing a bank of lessons learned from all domains. This new web application of project lessons learned will reduce the time associated with researching tool implementations and the consumption of resources needed. This grant a boost for ongoing or future projects, giving an ahead start to the project with data that already exists and is contained in a database. In addition, for evaluation of the collected data from lessons learned from previous projects to be reused for all the writeups documentation of the projects. This minimizes the time required for brainstorming when coming risk identification and analysis.

Project Team

The project team for this capstone project was Joel Jacobson, who served as the Project Manager and was the sole responsible person for all deliverables, scheduling of activities, and the overall execution of project.

Research Methodology

Research required to design and develop PMLLWA is essential to analysis-based conclusions and recommendations regarding format and content. Research conducted for this project includes survey questionnaires targeting specific Subject Matter Experts (SMEs). Portions of PMLLWA are based on experience executing a similar project by a project manager whose primary job duty is the development of software. Other sources of information were expert opinions from programmers, best practices provided online, and templates and examples provided by professors and students during project management academic course. Elicited data was assessed and utilized to generate robust lessons learned based on input and experiential data.

The project manager used documentation during PMLLWA development to accomplish specific goals:

- Build a knowledge base for PMLLWA design (layout)
- Act as reference points during PMLLWA development
- Build a list of best practices for use in developing PMLLWA content
- Support desired requirements listed in a project management plan

Research Review

Survey Review

As planned, a robust survey was developed. This initial survey includes ten questions related to lessons learned in personal or business environments. A follow-on survey gathers specific input for building web application tools. This data collection assists in understanding proper, effective lessons learned utilization.

The following interview questions were generated based on the literature reviews, checklist and feedback forms templates for lesson learned gather from numerous free template sources. This was tailored and narrow down based on the online tools tested or areas that didn't included to capture lesson learned or narratives to be developed or filled and lastly interviewed SMEs to ask them about the importance and the utilization to identify and expand all lessons learned gather from team meeting per projects.

Interview Questions

1. Does your organization implement lessons learned on each project?
    a) Yes
    b) No
    c) Not Sure
2. Do you build and design your own Lesson Learned Templates?
    a) Yes
    b) No
    c) Not Sure
3. What software platform do you use for lessons learned?
    a) Microsoft Excel
    b) Microsoft Word
    c) Not Sure
    d) None
4. How often during the lifecycle of your project do you use lessons learned?

a) All the time
b) Sometimes
c) Never
d) Rarely

5. Do you know how to build a lesson learned template?
   a) No
   b) Yes
   c) Sometimes
6. Has previous lesson learned feedback helped you for new or ongoing projects?
   a) Yes
   b) No
   c) Sometimes
   d) Depends on the project
7. How familiar are you with applying lessons learned to your whole project?
   a) Not Much
   b) A lot
   c) Somehow
   d) I do not know how to apply it
8. Have you used Lesson Learned for personal including volunteer work or business work projects?
   a) Just for Business Work
   b) Just for Personal or Volunteering work
   c) For both
   d) None of them
9. Do you believe implementing lessons learned into your project will increase the effectiveness of the results of your project?
   a) Yes
   b) A little
   c) Not Sure
   d) No
10. Do you get the data or inputs for your project lesson learned from the following: Team Brainstorming, Project Sponsor and Stakeholders or Internal and External team members?
    a) Team Brainstorming
    b) Project Sponsor and Stakeholders Feedback
    c) Internal or External Project Team Members

d) All of them
e) None of them

Online/Standalone Tools Review

Two important comparative data were added, these related to the web demo application like Lessons Learned Database and Lesson Flow. Where they both state that all identified tools are commercial products that you need to purchase for your use; Showing some exceptions like, trial versions with upgrade options to get full spectrum tools for the lesson learned databases. Other software meant for controlling and managing projects, with few sections to capture lessons learned, were priced over 200 dollars for full-featured software categories. A vast majority of this software needed enterprise installation protocols, which may not be functionally consistent with internal organizational network systems requiring rigidly controlled information technology administrative access rights. On the mobile side, the applications were related to project tracking with Gantt charts or statistics metrics for projects which have a Kanban-style idea or Agile methodology which didn't fit with the scope of work for this project to be produced. Many of these tools were trial versions with the option to upgrade for monthly fees. According to reviews of online and offline tools from research sources, these related to the Secutor Solution (2021) and the Milton (2021), shown in the Appendix G.

Literature Review

Online searches and current work documents may provide significant experience-based information on project lessons learned documentation systems. Searching referenced locations for information on lesson learned projects may provide a broad spectrum of data. Much high-level information available on project management was of significant benefit during this project, however, information on lesson learned tools did not provide a similar level of quality.

According to Rowe, S. F. & Sikes, S. (2006), in an article written for a conference, a strong message was presented "It is not necessary to wait until the end of the project for learning to occur. Lessons can be identified at any time during the project". By that part of the article was meaningful and powerful information that the project manager writes about all the good and bad that can bring lessons learned into projects once you dive deeper into the article. An overview of a research towards lesson learned study from (Knoco Ltd. 2009), shows the team a grasp on the study for questions developments for the survey to conduct. Reading at the feedbacks that users wrote, expands the knowledge of the use and the importance to apply the lesson learned. These blogs or articles provide a step by step what should contain or the areas that should be filled to capture lesson logs and some of them provided default template built-in Microsoft Word and Excel and most of those templates that get provided and users that write these contents

In the current work environment at the State of Alaska, Department of Commerce the project manager connects with colleagues which are SMEs in software development and project management career fields are professionals and often plan at a higher level of access and visibility. As a result, they do not report using similar types of planning or executing tools in defining lesson learned criteria. This is a true form which the project manager experiences same situation as well. These sources do offer a useful perspective for best practices applicable to lesson learned forms or templates. However, both best practices were conducted in conjunction with the creation of PMLLWA.

Research Analysis

Several applications such as Lessons Learned Database in Milton, N. (2021) and Lesson Flow in Secutor Solutions (2021) that generate and create documents or forms for lessons learned during project management, were selected, and used in conjunction with higher-level project management software during initial project planning phases.

Applications were reviewed using the project manager's lesson learned checklist and templates layout custom-created which compared each application against project work of scope to be completed. These areas monitor five specific categories: security and safety, narrative generate page, searchable lesson logs independent or within a project, ease of usability, administrative management and consolidate external files. Each category had a list of attributes to measure success see Appendix F. Categories evaluating each application were cost to the user, availability, accessibility, ease of use, design, content related to the project, generating reports, gathering, and compiling lessons learned for an entire project.

The project manager's informed opinion was a determining factor in assessing application performance. Each category had a defined set of expectations for success when determining the application's rating. The project manager continuously accessed and utilized each application and documented observations daily. Due to study size and duration, the project manager used simplified category rating schemes.

Baseline expectations set by previously identified software, combined with simplicity in rating scheme, allowed for usability and accessibility in evaluating each application. The intent of this study was not to provide exhaustive reports on application improvement, but instead to identify areas of weakness to inform decisions about the creation and application of PMLLWA.

Analysis Description

To start analyzing the data collected, the team gathered results from the feedback of five SMEs and reviewed results from online literature and tools used related to lessons learned data capture. The level of measurement and analysis of the information of the results collected through the creation of research surveys, are presented, and worked quantitatively. The data collection techniques were

elaborated through a questionnaire with closed questions. It is applied to obtain precision and specificity in the information. In the same way, collect and measure information from different sources to obtain a complete visualization on the subject. This survey was submitted through the specific audience on social networks related to the management field to gather feedback on the importance and need to utilize lessons learned in distinct project phases.

A research population targeted professionals in the information technology career field to retain as much possible integrity of data and honesty results. Data sample composition is presented with 29 participants were from different cultural backgrounds and different demographic locations which shows a significant difference in responses. Non-probability sampling, deliberate sampling or judgment was chosen based on the knowledge and judgment of the investigator. The 86% of the participants were men and the other 14% were women, with an age range of 25 to 45 years. Of which 76% of their work experience has been in project management and the other 24% was related to the field of Information Technology, with a range of work experience between 5 and 25 years of service (Appendixes H).

The use of this type of sampling allows the results obtained to be highly accurate with a minimum margin of error in real time, in the same way to minimize the results being biased. Allowing results to be predictive and providing added support to the analysis of the correlation of the captured data. The objective of the investigation is by means of the applied investigation process, it looks for the generation of the process of connection between the theory and the product. it consumes a minimum execution time allowing the project to directly approach the market objective.

Analysis Method

The Project Lessons Learned Questionnaire (Survey) is composed of 10 baseline questions related to implementing lessons learned into personal or business project life cycles. Questions have been generated from online search sites, tools, SME feedback from archived projects lesson learned, lesson learned templates checklists, existing lesson learned documentation, and lesson learned completed from a select work environment. This study produced 10 questions issued to intended respondents.

The purpose of the instrument is carried out to obtain valuable information and useful data within the subject. This provides an exhaustive analysis of the implementation of the lesson learned in the preparation of projects. The elaboration, validation and reliability of the instrument is established using a Likert-type scale, according to ten items that measure frequency, application, use, and need of lesson learned as a fundamental factor in Project management. Where eight of the items had the categories: (1) Yes, (2), No (3). Sometimes, (4) I'm not sure, (5) Rarely. The other two remaining reagents, their categories were established by the specific use in the work area.

Analysis Instrument

Questions were created and inserted into a database to demonstrate the validity of the instrument. Made up of five experts or judges, related in the field of project management, who evaluated the ten criteria or closed questions of the instrument. The discrimination criteria were based on the level of essentiality of the questions. Exposing the total acceptance of the instrument reagents, and an accepted average validity for its administration. Database results were tabulated and organized to generate pivot tables, graphics, and charts of assessment results.

Analysis Approach

The questionnaire was promulgated through a public URL (internet address) created for a specific audience of SMEs, using text messages, social media news feeds, and direct messages from social media applications, targeting individual projects managers.

This will provide an adequate sample size to capture meaningful and statistically significant data for credible analysis.

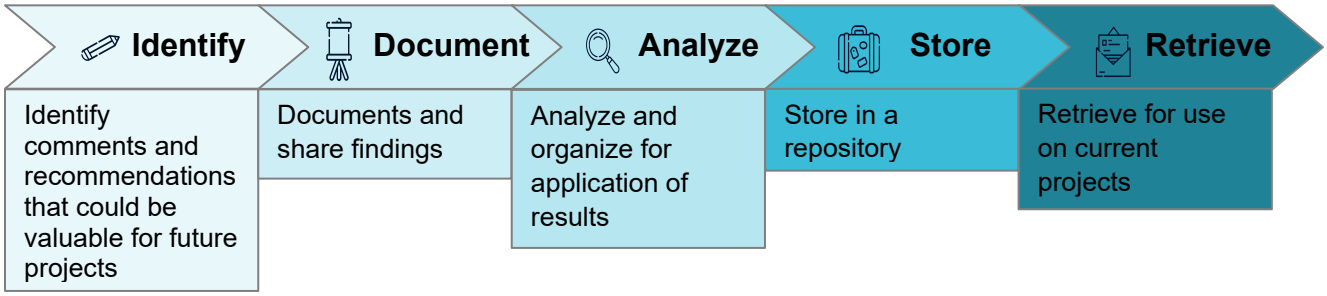

Exhibit 1: Lessons Learned Process (Adapted from PMI, 2017; Rowe, S. F. & Sikes, S. 2006)

Exhibit 1: Lessons Learned Process is the process included in PMBOK Guide 6th Edition This process is comprised of five steps which are: Identify, Document, Analyze, Store, and Retrieve. Exhibit 1 was integrated as part of the research survey. Respondents read over the lesson learned process before answering the questions. It showed the audience if they applied lesson learned the way it should by this process.

Analysis Process

The goal was to achieves 15 survey responses completed. If responses exceed 30, a portion of data results will be used to analyze. This was a random selection. Based on each question an assessment will be conducted to determine the percentage of how the selected users take advantage of Lesson Learned as they have been applied into projects (personal or business). This result indicates whether users understand the importance of using lessons learned and their importance for current or future projects.

This data also reveals how knowledgeable or well-understood concepts behind components which lesson learned to include, e.g., building templates, and properly populating them.

During the execution phase, this collected data be utilized to assess the adequacy of content present or used for fields needed in a project lesson learned web environment (browser). This is intended to improve the layout of items needed during execution.

Analysis Results

The expectation was exceeded by capturing a total of 29 respondents. Data validation was set in place to just allow each user to answer the survey one time by capturing the user's IP (Internet Protocol) address from their Internet Service Provider (ISP/Company who provides service) and flag them to repeat the survey. Also, data validations were enforced, and the survey could not be completed if a question was not answered. Based on the analysis, there were well-balanced results of data validation by interpreting one by one user along with their ten questions.

As the surveys were completed, and the results were exported from the database into a cleaner interface and cleaned and organized, and later analyzed, there were a variety of demographic backgrounds based on the selected persons for these surveys were as expected. These results steered the developments of the PMLLWA and guaranteed this new system reveals the needs of the stakeholders. Even though, the results identified the center focus of lesson learned web application with prominence on the capturing, implementing, logging, tracking, and reusing lessons learned from previous projects to satisfy and increase the success of managed future projects.

The results of the respondents showed similarity by integrity in the established answers, they were placed side by side according to the categorization evaluated. was presented significant differences in users who had experience using or implementing lessons learned in their organization. Showing an average of 7/10 positively correct questions related to the implementation, design, refinement of lessons learned, logging and tracking lesson learned templates in their work area per projects.

On the other hand, those users that had not experienced nor used lessons learned in their organization had a high average that the remaining questions were negative towards the use of lessons learned. Indeed, those that answered ‘No’ based on their remaining question seem they are unaware of what is compose a whole project as far as phases and knowledge areas.

Reporting Results

The results are projected visually under each exhibit in order by the number of the question and answered by the respondent. Let’s dive in on each analysis per question.

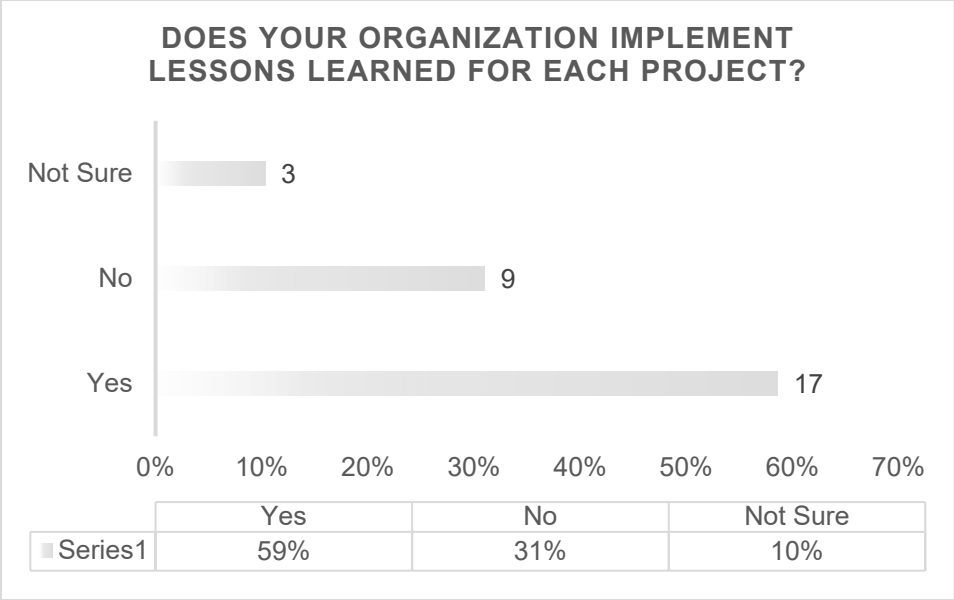

Exhibit 2: The implementation of lessons learned on the organization

Exhibit 2 expresses that more than 50% of the respondents in his organization still implement the lessons learned. When analyzing the 17 respondents in the remaining questions, it is observed that they have a comprehensive knowledge of the concept, responding correctly to the importance of the lessons learned. On the other hand, the results showed that 31% of the respondents who answered "No", still have a high number of the target focus group that is in Project Management that does not know if their organization has the knowledge or capacity on what benefits. and consequences. Failure to implement the lessons learned throughout the project will incur. The correlation and data integrity across all the respondents that answered 'No' is still negative results across all the other nine remaining questions. There is a similarity in their answers.

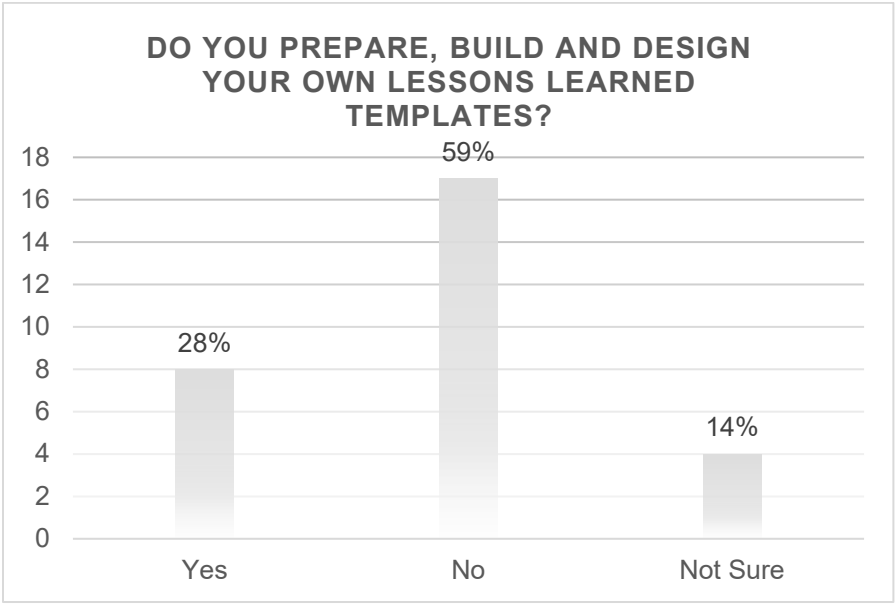

Exhibit 3: Designing Lesson Learned templates for projects

Exhibit 3, The high rate of the results of the respondents was clustered in the answer “No”, showing a 59% in the non-build, design or prepare lessons learned templates. Only 28% of the respondents who answered "Yes" recognized the construction of this. A significant data who answered “Yes”, and in correlation to Exhibit 2, shows that (2 of 8) 25% of their organization does not implement the lessons learned in their work process. A possible variable to these is that part of these respondents belongs to small companies or in the development of their documentation do not follow corporate guidelines to implement the Standard Operation of Procedures. Similarly, it is observed that users with the answer "Yes" access the integrity of the data, coinciding with the similarity of the related questions between a positive knowledge of the lesson learned.

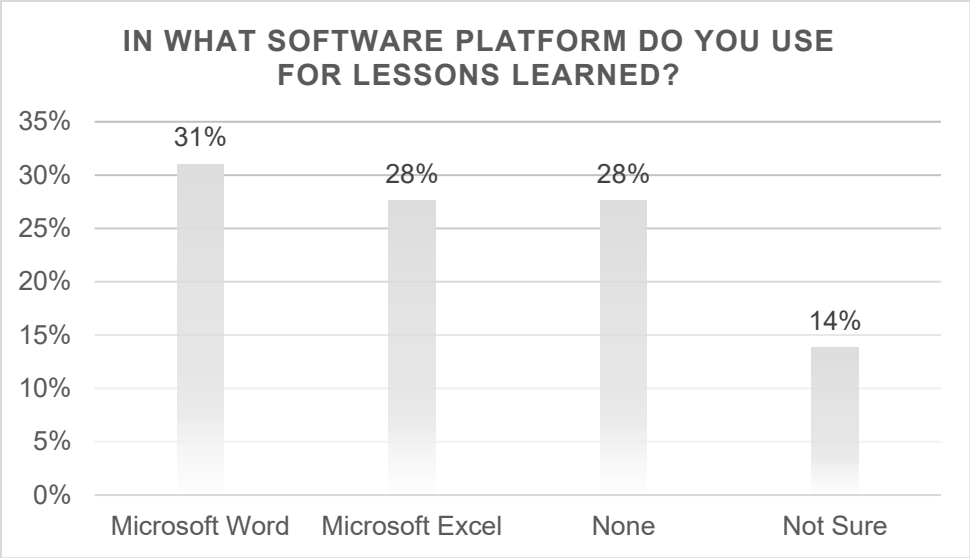

Exhibit 4: Type of software used

Based on Exhibit 4, demonstrates how the respondent interacts with these primary applications used in their projects lesson learned. There is a significantly high percentage of almost 60% combined that use either Microsoft Word or Microsoft Excel to capture all feedback and inputs. From this 60%, 12 out of 17 works for an organization that indeed use and implement lesson learned into their projects (refer to exhibit 1). As the application evolves, exposes a simplicity or user-friendly for these two applications that Microsoft offers. Looking at the correlation and relationship between the other 40% approximately half (7 of 12) of the respondent that answered “None” or “Not Sure” they are not familiarized nor knowledgeable on the concept on how or when to use the lesson learned or even applying lesson learned into a whole project (refer to exhibit 7).

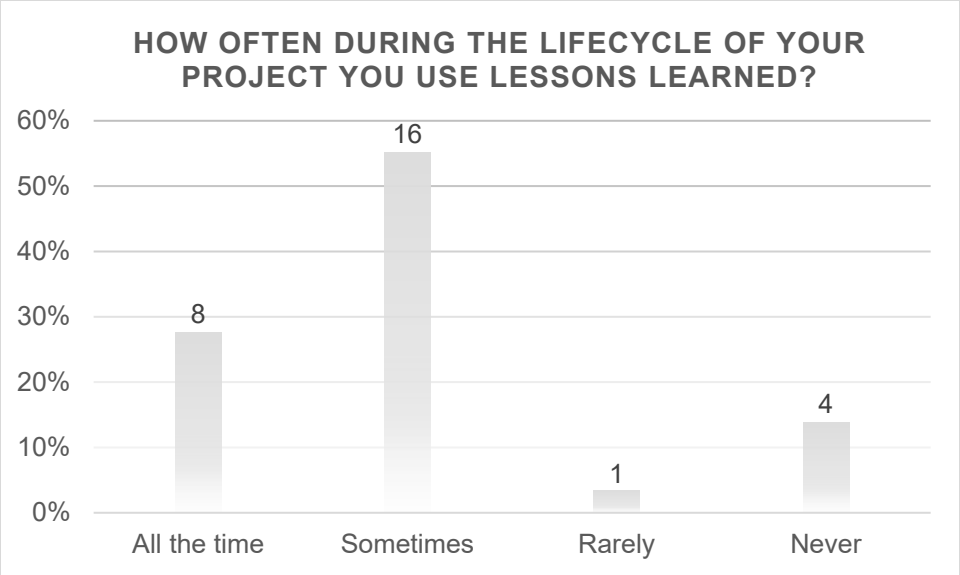

Exhibit 5: A constant use of lessons learned on the lifecycle of a project

Based on Exhibit 5 show the lack of effort to apply the use of lesson learn on each project phase from start to end of a project. Having users that responded 'Sometimes' as more than 50% is not acceptable while working in this project management associated field. How project managers which were the targeted audience let slip away lessons learned that are an important area on a lifecycle in a project and then how they will apply new recommendations in the future.

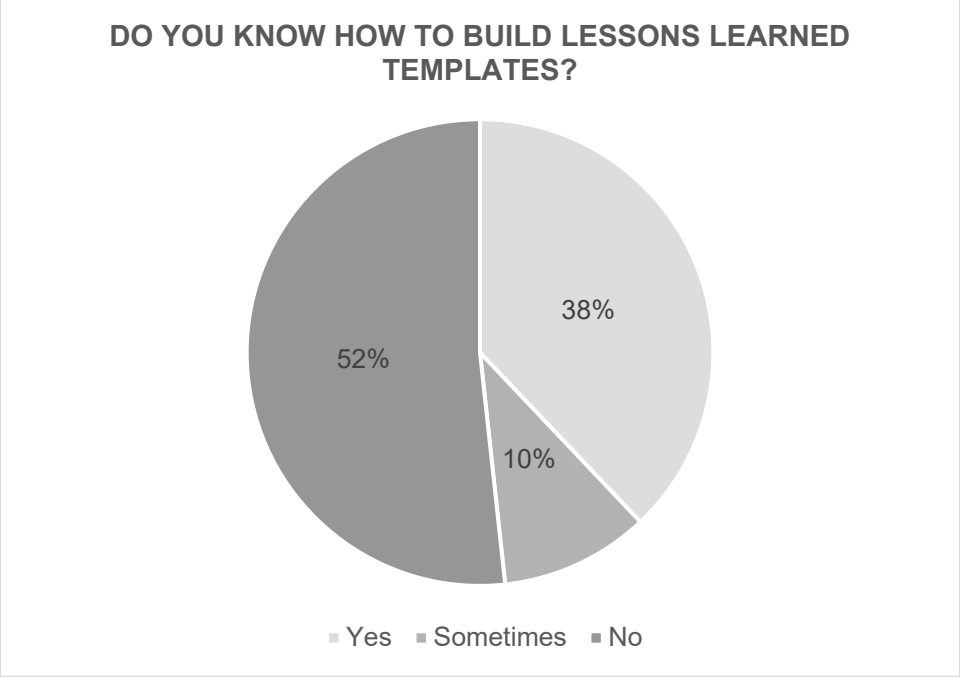

Exhibit 6: Building lessons learned templates

The details on Exhibit 6 shows that about half of the respondents do not know how to build a lesson learned template. A handful 10 out of 15 respondent that answered “No”, their organization do not implement the use of lesson learned in their projects. Meaning if they don’t know how to build a lesson learned template it is likely they don’t work for a specific organization or work for a small business that is lacking in the use and implementation of lessons learned. On the other hand, 10 out of 11 who answered “Yes” their organization do implement lesson learned. The meaning and interpretation of these results can say that working for an organization that provides a lesson learned template will have a higher rate of how to build a lesson learned template if needed. It seems these organizations provide an easy step or well-defined lesson learned template that drives through the manager to fill the necessary data to be captured per project/lesson log.

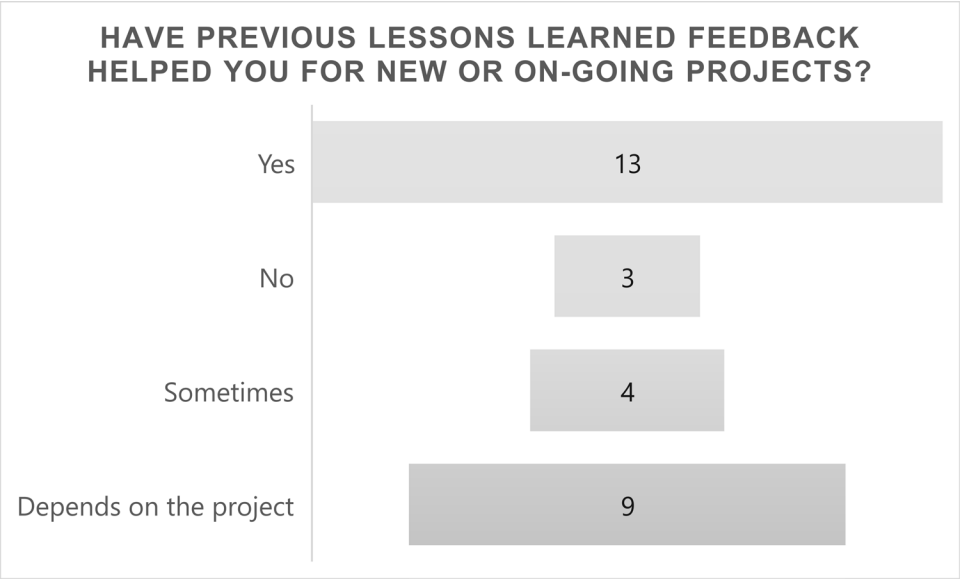

Exhibit 7: How feedback on lessons learned contribute to new projects

Exhibit 7 there is a big margin of optimistic results of how the previous lessons learned helped the respondents to improve future or ongoing projects. This means they hold a repository system locally stored in their machine where projects have been handled. About 30% answered ‘Depend on the project’ possibilities of new projects had not conducted previous research, the previous lesson learned was not captured enough data to be utilized as reference or on the other hand previous project were successfully concluded.

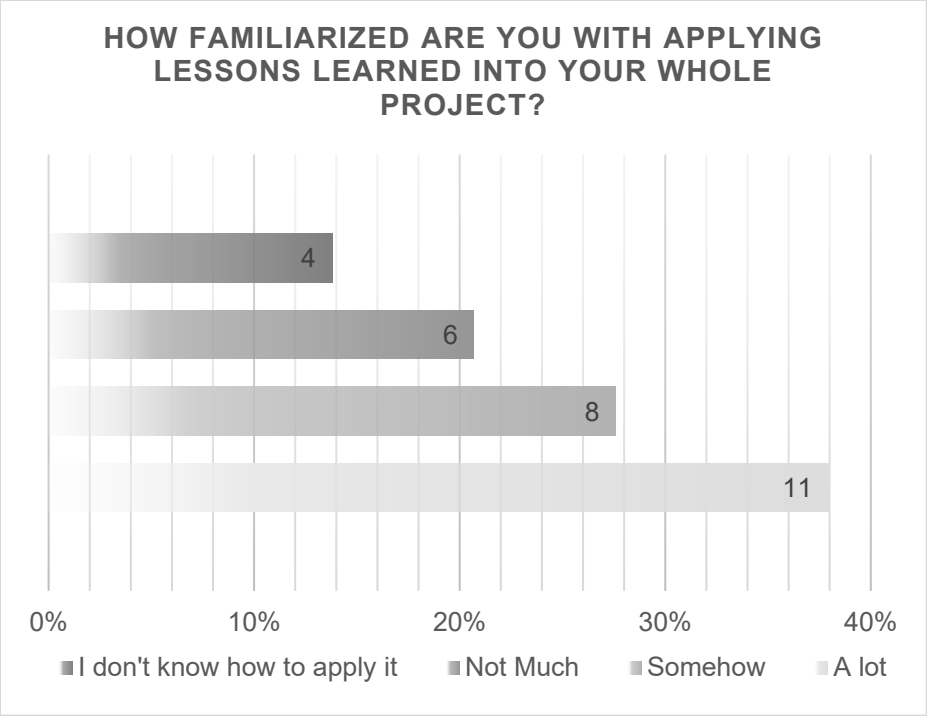

Exhibit 8: Familiarization on the use of lessons learned

Based on this Exhibit 8 comparing the respondent that answered, "A lot" (38%) vs the respondent that answered, "I don't know how to apply it" or "Not Much" (35%) has a balanced of results meaning that the audience or do possess the knowledge or not on applying lesson learn into a project. The result of these graphs has been used in the results of other questions to obtain meaningful data, since the Project Manager does not use the lesson learned or someone else captures the lesson learned.

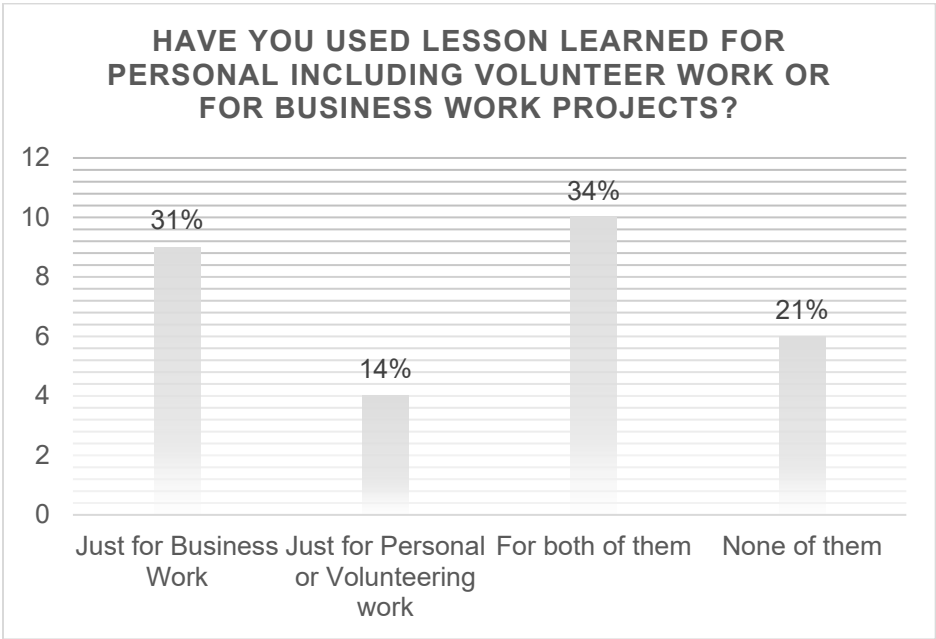

Exhibit 9: Environments where lessons learned has been used

Exhibit 9 clearly shows that the respondent working in project management follows the principles and documentation of project management when it comes to lesson learned. At the same time, the target respondent may be lacking in some contextual areas, as 21% do not use the lessons learned for the work environment or personal projects. With the exclusion of lessons learned there will not be insight information when moving on into another task or milestone before conducting a lesson learned.

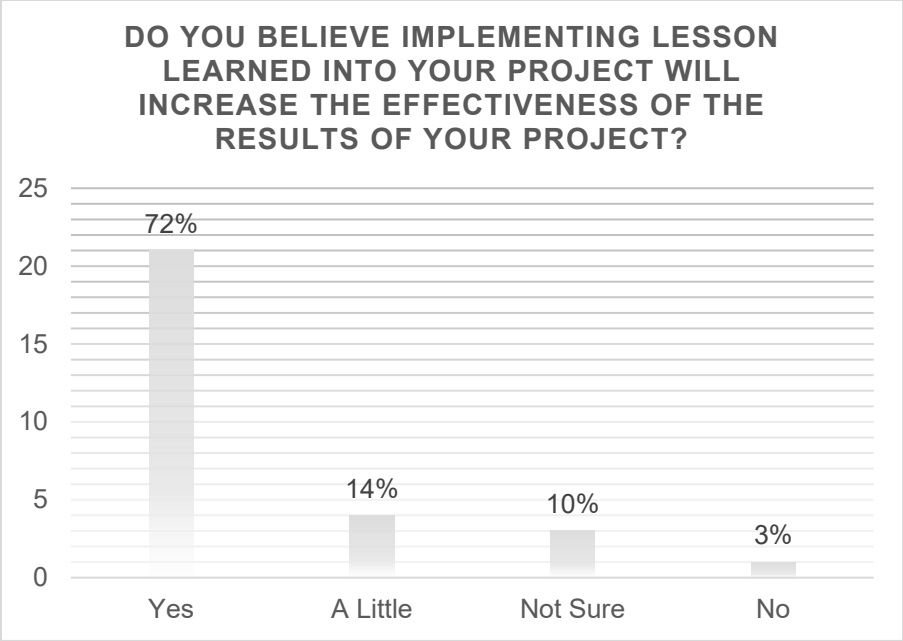

Exhibit 10: The effectiveness of implementing lessons learned in projects

Exhibit 10 the focus group is exposed since most of the objective with (72%) did agree on the lesson learned (after the review of the action), which represents a significant impact, if applied to the project life cycle. A profound thorough analysis for those that answered, “Not Sure” and “No” (13% combined) were respondents that their organization does not implement lessons learned based on their relationship against all the remaining questions. This is a small group that could be an independent contractor or has their own small business which may not include standards and policies on the department.

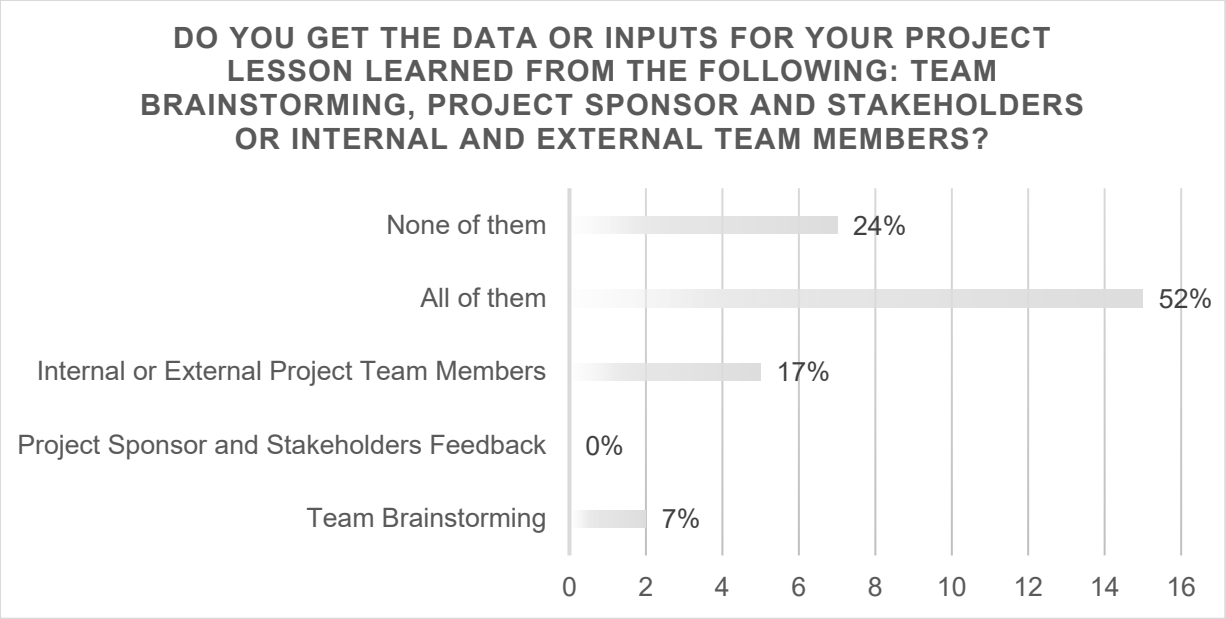

Exhibit 11: Feedback sources

Exhibit 11 Communication Plan or Matrix is a vital role when capturing lessons learned. Allow pinpoint for the stakeholders, sponsors, all team key members internal and external and rely on their feedback, helped to guide, and fill all criteria required for a satisfactory end project result. Only half of the respondents that does not use all the communication areas eventually will have a pitfall along the project lifecycle.

Almost a quarter of the respondent decided not to use any data feedback inputs from any sources. This group of selected respondents that answered "None of them" also answered as "No" or "Not Sure" that their organization implement lesson learned on projects as well for no knowledge on building or using lesson learned templates.

Confirmation of Research Methods Appropriateness

These research methods are suitable for this project for two reasons. The first is that a thorough literature review would make it possible for the Project Manager to take into consideration how project management practices could most efficiently apply lessons learned into projects. The second is that the data collection actions described above would improve the development of the web application to manage and track lessons learned.

Conclusions

This project developed a robust tool to facilitate the standardization of the use of lessons learned into projects that help to capture all inputs and feedback from team members, stakeholders, project sponsors, and other external manning by allowing them to help on the improvements of having better

projects results. There is a positive correlation between respondent that work for an organization which provides tools and guideline on implementing lesson learned into projects and their capabilities on utilizing forms or developing lesson learn forms on their own. Although respondents do have a negative correlation towards the use of lessons learned. There is a big lack of understanding and using resources and tools that are useful to run a project smoothly and with minimal deficiencies.

Based on the data analysis, project lesson learned templates might be traditional and offline performed and not use a dedicated system to capture lessons learned. Almost 60% use Microsoft applications such Word or Excel. At the same time, about 55% of respondents do not have the capability

of developing from scratch a lesson learned package that can include a checklist, lesson learned for reporting, logs, under narrative, etc.

They work as project managers, but they do not present or expose their skills in the area. Gives way to interrogate if they are following the principles of project management and the use of the appropriate knowledge areas, including the phases? Based on the question and the retrieval of the results, it allows to conclude that a large population that is familiar with and works within the project management may lack the knowledge, functionality or use in the application of the lessons learned. Simple areas that allow ease in the execution of any project to work. Filling it the project with a bumpy road lengthening its life cycle. It seems templates are already provided to them or reusing templates that get published online from any location of this topic. This is useful when sharing the document but at the same time files can get corrupted or conflict of use when managed by multiple sources.

This newly developed system brings a full spectrum of managing lessons learned across all platforms to prevent damaging files, altering templates layout, or required fillable fields. Based on the data analysis, the 29-audience selected were from different cultural backgrounds and different demographic locations which shows a significant difference in responses. This could be based on documentation standardization and big corporates who implement the norms on how projects should be managed and followed by steps. This new PMLLWA application facilitate the most of tools and forms to project managers, associates, and assistants to not miss any data needed per project during their phases of progress. Having an enormous number of files and end project reviews of summary of lesson learned can be centralized in one location without file corruption or duplication without the need of searching all their separate files previously created. The PMLLWA new implemented tools (see Appendices A, B, and C) would be the best for the customer that could improve their performance on executing new or existing projects and will provide clear and precise guidelines on how to fill everything required to have a completed and robust detailed lesson log. Files can be attached per project on the event lesson log template already provided by the organization.

Results Analysis into Project Deliverables

Once research analysis has been closely evaluated and organized, we can tell there is a lack of discipline in the project management principles and how to appropriately follow and apply lessons learn into each project phase and each project knowledge area along the project lifecycle. A clearly defined and detailed lessons learned process that included all five parts on how a lesson learned should be identified until it gets retrieved steps tailored to this project was provided as an image to the SME's. There were 2 out of 5 SME's that had seen that process flow from resources, books, or online. This process was also provided to the respondent as part of the body of the surveys to use it as a guideline, about half of the respondents returned a message if they need to interact with that image. Based on those responses we can tell there is a big deficiency on how to develop lesson learned templates and which templates to utilize with associated checklist documentation if an organization or a third-party group does not provide an already made template to be tailored to your project process.

The results of this analysis are an important guide on how to create these lessons learned web application based on each respondent, the knowledge background from the SME interviews, and the literature / tool analysis.

Once exported those notes we proceed to follow a list of deliverables based on the scope of work that is going to be the sole focus to make sure skills and technical expertise can be applied appropriately into lessons learned every time a project team interacts with a compilation of previous and current lesson learned of the lifecycle of a project. Focusing on big data lifecycle context is much more sophisticated to produce a satisfactory result which highlight all 8 stages of its lifecycle (Pacelli, V. 2021).

The following deliverable ensures complete coverage of the areas of a lesson learned, avoiding time consumption research on elements of the project scope. This based on a specific domain of the project and to minimize the identification and analysis of risks before the start of the project phase.

Deliverables: Each deliverable was precise, and it is coming from the project scope defined. The project was executed with a specific coding language selected (Visual Studio, 2021) from the project plan, and because it is an application to develop lessons learned, all feedback and research needed came from a support coding site. (Stack Overflow, 2021; SOA 2020).

1. Database: Schema which stores all data received by the users.
    i. Define the structure and tables of the database.
    ii. Design Relationship of tables in the database.

The database is the main skeleton of this project. It keeps all components together and validates that no data and files get corrupted by the users. This facilitates integrity between metadata inserted.

2. Look and Feel: Design a professional layout for the web application for the users to navigate.
    i. The layout design includes a small logo professional with dark or grey colors.

The layout serves as a friendly user interface that accesses sections and areas without confusion. It adjusts to the needs of the user on a static or moving computer (mobile version).

3. Hosting/Domain: Location where all files and web applications are located.
    i. Define the space and naming convention needed for the PMLLWA.

Hosting and Domain helps the user to access a public address on the internet from anywhere on the world, any system can be used to access. The web application name is set to www.pmlessonlearned.com.

4. Lesson Learned Templates: Useful templates related to all lessons learned.
    i. Design all template that majority of projects uses.
    ii. Templates for MS Word and Excel.

The default templates are provided on the portal for easy download. Once the template is completed manually, it is reloaded to be inserted into the web application. This through assigned project team members or data entry staff.

5. Manual for User: Provide and guide users on how to use the PMLLWA.
    i. PDF formats write out with visual images of all areas used in this project.

A step-by-step PDF manual is provided for new users of the site. This is a detailed knowledge and how-to guide on the functionality, access and use of the application.

6. Security: the site and web content are protected by authentication.
    i. Login/Register system.
    ii. User roles.
    iii. Personal details, job title, biography and contact information

Being a public web application, it has a robust security system such as: reCAPTCHA, email authentication to avoid duplication, the requirement of specific characters in password generation, among others to access and log in.

Recommendations for Further Research

Further research needs to be done on a section that involves a whole package of the components from a lesson learned templates. This includes a Lesson logs checklist, log tracker, brainstorm review by the team, reviews by the stakeholders, final project results, and what could be improved. Alongside this question a basic image of the templates mentioned above should be included as reference. Another set of questionnaires should be created for this internal component where the users will have hands-on in those tools' sets. Because of how dynamically thinking each respondent were even though they are related to project management career field there were some uncertainties when analyzing and doing data validation to get as much possible clean data that were most authentic as possible. When projecting each survey question results of the 29 respondents into their own graphics charts, the team went back and forth for

each grouping respondent's data to compare similarity on their responses towards other questions to make sure integrity is been evaluated.

There were only ten questions provided from 3-5 one option to select. And all questions their sole focus was on regard to the lesson learned implementation, knowledge on building lesson learns and their outcomes for the usage of a lesson learned. Next time Survey should be more detailed and open answers as Other to include a field to capture more insight information from the respondent. At the same time, because this research is based on a development of a robust and strong easy to follow lesson learn templates, there should be a set of questionnaires of examples that I could build up front to show it in one of the questions to have an open answer so the respondent can provide critics on what can be done better or if this template fulfills their needs on capturing lesson learned.

Lesson Learned

One of the main lessons learned from this project and research is the need to categorize what area needs to be the focus for this research. This area needs to be explicit to the content to be published or projected. Research and analysis regard to a project web application to implement a robust lesson learned system need the be as detailed as possible by breaking down the pieces to the smallest layer to provide to the targeted audience. One of the feedbacks received from the audience was the similarity on questions very similar but written in another way.

The end project product turns out to be successful with additional timing to the project but to archive this goal, the structure of the research needed to be more specific of what the deliverables should produce. A lot of questions were background related to the respondent and not to the area of interest for their skills to improved. This project is a small fraction of what completes a big picture for project management principles, but it got a little bit expanded to include a repository system as well. This causes side topics towards the respondents.

Acknowledgments

I would like to acknowledge the many people that provided support and guidelines throughout the time working on my master's in sciences in Project Management program. At first glance I would like to thank my advisors Roger Hull and LuAnn Piccard for their patience and support thought all the review, feedback for rewrite, draft templates and technical writing skills and other difficulties along the road of the journey. The provided flexibility time in their schedule to assist me with the project and research documentations. Also, I would like to thank to Lic. Zarah Vazquez Ortiz and Justin Holvoet for been there for me during project challenges and editor review towards the capstone project timeframe.

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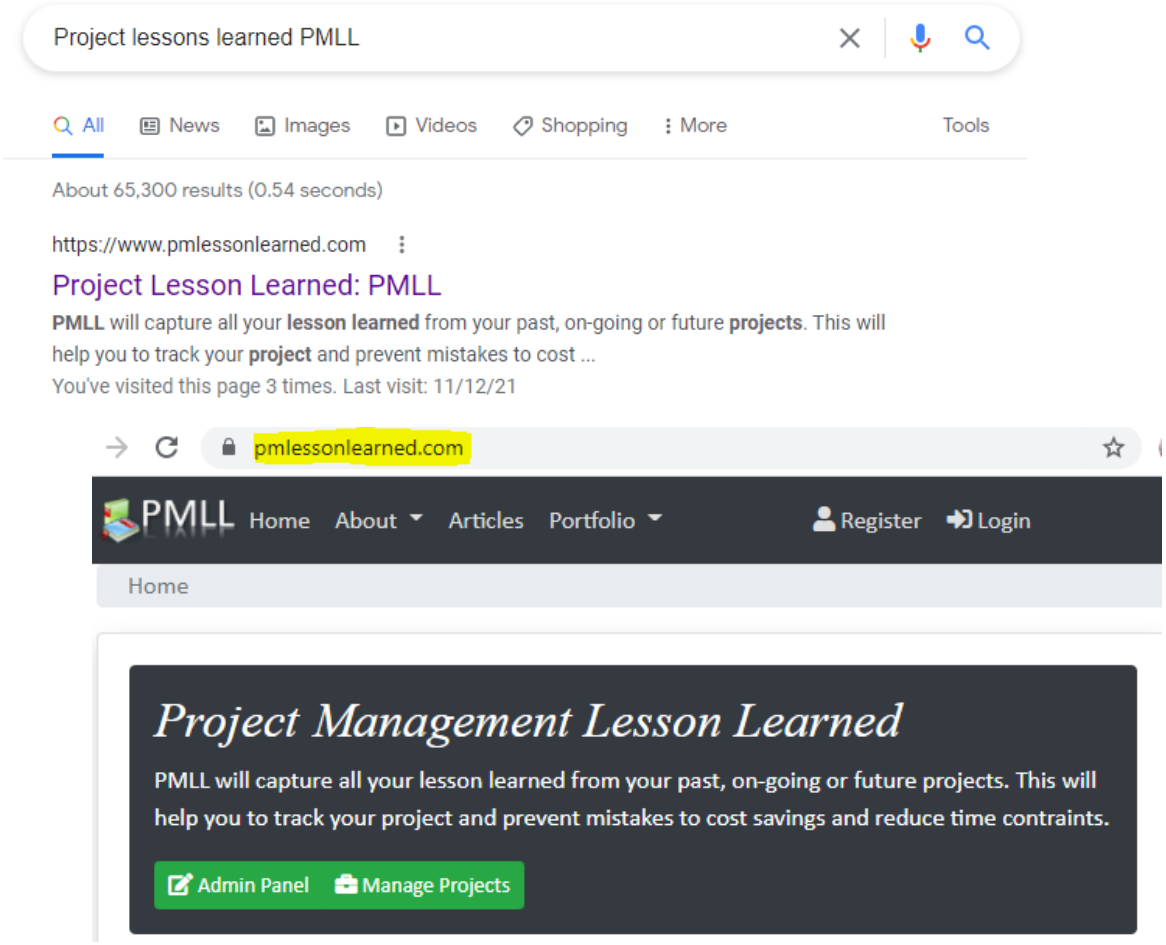
Appendices

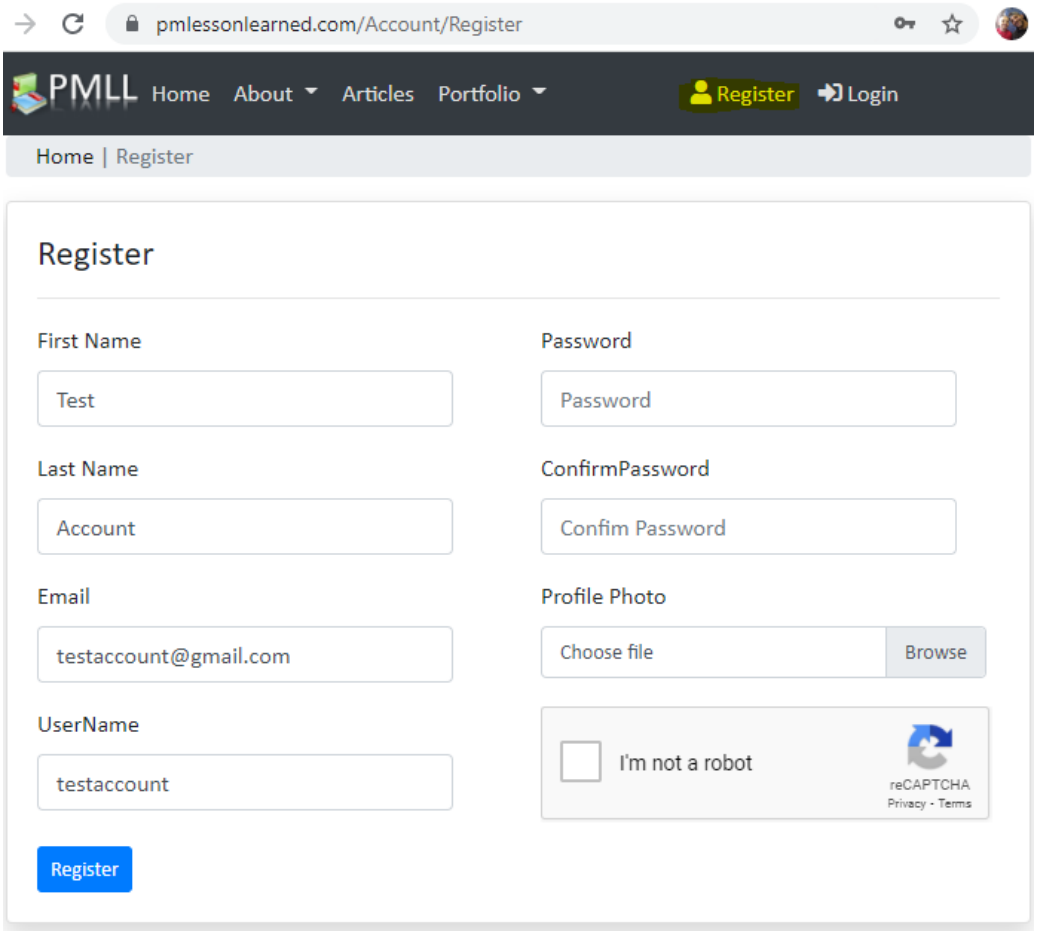
Appendix A: PMLLWA Homepage

PMLLWA can be access through any web search engine with some keywords like: Manage Project Lessons Learned or directly to the following url: http://pmlessonlearned.com



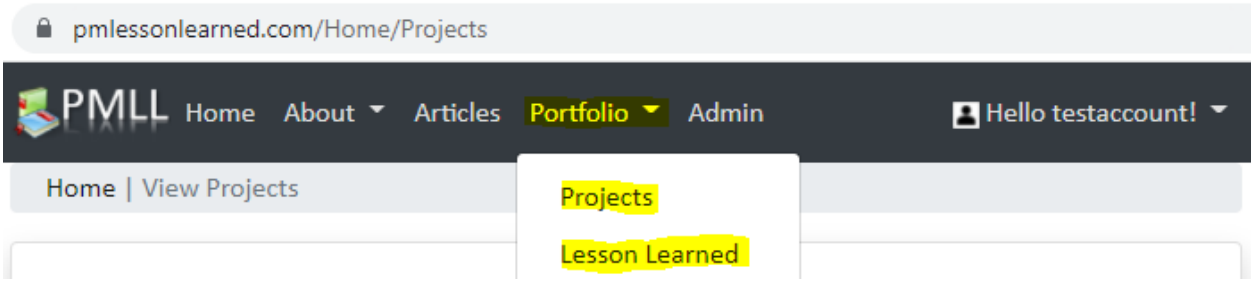
Appendix B: Create an Account

The following step guide you on how to create an account to start managing projects lesson learned.

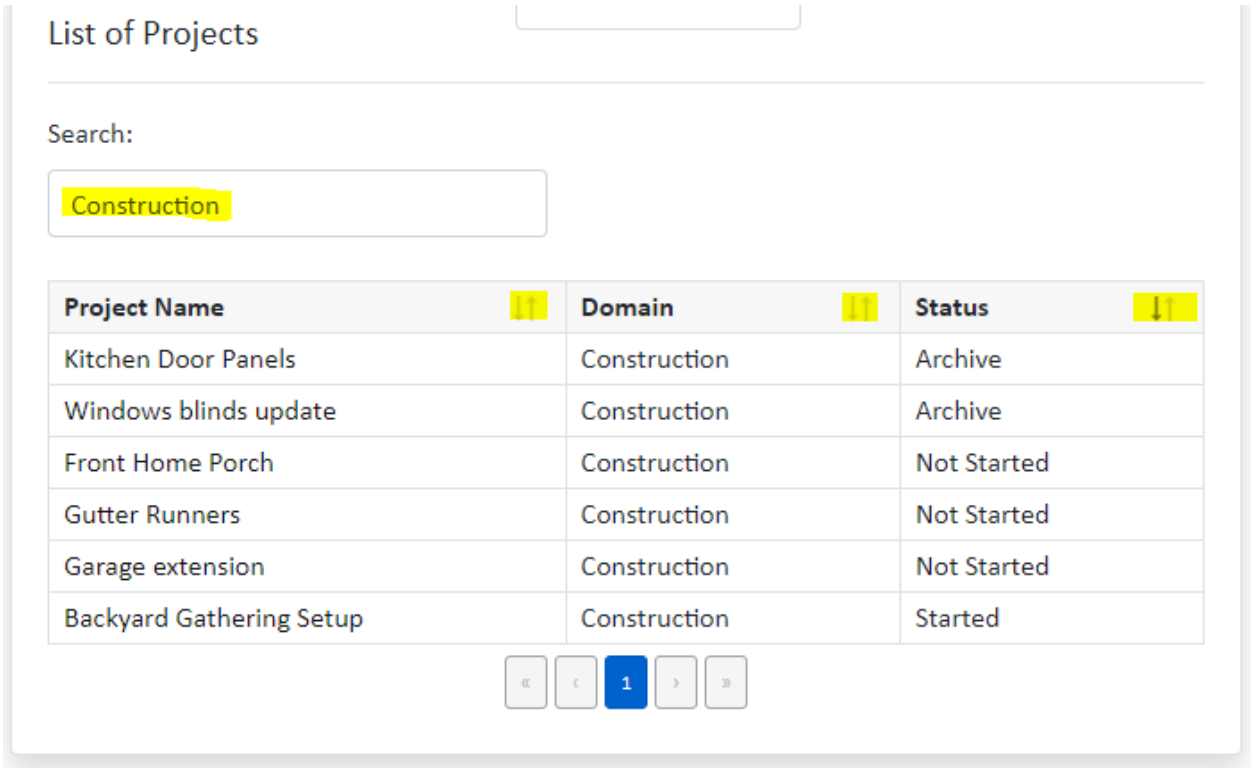


Appendix C: Search Projects and Lessons Learned

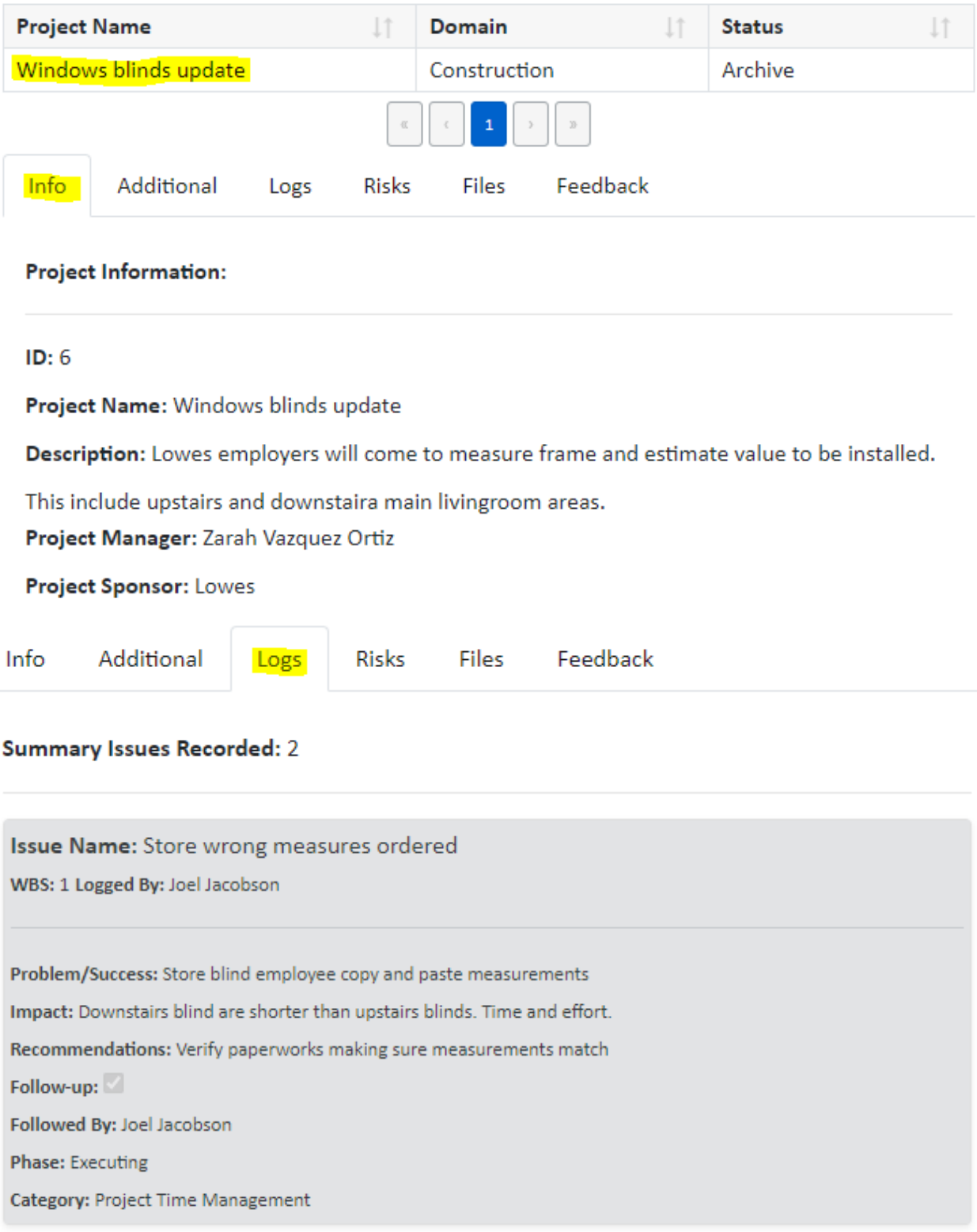
1. On menu bar click Portfolio: Select either Projects or Lesson Learned.



2. Under List of Projects, type any keywords under Search text field. Use the filter on the columns. Searching keywords will find all Project Domain, Status, Name, Phases, Knowledge Area and Project Details including all lesson learned under that project.

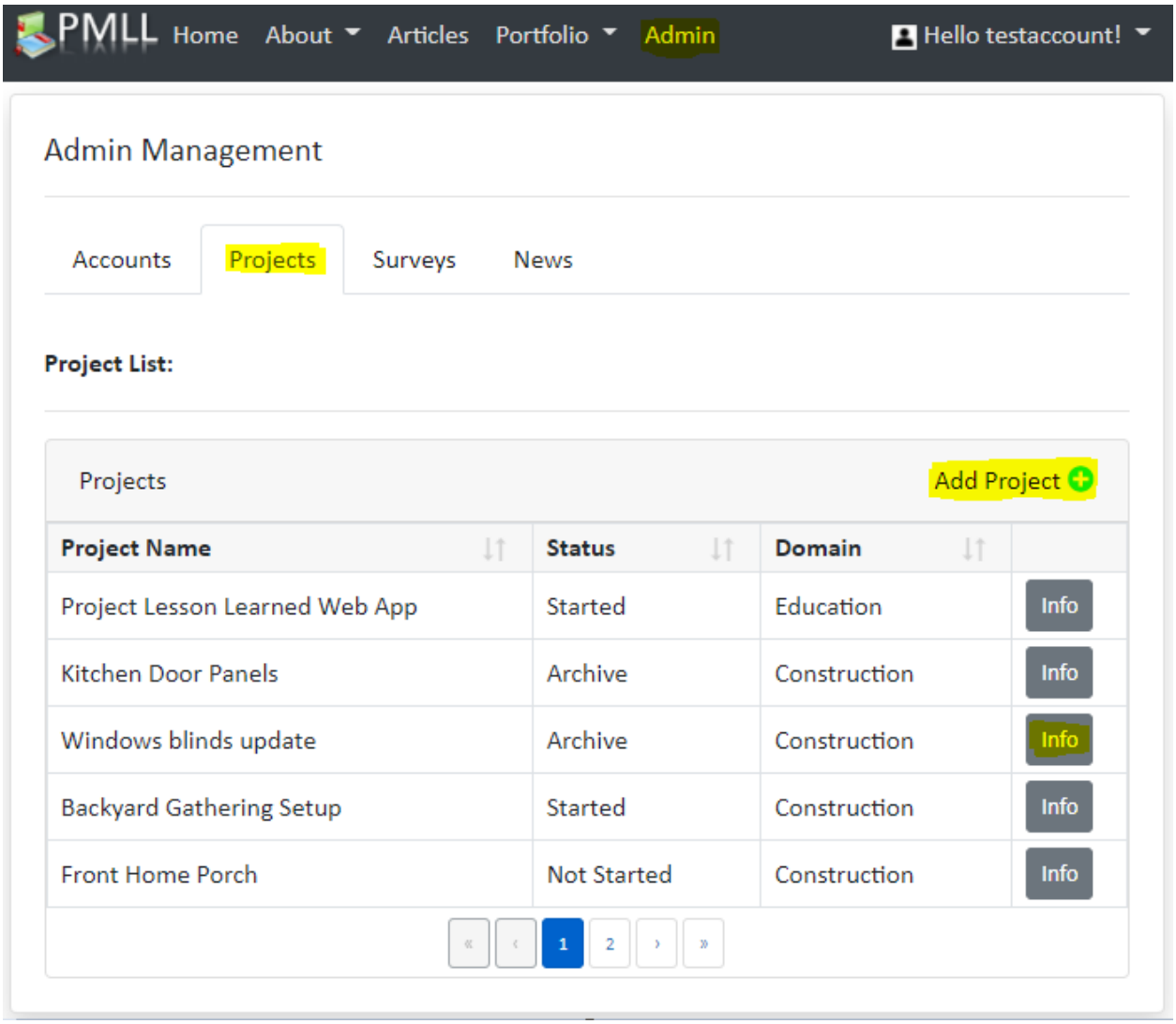


3. After searching for any keyword, select or click a row to pull up details from that project on the bottom, clicking on Logs tab will bring up details on all lesson logs registered for.

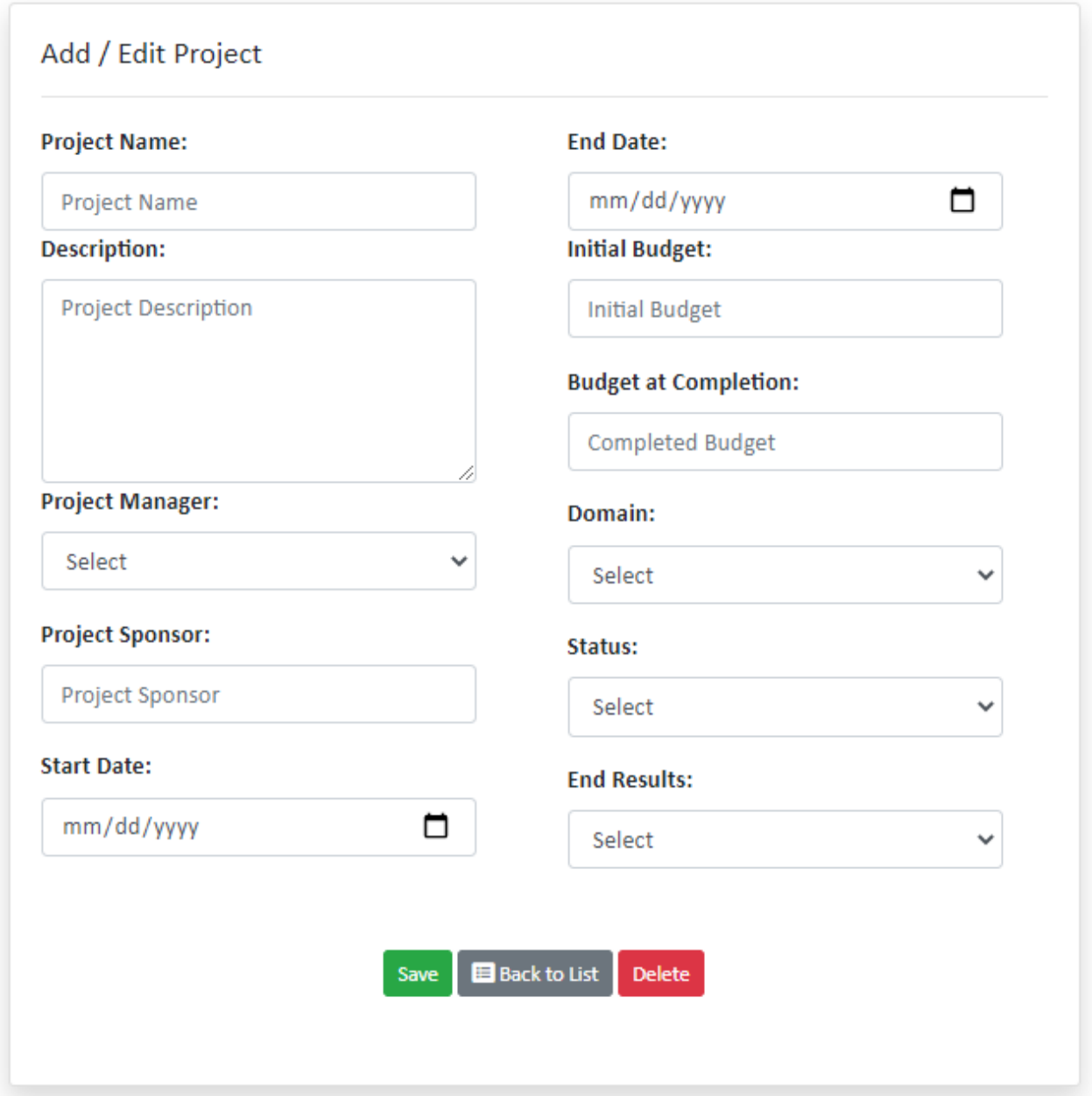


Appendix D: Admin Portal

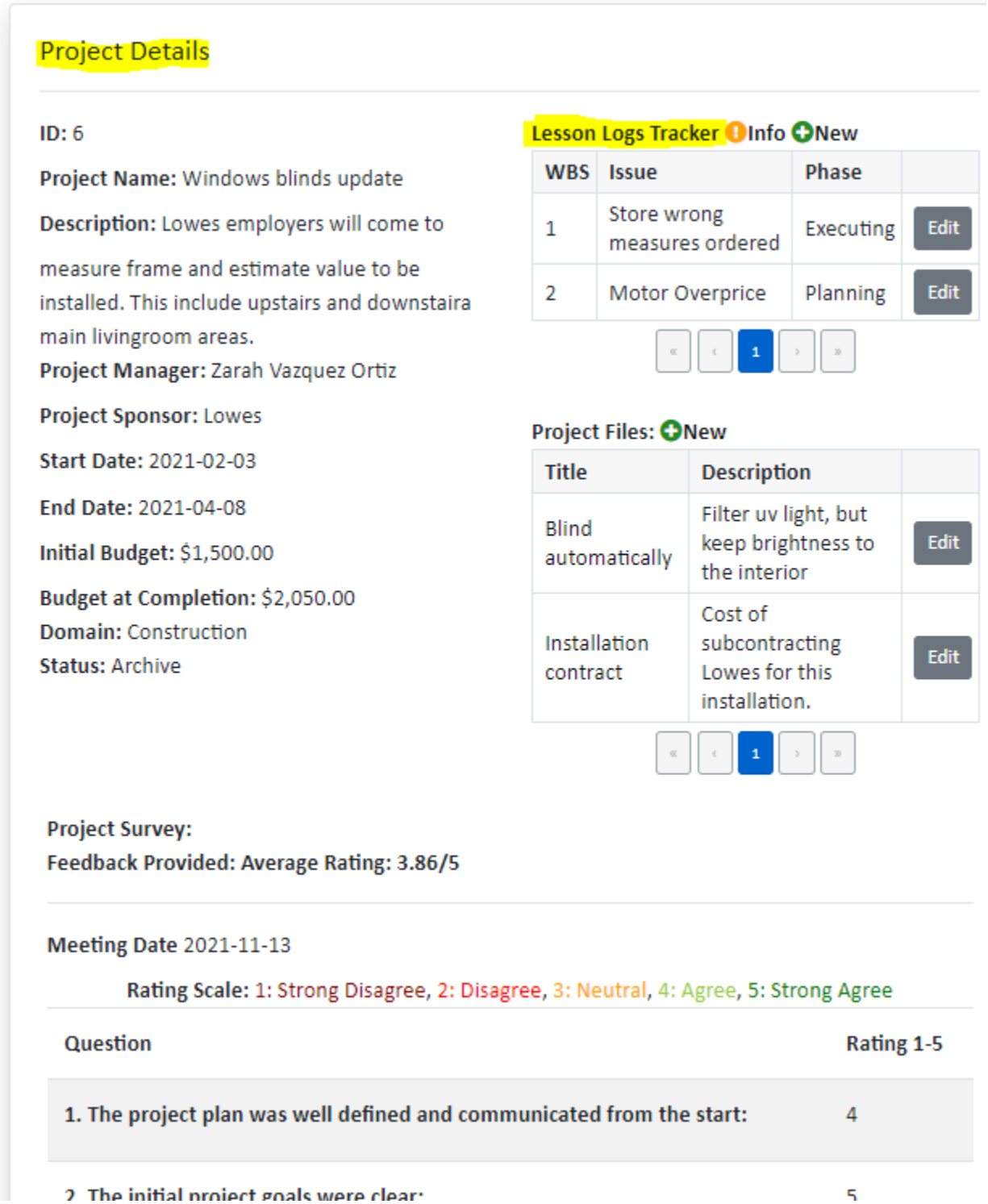
1. Once having access as Admin role, you can freely access the Administration Portal. At Appendix D you can be able to add a new project or modify existing projects (Info Button) pointing on the highlighted areas.



2. Adding or editing a project. During adding it will provide you with a brief description inside each text field.



3. View a current project or edit parts of the project such as Lesson Logs, Project Files, Project Details, and the Project Survey Feedback from meetings.



Project Details

ID: 6

Project Name: Windows blinds update

Description: Lowes employers will come to measure frame and estimate value to be installed. This include upstairs and downstaira main livingroom areas.

Project Manager: Zarah Vazquez Ortiz

Project Sponsor: Lowes

Start Date: 2021-02-03

End Date: 2021-04-08

Initial Budget: $1,500.00

Budget at Completion: $2,050.00

Domain: Construction

Status: Archive

Lesson Logs Tracker Info New

WBS	Issue	Phase	
1	Store wrong measures ordered	Executing	Edit
2	Motor Overprice	Planning	Edit

« ‹ 1 › »

Project Files: New

Title	Description	
Blind automatically	Filter uv light, but keep brightness to the interior	Edit
Installation contract	Cost of subcontracting Lowes for this installation.	Edit

« ‹ 1 › »

Project Survey:

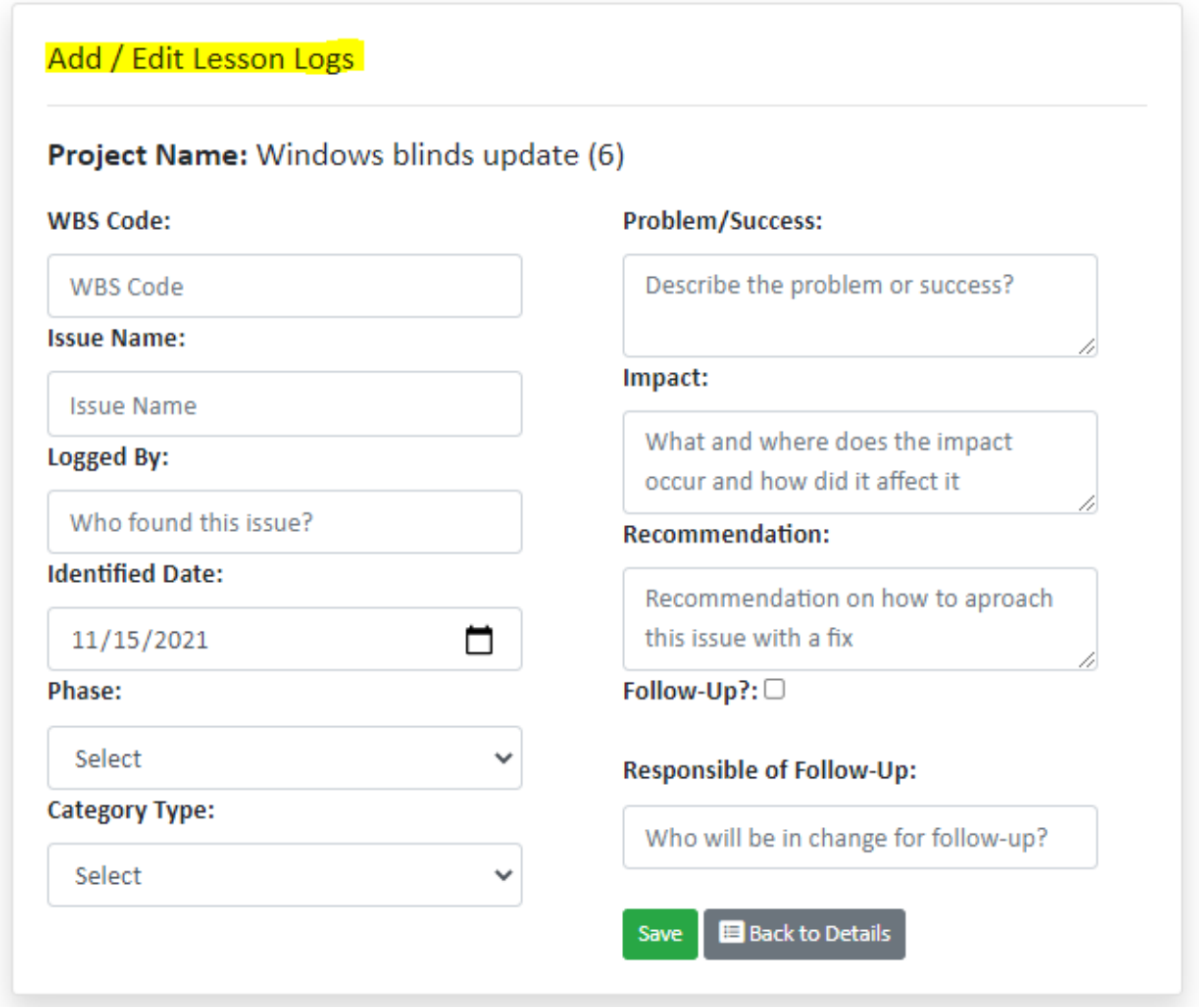
Feedback Provided: Average Rating: 3.86/5

Meeting Date 2021-11-13

Rating Scale: 1: Strong Disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strong Agree

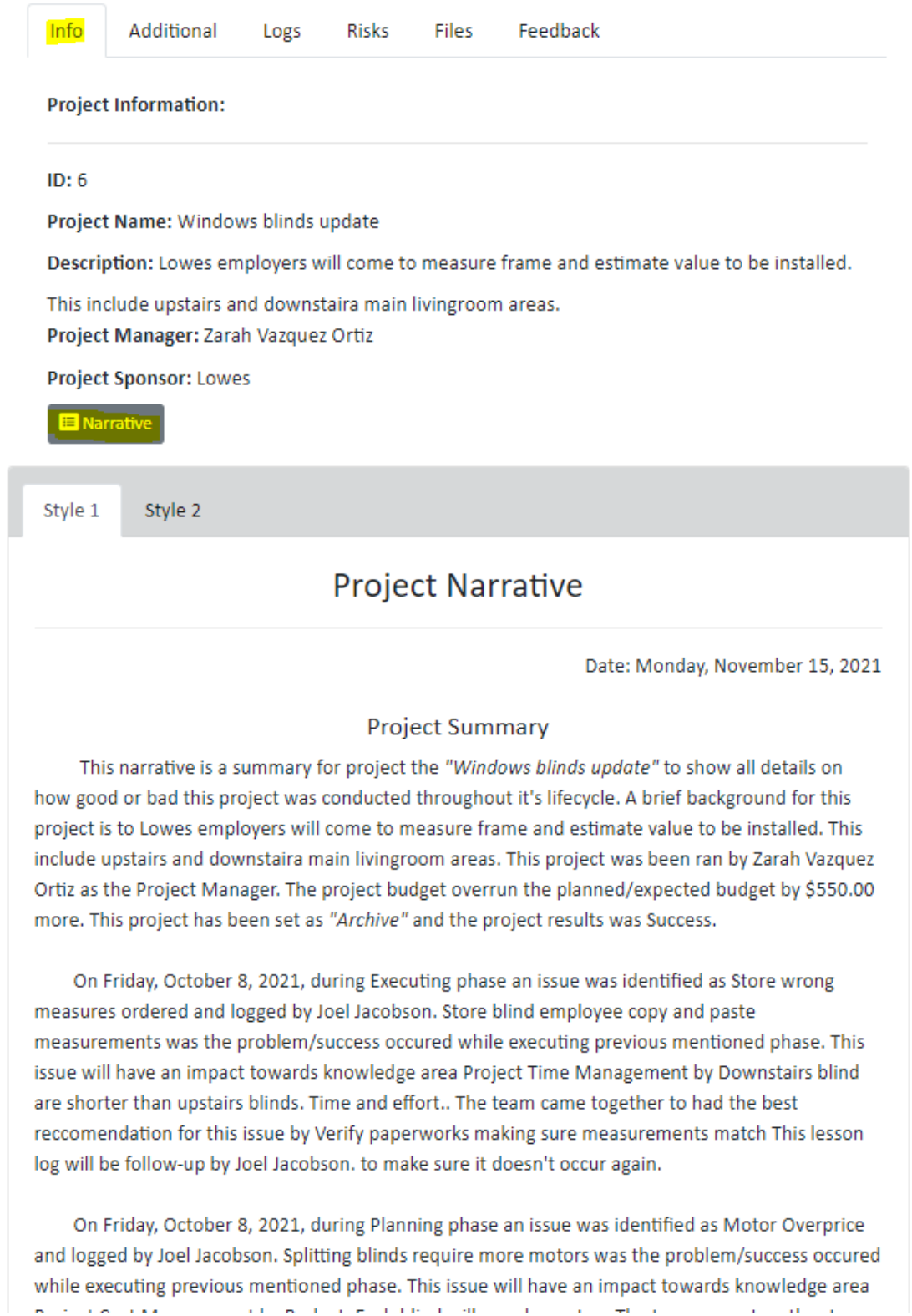
Question	Rating 1-5
1. The project plan was well defined and communicated from the start:	4
2. The initial project goals were clear:	5

4. Adding/Editing Lesson Logs. Include in-text field prefix values to help you through the filling of a lesson learned event.



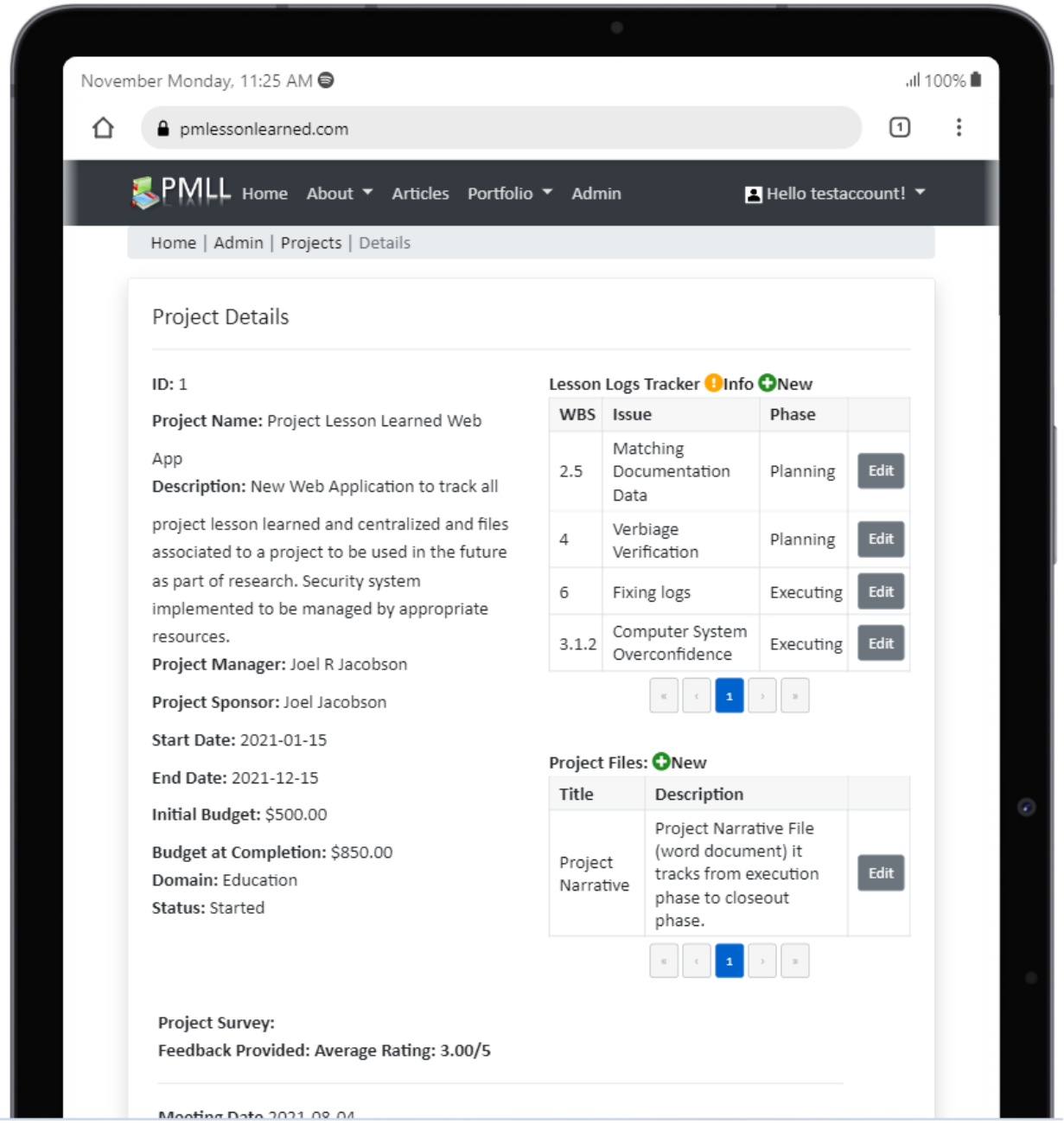
Appendix E: Project Narrative

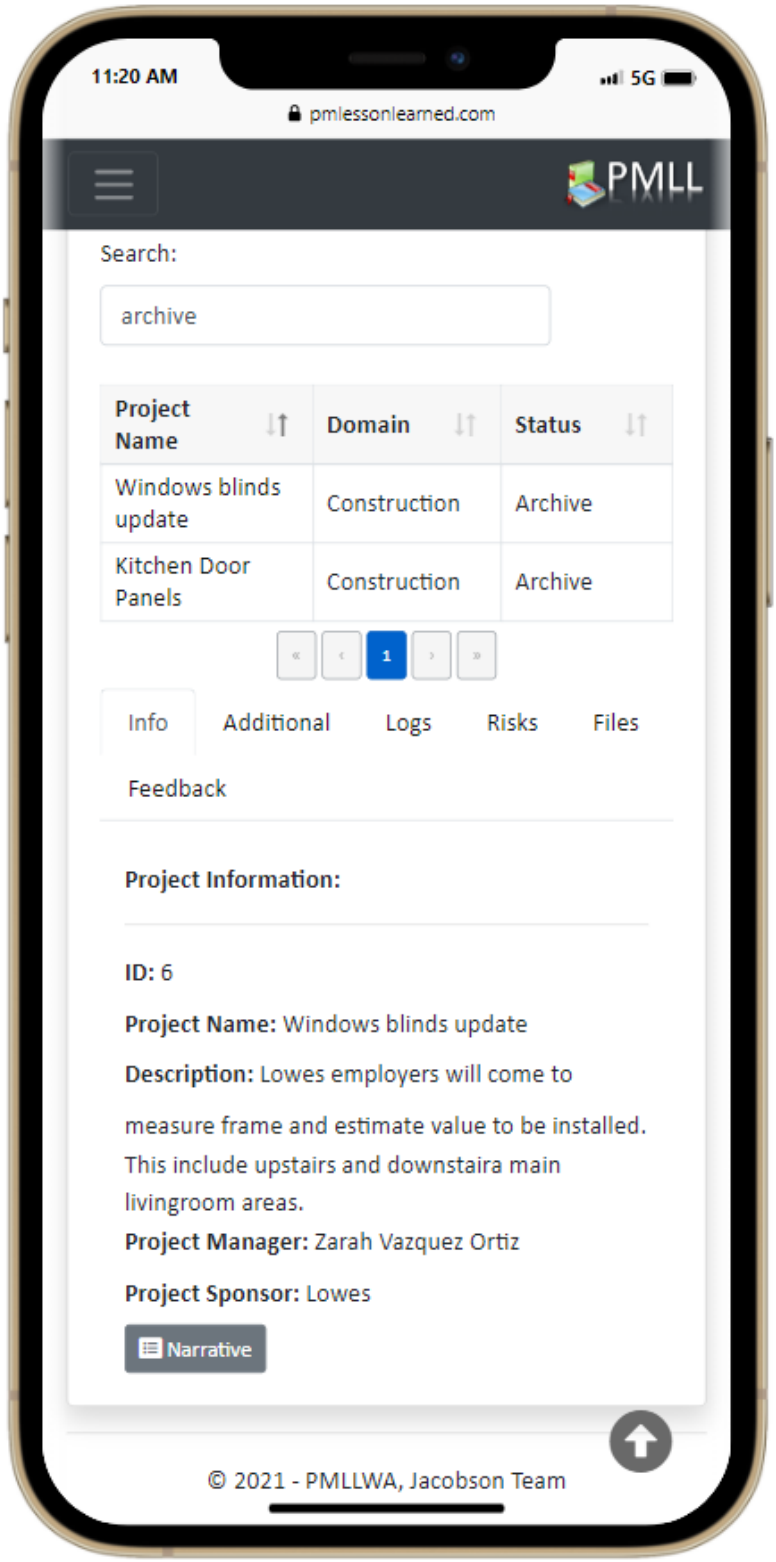
During searching for projects there is a tool functionality that will generate a project narrative for easy printout. Two type of style is provided.



Appendix F: Mobile version

Compatibility with iPhone and Android Operative system for mobile devices




11:20 AM
5G
pmlessonlearned.com
PMLL
Search:
archive
Project Name
Domain
Status
Windows blinds update
Construction
Archive
Kitchen Door Panels
Construction
Archive
1
Info
Additional
Logs
Risks
Files
Feedback
Project Information:
ID: 6
Project Name: Windows blinds update
Description: Lowes employers will come to measure frame and estimate value to be installed. This include upstairs and downstaira main livingroom areas.
Project Manager: Zarah Vazquez Ortiz
Project Sponsor: Lowes
Narrative
© 2021 - PMLLWA, Jacobson Team

Appendix G: Evaluation of Online Demo Application

Scoresheet built to score two applications used on the research

	Score sheet 1 - 5		
	Web Applications		
Categories	**Secutor Solutions**	**Lesson Flow**	**Review Notes**
Usability and Accessability	3	3	Both application needs to be request for a demo.
Security and safety	3	4	The App owner provide you with an account, no direct access to db content.
Admin Portal Management	4.5	4	Limitation to create categories, new areas, user accounts.
Lesson Logs Tracker	5	5	Well define and reusage of lesson learned log to be reused when annotation another log.
Searchable functionality	5	5	Searchability functionality both of them had them and fast with multiple filters criteria.
Repository Consolidation	2	3	Didn't saw any location where to attach or upload archived data.
Project Narrative Generated	2	1	Summary but not generate a full narrative for both application.
	3.50	3.57	= Total

Appendix H: Demographic Data

Code: _____

Sheet of Demographic Data

THIS IS AN EXAMPLE. THEY CAN ADD OR DELETE PREMISES, ACCORDING TO THEIR THEME.

1. Age: _____ (Note: you can break down ages by categories as well).

2. Gender: _____ F _____ M

3. Indicate the highest academic degree obtained:

_____ High School Diploma _____ Certificate / Associate Degree

_____ Baccalaureate Diploma _____ Master's Diploma

_____ Doctoral Diploma _____ Postdoctoral Diploma

_____ Juris Doctor _____Other: _____

4. Area of residence:

_____ Urban _____ Rural

5. Indicate if you work:

Yes: ____ No: ____ Otherwise: ____

6. If you answered "yes", please indicate the position you occupy:

_____.

7. If you work, indicate if you are:

_____ Part time _____ Full time _____ N / A

8. Years of experiences: _____.