

APPLICATION OF PROJECT MANAGEMENT TO DEVELOP A MULTIFUNCTIONAL
WHEELCHAIR MOUNT IN THE NON-PROFIT SECTOR

By

Ruger Johnsen, B. Eng

A Project Submitted in Partial Fulfillment of the Requirements

for the Degree of

MASTER OF SCIENCE

in

Project Management

University of Alaska Anchorage

May 2025

APPROVED:

LuAnn Piccard, M.S., PMP, Committee Chair
Nasim Bahari, PhD., PMP, CSM, Committee Member
Valerie Pettit, M.E.M, PMP, Committee Member
LuAnn Piccard, M.S., PMP, Chair
Department of Project Management
Kenrick Mock, Ph.D., Dean
College of Engineering
Mary Jo Finney, Ph.D., Dean
Graduate School

TABLE OF CONTENTS

Table of Contents 1

List of Exhibits..... 3

1. Acknowledgements..... 4

2. Abstract..... 1

3. List of Definitions 2

4. Project Summary 3

 4.1 Project Background..... 3

 4.2 Project Overview 4

 4.3 Project Objectives 7

5. Literature Review 9

 5.1 Project Management in a Volunteer Environment..... 10

 5.2 Leadership in a Volunteer Environment 10

6. Research..... 12

 6.1 Interviews..... 12

 6.1.1 Motivation..... 12

 6.1.2 Conflicting Priorities..... 12

 6.1.3 Accountability & Feedback..... 13

 6.1.4 Use of Authority..... 13

 6.1.5 Value of Time and Resources..... 13

 6.1.6 Other Points of Interest: 13

 6.2 Action Research 14

 6.2.1 Project Management Lessons Learned..... 14

7. Results of the Multifunctional Wheelchair Mount Project 15

 7.1 Generation ‘A’ Prototype 15

 7.2 Guideline for Future Projects..... 19

8. Analysis 22

8.1 Trial Testing Results.....	22
8.2 Discussion of the Research & Development Process	22
9. Discussion of Project Management Elements.....	25
9.1 Stakeholder Management.....	25
9.2 Schedule Management	27
9.3 Communications Management	28
9.4 Risk Management	29
9.5 Change Management	30
9.6 Leading Volunteer Projects	31
9.6.1 Leading from the Center	31
9.6.2 Situational Leadership.....	31
9.6.3 Authority	33
10. Conclusions.....	38
11. Recommendations.....	39
12. References.....	41
13. Appendices	42
Appendix A: The Bonus Years Project Management Guide	43
Appendix B: Trial Testing Results & Analysis	3
Appendix C: Risk Matrix	4
Appendix D: Requirements Traceability Matrix.....	5
Appendix E: Stakeholder Register.....	6
Appendix G: Change Management Log	7
Appendix H: Action Item List.....	8
Appendix I: Decision Log.....	9

LIST OF EXHIBITS

	page
Exhibit 1: Wes & the Proof-of-Concept.....	4
Exhibit 2: Constraint Priority Matrix.....	5
Exhibit 3: Develop Project Management Plan Data Flow Diagram	6
Exhibit 4: Project Organization Chart.....	7
Exhibit 5: Example of 80/20 Application	15
Exhibit 6: Initial Testing Configuration	16
Exhibit 7: Generation 'A' Mount Assembly	17
Exhibit 8: Noted Project Requirements	18
Exhibit 9: Phases of Team Development	20
Exhibit 10: Steps in Managing a Project.....	21
Exhibit 11: R&D Execution Process – baseline.....	23
Exhibit 12: R&D Execution Process - as executed.....	24
Exhibit 13: Skills Matrix.....	26
Exhibit 14: RACI Chart	26
Exhibit 15: Risk Management Cycle	29
Exhibit 16: Change Management Criteria	30
Exhibit 17: Situational Leadership Model	33

1. ACKNOWLEDGEMENTS

Thank you to Wes Price and his volunteers at Bonus Years for inviting me to join the team. I am glad we found many ways to learn from each other.

Corbin Rowe and the University of Alaska Anchorage machine shop helped with problem-solving and machining. Corbin's passion and calm demeanor were only matched by his technical abilities.

My wife, Liane, provided the necessary guidance to help me complete this work when I struggled with my seemingly unlimited conflicting priorities.

Appendix A: The Bonus Years Project Management Guide

2. ABSTRACT

There are currently few commercially available multi-function accessory mounts for electric wheelchairs that are practical for high-level quadriplegics. Consequently, an individual user must design and create one for themselves, an undertaking that requires significant resources in the form of expertise, time, and money.

Wes Price, a quadriplegic, has developed a concept mount for operating a hunting rifle. This project optimized the proof-of-concept by building a prototype and completing a design that can be offered to the public.

The primary tasks and deliverables of this project include:

- 1) Research and develop improvements to the proof-of-concept and prototype
- 2) Fabricate prototypes
- 3) Field test and analyze results

This project used Project Management methodology to effectively plan, organize, and execute. It was completed with volunteers, thus introducing novel project management issues and concepts. A project management guide was produced to be used on similar future projects executed in a volunteer framework.

Keywords: wheelchair mount, gun mount, paraplegic accessibility equipment, project management, volunteer, nonprofit, volunteer leadership

3. LIST OF DEFINITIONS

CPM – Critical Path Methodology. A type of schedule management technique that optimizes the critical path of a project.

CSF – critical success factor

EAC – estimate at completion

EVM – earned value metrics

RAM- Responsibility Assignment Matrix. Used to communicate assigned project task responsibilities and roles.

R&D – Research and Development

PM – Project Manager

PMP – Project Management Plan

Project – a temporary endeavor to create a unique product, service, or result.

Stakeholder – an individual, group, or organization who may be affected or be affected by a decision, activity, or outcome of the project.

WBS – Work Breakdown Structure. A method to decompose all and only the work required to complete the project.

Quadriplegic - one affected with partial or complete paralysis of both the arms and legs, especially as a result of spinal cord injury or disease in the region of the neck. A ‘high-level’ quadriplegic is considered an individual who has damaged vertebrae between C1 and C8.

4. PROJECT SUMMARY

4.1 PROJECT BACKGROUND

It is estimated that between 250,000 and 350,000 people in the USA are quadriplegics (www.sci-info-pages.com). Many of these individuals became quadriplegics later in life. Consequently, many experience a struggle to regain elements of independence and the quality of life they previously had.

Such is the case with Wes Price. He was injured during a 2010 plane crash in Alaska. Over the subsequent years, he realized that there were significant barriers to people with quadriplegia regaining elements of independence and increasing quality of life. There were few commercially available products, and those that existed left much to be desired. This creates a situation where a team of engineers and fabricators is required to produce a product for the individual. Generally speaking, building a custom mount is an insurmountable barrier to most and provides little benefit to society. An accountant by profession, Wes created a 501c(3) nonprofit, *Bonus Years*, to improve the quality of life for people with quadriplegia. The name *Bonus Years* is a tribute to the fact that Wes believes he could have died in the crash, and every year since has been a bonus.

Wes envisions a vast group of products that can benefit people with quadriplegia. With new technologies and the cost reduction of existing technology, new opportunities exist to modify products or develop new ones. Wes' vision is for *Bonus Years* to create a program to develop a portfolio of products and devices utilizing a team of individuals that bring together the necessary skills in a volunteer framework to design and develop products for the general public. This program is a multi-year, sustainable approach utilizing external funding. A significant cost element to this work is labor, and utilizing volunteers allows a more significant percentage of the funds to be allocated toward material or other cost centers.

A key strategy identified that was considered vital to the program's success was the development and implementation of a repeatable method for taking a concept, designing a solution, testing the invention, and making a product that could be used by the public. Enter the Multifunctional Wheelchair Mount.

Wes had in his possession a wheelchair mount designed and built by a collection of friends. This was done in the traditional fashion of many paraplegic devices that were resource-intensive for a one-off application. The proof-of-concept in *Exhibit 1* was rudimentary but provided a starting point to refine a design that could be shared with the paraplegic public. This process was clearly a project and thus was suitable for applying project management tools and techniques. In addition to providing a new design mount, the project would create a process, including templates and go-byes, that would be used for future product developments with the *Bonus Years* program.



Exhibit 1: Wes & the Proof-of-Concept

4.2 PROJECT OVERVIEW

The Multifunctional Wheelchair Mount Project is delivering a working mount design ready for public use. The mount is compatible with select types of electric wheelchairs and allows different types of accessories to be attached to it. The target market is high-level quadriplegics. The project utilized a collection of designers, engineers, fabricators, and field testers to progress the design from the existing proof-of-concept to a version that is fit for general use as defined by the project's quality and performance criteria.

This project was initiated in August 2023 and is forecasted to complete all scope and deliverables by Q4 2025.

The primary tasks and deliverables of this project include:

- 1) Secure project funding
- 2) Research and develop improvements to the existing prototype
- 3) Fabricate five prototypes for testing
- 4) Complete testing, analyze results, refine design
- 5) Complete a Version 0 design suitable for use
- 6) Prepare marketing, instructions, and outreach program

The project EAC is \$43,000.

The residual value this project generates is in the guidelines, processes, and templates that will be used for future wheelchair accessory design and development.

The scope of work includes securing funding sources, regulatory review, market analysis, research and development, and trial testing to refine and prove the design.

The acceptance criteria are: 1) the final design accepts a predetermined number of accessories; 2) the final design is compatible with a predetermined number of electric wheelchairs; and 3) the released design can be produced for less than \$3000 per unit.

The project scope does not include 1) mass production, 2) distribution, and 3) regulatory approval.

This project is the first of a more extensive program in the *Bonus Years* organization to develop other wheelchair accessories and produce them on a commercial scale.

During the initiation phase and the development of the Charter, it was determined that a *Constraint Priority Matrix (Exhibit 2)* was necessary to ensure alignment amongst the Stakeholders. Referring to the techniques identified in *Fundamentals of Project Management (Heagney, 2016)*, the Sponsor and PM agreed that *Performance* was a constraint because it was of utmost importance for the mount to perform as intended. The project would enhance *Cost* and *Quality* because those elements were determined to be two that could complement each other should opportunities arise to optimize or compromise. *Schedule* was made to be accepted after the *Resource Plan* was in development. As the benefits and limitations of a volunteer workforce in a matrix organization with strong external factors took shape, it became apparent that schedule would be the variable that accepted the prioritization of the other characteristics.

	Constrain	Enhance	Accept
Cost		X	
Schedule			X
Performance	X		
Quality		X	

Exhibit 2: Constraint Priority Matrix

It is worth mentioning that the project identified the characteristics associated with *Performance* and *Quality* as separate and distinct. *Performance* represents the ability of the mount to function, including reliability. *Quality* represents the appearance of the product and the accuracy and completeness of the project execution activities and deliverables. In this way, the project was able to improve resource allocation specific to work affecting *Performance*.

The project utilized a project management plan (PMP) to guide this project, detailing objectives, timelines, resources, and processes. It defined roles, communication, risks, and mitigation strategies, ensuring clarity, alignment, and accountability among stakeholders. As the scope of work and execution strategy were developed, the elements of the PMP were developed at the same time. The project referred to the *Develop Project Management Plan (PMI,2013)* process and techniques to build the specific PMP. *Exhibit 3: Develop Project Management Plan Data Flow Diagram* indicates the incorporated elements. This exhibit was a good starting point for building the PMP. Two additional elements, *Fabrication* and *Research and Development*, received plans. This resulted in a PMP that was 13 pages in length, which balanced accessibility and brevity with sufficient detail.

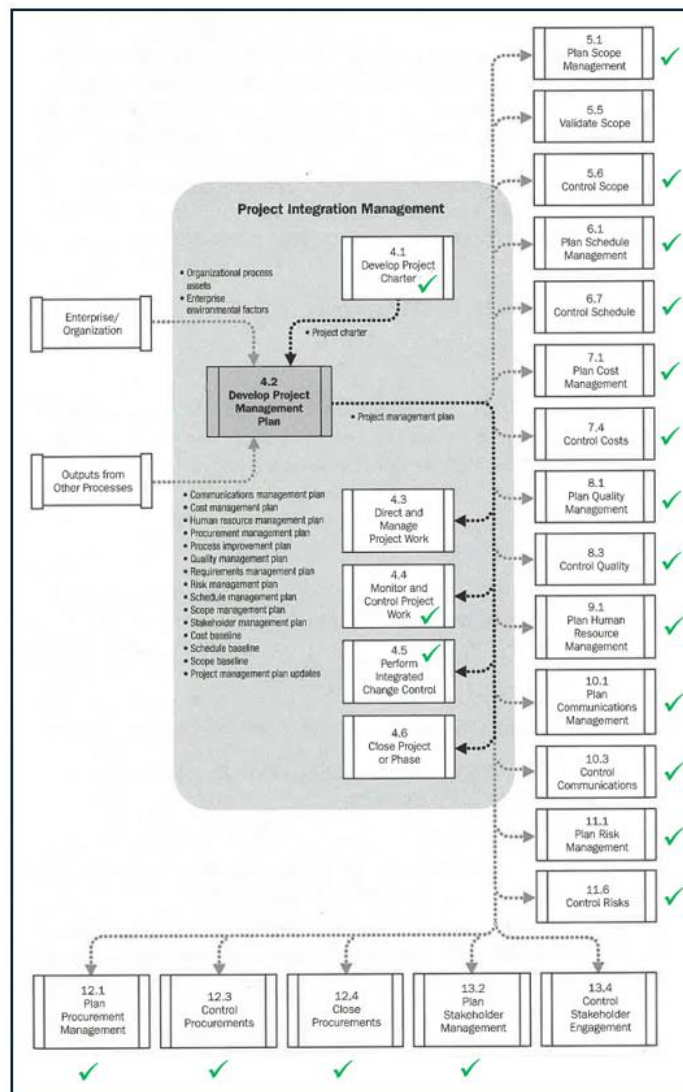


Exhibit 3: Develop Project Management Plan Data Flow Diagram

The Project Manager prepared and owned the PMP for this project, which was updated twice during the project.

The project team had two types of organizational structure. Within the project, the team has a project-oriented structure in that the hierarchy directly supports the project. The second type of organizational structure is a weak matrix in that each team member was part of another organization and on 'loan' to the project team. This type of organization created significant project externalities that created conflicting priorities between work to be completed for the project and work to be completed for the parent organization. Refer to *Exhibit 4: Project Organization Chart*.

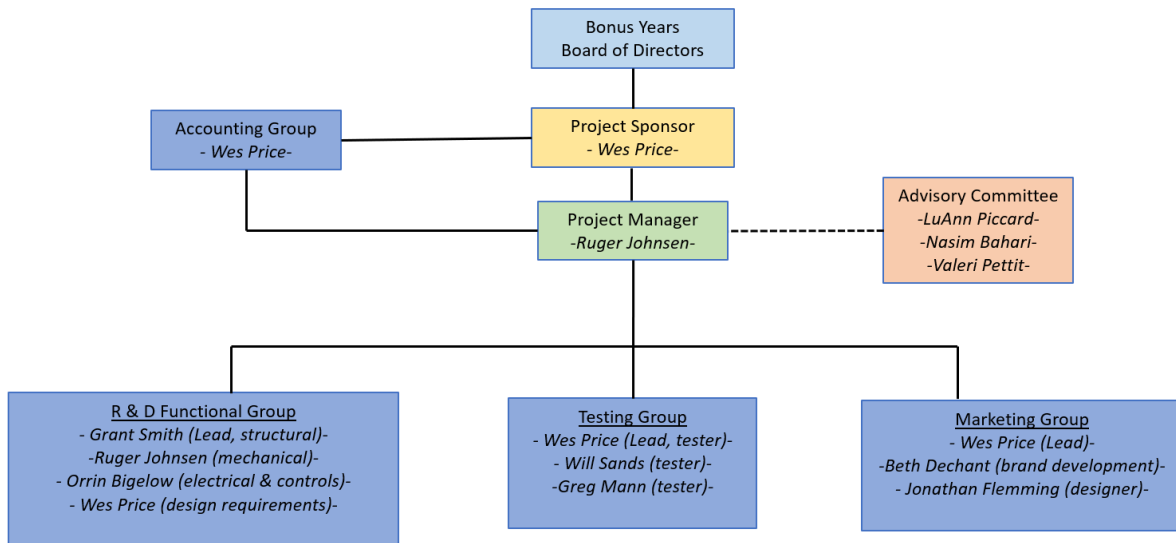


Exhibit 4: Project Organization Chart

4.3 PROJECT OBJECTIVES

The project had two project objectives related to deliverables:

- 1) Design and build a multifunctional mount.
- 2) Write a project management guideline for future *Bonus Years* projects in the nonprofit volunteer environment.

The Multifunctional Wheelchair Mount is a functional mount constructed out of extruded aluminum shapes. It includes two linear actuators that provide vertical and lateral movement using a joystick controller. The assembly includes a 24VDC battery power supply. When the mount is equipped with a firearm, the controls include a piezoelectric switch to activate the trigger-release solenoid.

The guideline organizes best practices and lessons learned that can be referenced and applied to future projects. It is specifically tailored to product R&D projects within the Bonus Years program and includes templates and processes that are part of the feedback from this project's execution.

The *Requirements Traceability Matrix* is at the core of the project objectives and goals. The RTM was critical to capturing and documenting the key pieces of this project. The RTM does contain many requirements that are not considered goals, like ID#8 *File Sharing Site Access*. However, having a common location for goals, objectives, and project requirements per the PMP was successful because it allowed the management of elements concisely and in reference to the other elements since they were in one file.

One input to the RTM was the Design Criteria. The Design Criteria is a mixture of qualitative and quantitative requirements that form the level of expectation and performance of the mount and the specific elements. The categories include:

- 1) Safety
- 2) Reliability & Durability
- 3) Accuracy & Repeatability
- 4) Ease of Use

Another input to the RTM was Critical Success Factors. There were standards used to determine or judge a project's success that refer to conditions, events, and circumstances contributing to the result. They were developed during the Initiation Phase and are part of the Charter. For this project, they include:

- 1) Maintain or foster relationships between key stakeholders
- 2) Perform cost-benefit analysis during decision-making that aligns with the Priority Constraint Matrix

5. LITERATURE REVIEW

A literature review was performed during the Planning and Execution phases of the project. At the Initiation phase, it was thought that the literature review should include the following topics:

- Project Management techniques specific to product development
- Material selection and fabrication techniques applicable to the wheelchair mount
- Trial testing

As the project team formed during the Planning Phase, two important things became apparent:

1) The project team included expertise in material selection and fabrication techniques. This was the result of the PM performing Stakeholder Management while completing the Stakeholder Register and Skills Matrix.

2) The project was resource-constrained. As the PM performed the Resource Planning, it became a systemic project concern that more work was needed than the allocated time, money, and project people could complete. The PM assessed the literature review priorities to mitigate the risk of project scope creep or the effects of incomplete scope definition (both resulting in more project work than planned).

Upon completing the literature assessment, the PM determined that the optimal use of the time allocated to the literature review would be to focus on project management and leadership in a nonprofit, volunteer environment. The rationale was based on the value proposition analysis that a well-organized team that functioned effectively could overcome the challenges associated with any technical issues that would arise in the project.

While there is a large body of knowledge concerning the management and leadership of volunteers, surprisingly, little is written explicitly about the application of project management and leadership of volunteers in a project. While many elements and techniques apply to both applications, one fundamental difference exists. That difference is that many volunteer organizations are in a steady state, operational mode. They are not fundamentally executing projects, which are a temporary affair. This means that an established organizational culture, work processes, and procedures exist and are sustained, while team members come and go over time. An analogy could be that the organization represents the 'wheel' already rotating, while the volunteers are the 'cogs' of the wheel. By contrast, the analogy applied to a project would result in the 'wheel' not being defined or existing at initiation, so no one knows the size or number of the cogs needed!

5.1 PROJECT MANAGEMENT IN A VOLUNTEER ENVIRONMENT

In *Practical Project Management for Voluntary Organizations (2021)*, Elizabeth Gray-King makes a convincing argument for using project management tools and techniques for a project utilizing volunteers as core project team members. By expounding on the virtues of splitting the project into the typical five project phases (Initiate, Planning, Execute, Monitor & Control, Closeout), Gray-King clearly articulates what occurs during those phases and why they should be utilized. The goal of the book is to introduce project management to individuals who have little to no exposure. As a result, the book's value was de minimis to this project.

In *The Volunteer Handbook (2001)*, Tracy Daniels Connors is the editor and organizes various expertly created papers and chapters that comprise the handbook. While none are directly tied to the topic at hand, many are relatable and have the potential to be applied. For instance, the chapters related to administration and program management provided insight. For example, the notion that there are numerous and distinct advantages to having one or more paid positions in a volunteer organization should be considered.

5.2 LEADERSHIP IN A VOLUNTEER ENVIRONMENT

There is a wealth of knowledge in leadership that applies to leading volunteers. For this project, motivation was identified as a topic critical to its effectiveness.

Again, *The Volunteer Handbook(2001)* by Connors provided practical information on understanding volunteer motivation and applying techniques. Within this chapter, Milena M. Meneghetti, CHRP, provided the expert authority on the topic. After a thorough review of altruism as applied to volunteers, the chapter introduces numerous theories:

Instrumental Theory: People will act if they believe doing so will eventually help them obtain something they value.

Reinforcement Theory: Consequences of actions influence behavior

Maslow's Need Hierarchy: A person will act systematically to satisfy basic needs and then move to more complex needs.

Herzberg's Two-Factor Theory: Motivation and de-motivation are two separate issues, and the factors that motivate individuals are not the same as those that demotivate.

McClelland's Learned Needs Theory: an individual has three types of needs: achievement, affiliation, and power. That individual will act to satisfy the need that is strongest at any given time.

The chapter goes on to describe how motivations vary with each volunteer and may change over time.

The other relevant leadership element was the Situational Leadership Model developed by Paul Hersey and Ken Blanchard in the 1960s. This model suggests that effective leadership is achieved by adapting one's style to the specific needs and readiness of the follower or team in a given situation rather than relying on a single, fixed approach. This topic is elaborated on in more detail in *Section 9.6.2 Situational Leadership*.

6. RESEARCH

Two types of research were conducted as part of the project: interviews and action research. Below is a summary of the results and how they relate to the project. Some of this information was immediately applied to the project as part of the Continuous Improvement Philosophy, which was part of the *Quality Plan*. Other information did not appear immediately relevant, only to find out later how salient the knowledge was. There was other valuable information that was determined to be considered in the future or as part of the guideline.

6.1 INTERVIEWS

Four individuals who met the criteria for being knowledgeable in volunteer management were interviewed. These interviews were open-ended discussions that allowed the conversation to flow toward topics in each person's area of specific expertise while reviewing the common themes. The key themes discussed included the importance of motivation, accountability, and managing conflicting priorities.

6.1.1 Motivation

Each interviewee expressed the importance of motivation with volunteers because that drives them to contribute. They all agreed that motivators are more significant for volunteers than non-volunteers, where compensation is the primary or underlying motivation. One noted that a volunteer's motivation can change over time (months). So, a volunteer project spanning up to or over a year can require regular reviews of motivators and the necessary rebalancing of volunteer assignments. One person said that she had reliable success identifying volunteers interested in learning new skills with those interested in sharing expertise. Others were motivated by using existing skills in a new manner.

Another person explained how important it was to recognize volunteers and determine how they wanted and could be rewarded under the given constraints.

6.1.2 Conflicting Priorities

Conflicting priorities are when there are more things to be done than resources to accomplish. In a volunteer context, this means that other things in a person's life can compete with the time allocated to volunteering.

One common theme in the interviews was the concept of a hybrid model where there is a mixture of compensated and volunteer roles. The concept is that specific roles and responsibilities have a magnified effect on the rest of the group or project should they not be prioritized. To mitigate this, they all said that

some paid positions are valuable, especially when they relate to coordinating other volunteers or areas with direct or trickle-down effects. In project management terms, these are 'critical path' tasks.

All interviewees correlated Conflicting Priorities with Motivation.

6.1.3 Accountability & Feedback

All interviewees agreed that holding volunteers accountable is critical, while acknowledging it can be difficult. It is critical because the tasks assigned to a volunteer can be as important as those assigned to a compensated person. There is this common misconception that a volunteer's work is not that important; all interviewees agreed that nothing could be further from the truth! All interviewees said that a volunteer needs to understand the expectations of the role, just like it were a paid job. He or she also needs to get feedback as if it were a compensated position. One person commented that she has 'fired' numerous volunteers because he or she was not fulfilling the responsibility assigned to them.

Another noted success is employing the 'friendly reminders' strategy within a culture of 'actionable items.' She said that for this to work, there had to be already a strong culture of 'getting things done' in the group and the ability to effectively deploy a 'sense of guilt.'

6.1.4 Use of Authority

A consistent theme was that authority in a volunteer organization needed to be defined and used. This concept is directly related to Accountability and Feedback.

6.1.5 Value of Time and Resources

While only one person mentioned this, it had resonance with the topic. She said that a common misconception is that the value of a volunteer's time is little to nothing. Sometimes, this may be the case, but the assumption should be that a volunteer's time is very valuable. The argument is that some types of compensated work have a defined value to the person doing the work. So, the logic is that the worker does not carry any inefficiencies when performing the task. For example, the compensated worker gets rewarded by waiting around for a task to start or re-doing a task. On the other hand, when a volunteer is affected by inefficiencies, the volunteer pays by utilizing his or her time. When there is a situation of Competing Priorities, this can become problematic.

6.1.6 Other Points of Interest:

- Watch out for conflicts of interest related to funding; look to avoid setting up power or influence dynamics.
- Consider developing a skills/interest matrix of the volunteer pool

- Have a plan for when a volunteer fails, or something does not go according to plan.
- Consider investing in the group: offer training; use relationship and team-building techniques.
- Need a chair or leader with vision. Leverage for group motivation.

6.2 ACTION RESEARCH

This project has been well suited to perform research and investigation during its execution. It has the distinct advantage of allowing Continuous Improvement and lends the ability to employ Agile Project Management techniques. Two distinct types of Action Research have been performed: 1) Trial Testing results and 2) Project Management lessons learned. See *Section 8.1* for the discussion of Trial Testing results.

6.2.1 Project Management Lessons Learned

There were Project Management lessons that were learned during the project. The planning and execution of this project have been experiments in many ways. This arrangement of people, goals, resources, and work locations has not been attempted. As such, a case can be made to learn from feedback during the project and look to deploy improvements as soon as possible. Here is a summary of some of the project management lessons learned to date:

Issue of competing priorities: On numerous occasions, tasks have not been completed per the schedule. This situation is likely related to motivation or resource allocation.

Active participation by the Sponsor in progressing deliverables: The project Sponsor has multiple roles, including securing funding, managing the budget, being involved in the technical design, and attending weekly meetings. This active Sponsor role has worked well.

Feedback to planning tools: Sending emails and requesting feedback has not worked well. Historically, inconsistent feedback has been provided, resulting in the misalignment of goals and execution planning. When considering options to incorporate different tools or techniques, recognize that this may be an issue of available time.

Inconsistent weekly meetings and attendance: Weekly meetings are being canceled at the last minute without being rebooked. This is affecting the group's communication and building a culture that may not be aligned with the long-term best interests of the project.

Team size: The size of the team and the areas of expertise appear correct. One thing being considered is looking to outsource more of the design work.

7. RESULTS OF THE MULTIFUNCTIONAL WHEELCHAIR MOUNT PROJECT

As of this report, the project has produced many of the deliverables as outlined in the PMP. They include:

- Fabrication of Generation 'A' Prototype mount
- Trial Testing and test results of Gen 'A'
- Project Management guidelines for future Bonus Years projects

7.1 GENERATION 'A' PROTOTYPE

The fabrication of the Generation 'A' Prototype and subsequent testing was successful. One Gen 'A' 'mount was fabricated, and field testing was completed. The significant change to the Gen 'A' mount design from the proof of concept was incorporating 80/20 extruded aluminum structural members and proprietary joint connections. See *Exhibit 5: Example of 80/20 Application*. The primary benefit of incorporating this technology was the reduction in welding required. It further simplified assembly by ensuring square connections using few tools through standardization of fasteners.



Exhibit 5: Example of 80/20 Application

The mount was fabricated in Anchorage at two of the team members' homes, depending on what elements of fabrication and assembly were required. The machined components were completed at the UAA machine shop.

Initial qualitative testing was conducted at the Rabbit Creek State of Alaska shooting range. Refer to *Exhibit 6: Initial Testing Configuration* for the testing setup. This initial testing validated three key aspects:

- 1) The mount assembly has sufficient strength and stiffness
- 2) The joint connection stayed tight after numerous firing cycles of the gun
- 3) To check the full movement of the linear actuators and for no binding in the slides



Exhibit 6: Initial Testing Configuration

Upon completion of the Initial testing, the mount was shipped to the testing site in Oregon to be used on a hunting trip. The testing team consisted of Wes as the tester and the team's electrical engineer to troubleshoot and maintain the mount. The mount was assembled, and the final electrical wiring was completed. Refer to *Exhibit 7: Photo of Generation 'A' Mount Assembly* installed in the test wheelchair.



Exhibit 7: Generation 'A' Mount Assembly

Refer to *Exhibit 8: Noted Project Requirements* to correlate the key project requirements noted in the RTM with the corresponding identification numbers. Since the RTM used in the project contained verification details, it was relatively easy to perform the *Closeout* activity on those project requirements.

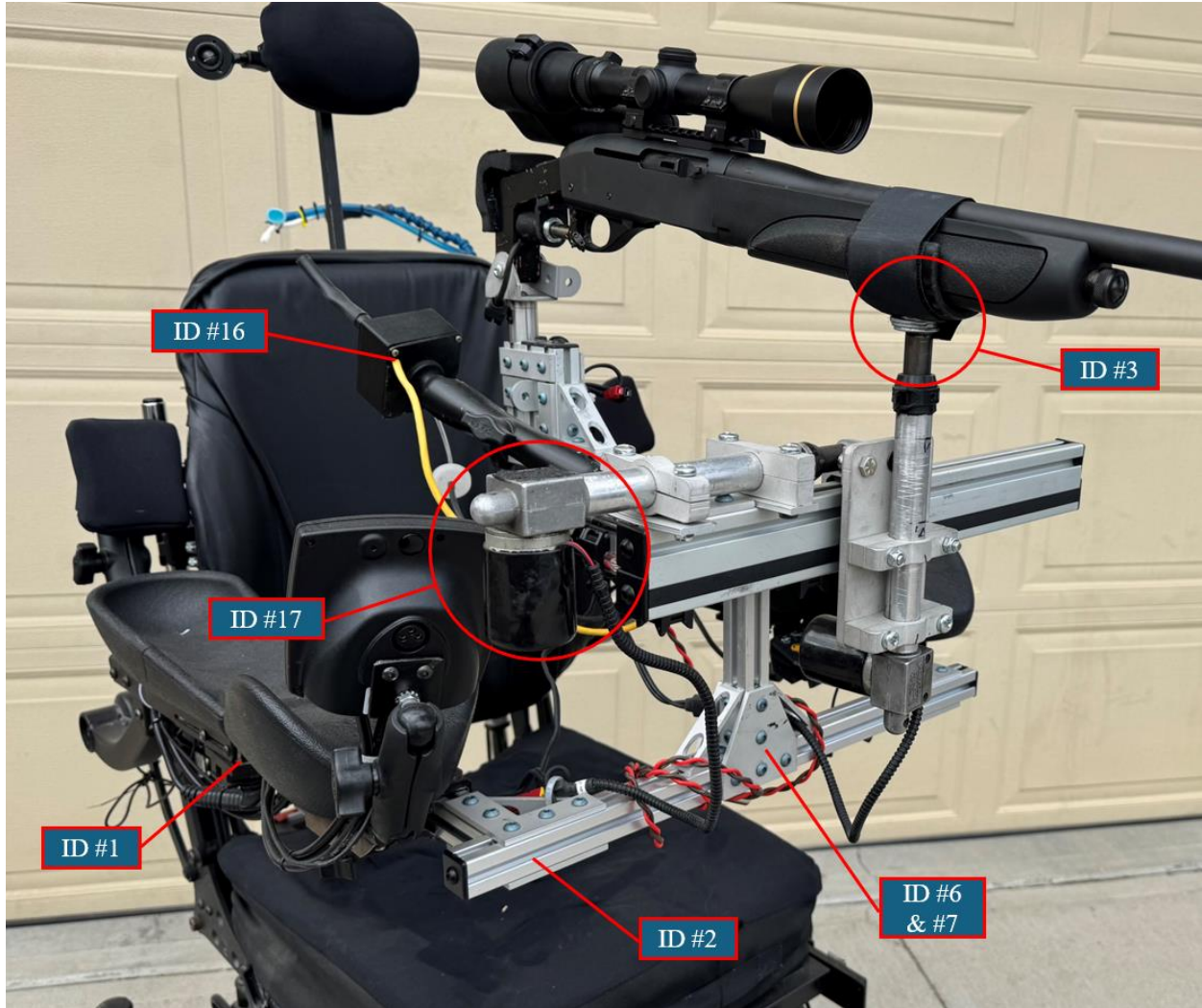


Exhibit 8: Noted Project Requirements

Refer to *Section 8.1 Trail Testing Results* in the Analysis Chapter for a discussion on the testing results.

As noted in the Project Objectives section, the project scope includes the following deliverables:

- Fabricate five prototypes for testing
- Complete a Version 0 design suitable for use
- Prepare marketing, instructions, and outreach program

As of the publishing date of this report, those deliverables remain in progress. The primary reason that the Version 0 mount is not ready for use is that the results of the field testing indicated that the minimum requirements to meet distribution were not met, those being:

- Movement in vertical and right-left panes (RTM ID #17)
- Ease of use: assembly & disassembly (RTM ID #20)
- Reliability of electrical control system (RTM ID #21)

This identified risk (*Risk Register* ID #4, see *Appendix C*) had the predetermined response of repeating the design cycle an additional time. The Generation ‘A’ mount and the results of the testing analysis will be the inputs into the Generation ‘B’ mount. Should the testing of the Generation ‘B’ mount meet all of the requirements, then final updates will be made to the design, and it will become the Version 0 *Multifunctional Wheelchair Mount*. This version will then be used to make instructions and prepare marketing material, and the outreach program to provide the public access to the design.

7.2 GUIDELINE FOR FUTURE PROJECTS

As introduced earlier in the *Project Objectives* section, a key deliverable of this project was to produce a guideline for future R&D projects within the *Bonus Years* program of accessibility equipment. This guideline constitutes the best practices, templates, and procedures resulting from active learning during the project and the quality feedback loop and continuous improvement that is part of the *Quality Management Plan* in the PMP. One of the primary goals of this guideline is to avoid or, at the very least, minimize the *Forming*, *Storming*, and *Norming* phases of project team development, as formulated by Dr. Bruce Tuckman. See *Exhibit 9: Phases of Team Development*. The inefficiencies of those two stages are partly caused by the need to generate a PMP and the associated elements. Suppose those details are predetermined, and the PMP has been refined and optimized during similar previous projects. In that case, the project team can accelerate to the *Performing* stage, thus improving the project's overall efficiency while decreasing potential team frustration.

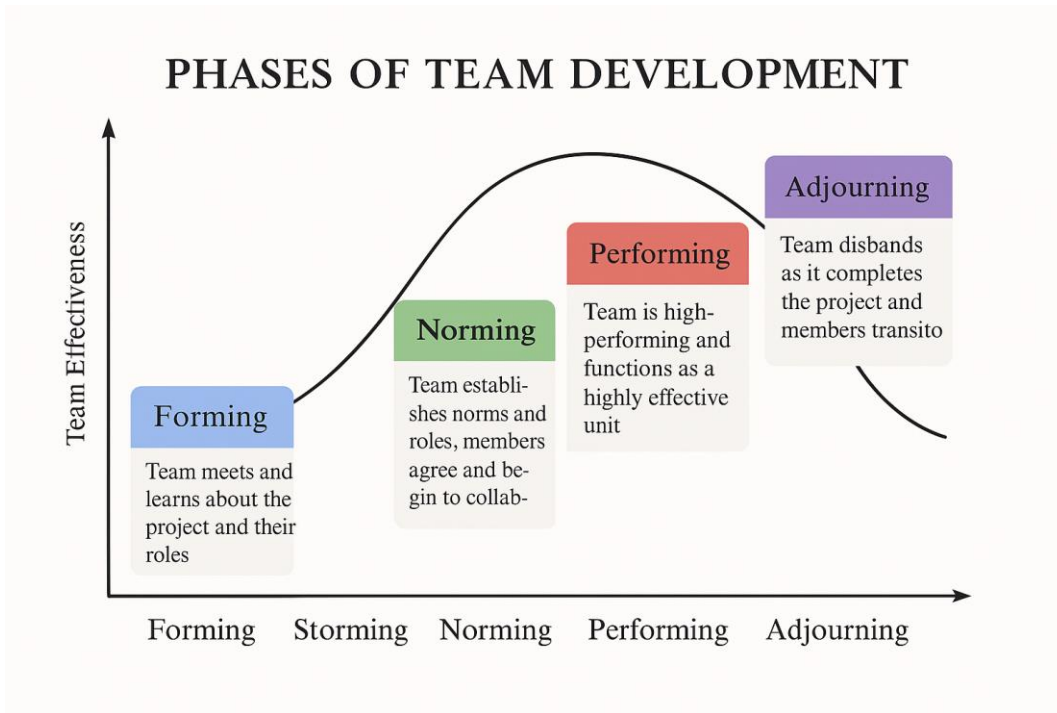


Exhibit 9: Phases of Team Development

This was *Bonus Years'* first project executed using formal project management approaches and techniques. There were no organizational standards or templates to use as a starting point. Consequently, it was the responsibility of the PM to gain a rapid and complete understanding of the project to generate a suitable PMP. As noted in *Exhibit 3: Develop Project Management Plan Data Flow Diagram*, most of the PMBOK elements were applied to this project. They are expected to apply to future projects as they will contain the exact general needs and processes noted in *Exhibit 10: Steps in Managing a Project* (Heagney, 2016, p.15).

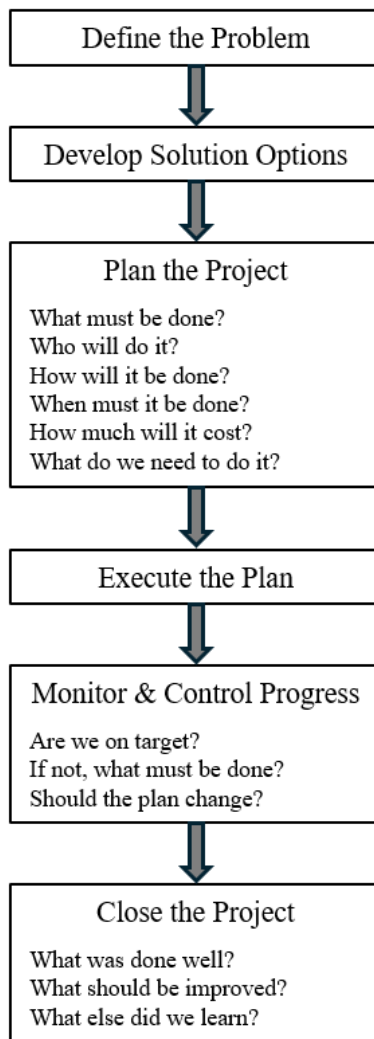


Exhibit 10: Steps in Managing a Project

8. ANALYSIS

8.1 TRIAL TESTING RESULTS

The Generation ‘A’ version of the mount was tested in the field during October and November of 2024. A summary of the results is as follows:

- Overall, it is highly functional and sufficiently solid
- Left-Right actuator system started binding up after a few hours of use. Left black marks on the lateral rail.
- Consider increasing the range of motion. This would be beneficial to prevent having to relocate the chair.
- When blending into the local environment, consider constructing the framework from colors other than bright aluminum.
- Upright rear braces are difficult to attach.
- The front attachment points are good: they allow for easy adjustment of different armrest widths.
- Consider adding vertical adjustment to the upright post.
- The entire mount system is not easy to dismantle or set up. It is also bulky for storage and travel. Look to balance an improvement here without compromising sturdiness. Consider using nut rails instead of individual nuts.
- Consider increasing the speed of actuators.
- When using the mount with a hunting scope, it would be great to have an option to adjust the scope’s field of view electronically by the user.
- The wires are all over the place. Need better wire management.

Appendix B includes the complete Trial Testing results with analysis. These results were introduced into the R&D Process (*see Exhibit 11: R&D Execution Process—baseline*) to validate the existing design and refine or change other elements of the mount.

One point of interest is that the testing allowed the team to identify project and mount design requirements that had not been previously noted. For instance, RTM ID #22 documented the need for power and control wire management. This need was not apparent during the planning phase but became evident once the unit was tested.

8.2 DISCUSSION OF THE RESEARCH & DEVELOPMENT PROCESS

The R&D element of this project captured the tasks to determine what was needed, build it, and then test to validate if it fulfilled the identified needs. *Exhibit 11: R&D Execution Process - baseline* is a visual representation of the steps and activities as planned. Of significance is that the *Requirements* preceded the

Design Specification and were to be a critical input to it. The design specification was to be used to design the version of the Alpha Mount. The specification would convert the performance requirements listing the RTM and provide a concise document that dictates the criteria necessary for the design to be completed.

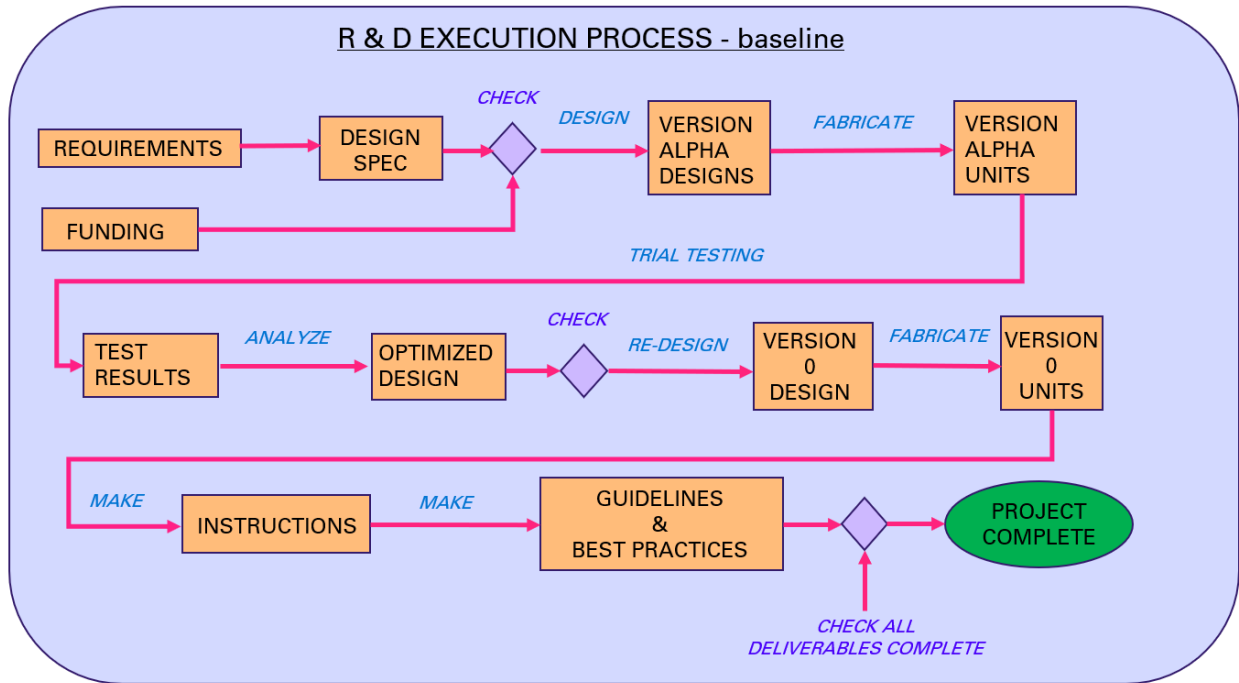


Exhibit 11: R&D Execution Process – baseline

What occurred during the project was that the *Design Specification* step was omitted. Refer to *Exhibit 12: R&D Execution Process – as executed*. This resulted in a trial-and-error approach during the design and fabrication activities. There were some interesting results:

- 1) While an estimated 20 days of schedule were conserved by not performing that task, the same number of days were added to the design and fabrication tasks.
- 2) The trial-and-error method was more fun than preparing the design specification, but it still needs to be completed.

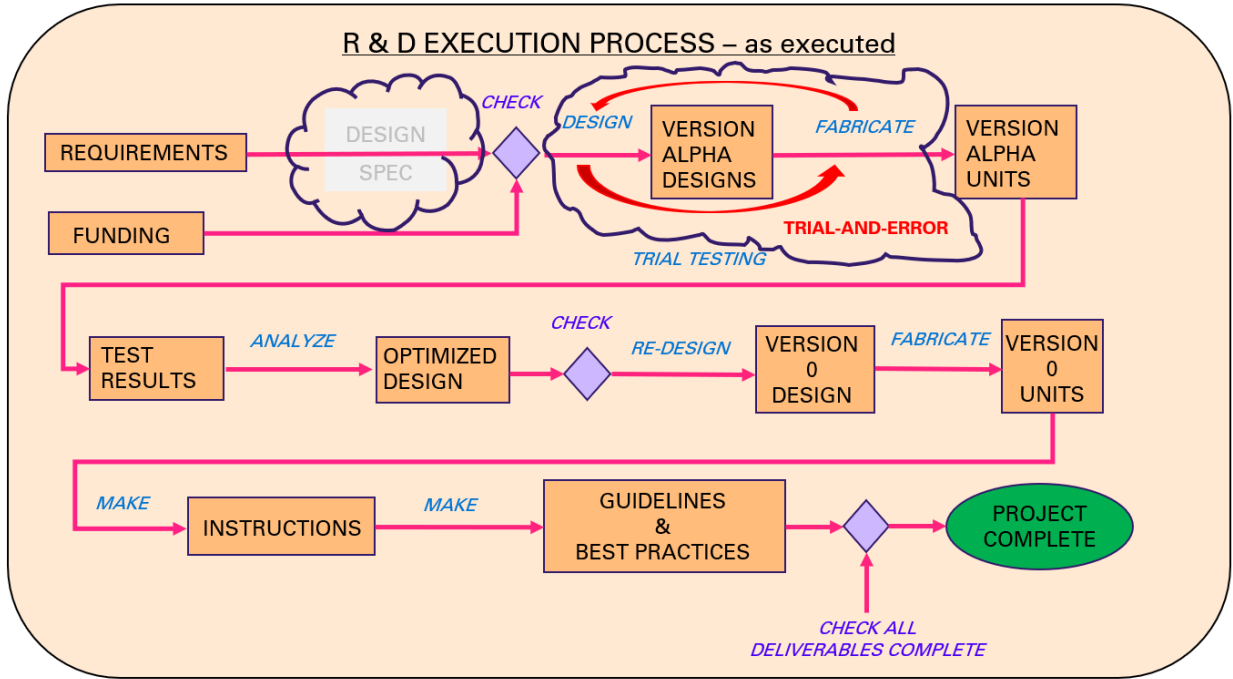


Exhibit 12: R&D Execution Process - as executed

9. DISCUSSION OF PROJECT MANAGEMENT ELEMENTS

This project applied project management approaches focusing on five knowledge areas:

- 1) Stakeholder Management
- 2) Schedule Management
- 3) Communications Management
- 4) Risk Management
- 5) Change Management
- 6) Leadership

9.1 STAKEHOLDER MANAGEMENT

Stakeholder Management was identified as a critical piece to the success of this project. Stakeholders were engaged throughout the project to acquire buy-in and maintain project alignment. The primary stakeholders in this project are volunteers. In a volunteer organization, project stakeholder management can pose unique challenges due to volunteers' diverse nature and varying levels of commitment, availability, and expertise. Engaging and motivating volunteers to actively participate and align with project goals can be challenging, as they may have competing priorities and limited time to dedicate to the project.

Additionally, maintaining clear communication channels and managing expectations among volunteers, who may have different backgrounds and communication preferences, requires careful coordination and flexibility. Furthermore, ensuring accountability and resolving conflicts in a volunteer-driven environment can be complex, as volunteers may not be bound by the same organizational structures and hierarchies as paid staff. Effective stakeholder management in a volunteer organization requires a tailored approach that emphasizes inclusivity, transparency, and proactive engagement to harness volunteers' diverse skills and perspectives toward project success.

The Stakeholder Management plan for this project involved four processes:

- 1) Identification: Using the Stakeholder Register, the PM will identify stakeholders and record key information. This was accomplished by conducting interviews with the Sponsor.
- 2) Plan management: The PM analyzed each stakeholder and assigned an Interest-Influence score to assist in understanding their expectations and potential impacts on the projects. This and any other information were recorded in the Stakeholder Register.
- 3) Manage engagement: This engagement focused on communicating with stakeholders. The focus occurred between the PM and Sponsor and the PM and R&D Lead.

- 4) Monitor and control engagement—The PM used the information gathered from the communication with the stakeholders to determine if the method of engagement was sufficient. This occurred during regular communication, such as phone calls and meetings.

The Resource Management Plan included the use of a skills matrix that allowed the PM to evaluate the team's stakeholders and see where the gaps in skills were. As you can see in *Exhibit 13: Skill Matrix*, there was a gap in the skill to provide Solidworks drafting. This tool helped visualize this need, and as a result, the PM and Sponsor were able to find and recruit an additional team member to fulfill that skill gap.

SKILL	WES	RUGER	GRANT	ORRIN	CORBIN	MATT	JONATHAN	BETH	WILL	GREG
Use MS Project		X	X							
Solidworks Drafting										
Machining		X			X					
Welding		X								
Electrical Design				X						
Mechanical Design		X								
Structural Design			X							
Contract Negotiation		X	X							
Grant writing	X									
Accounting	X									
Generate Promotional Video						X				
Generate Website						X	X	X		
Marketing & Content (brand mgr)								X		
Trial Testing	X								X	X

Exhibit 13: Skills Matrix

A *Roles and Responsibilities Chart* (*Exhibit 14*) was used to identify and assign key duties. While it appeared to be a complete and practical tool during the Planning Phase, it was insufficient to ensure that assigned roles were fulfilled. This may be attributed to incomplete Stakeholder alignment or misassigned roles. A root cause analysis is planned to investigate this issue at a later date.

Description	Sponsor	PM	Accounting Lead	R&D Lead	Testing Lead	Marketing Lead
Manage and Update Schedule	A	R	I	C	C	C
Manage and Update Budget	A	R	R	C	C	I
Secure Funding	R	A	I	I	I	I
Generate and Manage Design Specification	C	A		R	C	
Manage fabrication		A	I	R		
Manage procurement/ purchasing		A	R	C		
Manage Quality		A	R	R	R	R
Resourcing	A	R	C	C	C	C

RACI	DEFINITIONS
RESPONSIBLE	The person(s) who does the work. At least one person should be responsible for each work package.
APPROVAL	Approval required prior to implementation or use
CONSULTED	Subject-matter experts whose advice is required
INFORMATION	People who are informed of progress. For example, project admin, or PMO.

Exhibit 14: RACI Chart

9.2 SCHEDULE MANAGEMENT

Schedule Management was the responsibility of the Project Manager to develop and maintain the integrated project schedule using Microsoft Projects. Critical Path Method (CPM) and auto-scheduling supported 'what if' analysis and risk management. A Rolling Wave Planning approach that added details progressively as more information became available complemented the hybrid-agile execution methodology. As the project transitioned from the *Planning* to the *Execution* phase, additional Critical Chain Project Management strategies were implemented to assist with resource availability challenges. The primary technique used was to add feeder buffers at critical points to help absorb scheduling delays rather than add additional schedule float in each task.

The schedule used fixed durations and assumed a seven-day work week to offer flexibility to match volunteer availability. While this was an accurate representation of the planning, it posed challenges to plan and manage the project work based on *Actual Work* required to complete the task. As a result, it was not easy to get meaningful EVM. An Action Item Log accompanies the formal schedule to track tasks that require attention but are too minor or dynamic to include in the main schedule.

Roles and responsibilities were clearly defined: the Project Manager oversees schedule creation, updates, and coordination with the team, Sponsor, and Stakeholders; the project team supports planning and executes tasks; the Sponsor approves the final schedule; and stakeholders contribute to validation and reviews. All of this worked according to plan.

The fundamental flaw in this process was the ability to predict how long tasks would take to complete. This was not a case of how much work was involved per task; the team was relatively accurate at predicting that. It was a case of how many calendar days or weeks to complete the task. What occurred is that an 8-hour task could take anywhere from 1 day to 21 days to complete, depending on how the task was completed. This action also had a tremendous variation in that the task could be completed in 1 day or eight 1-hour blocks. Most of the time, the task's duration was not known until the task was partially or fully completed.

The project team was fully aware of Parkinson's Law, where work fills the time available. Since the team organizational structure had a matrix characteristic due to team members having work obligations to external organizations, available time was used to perform work or clear backlogs associated with the other projects and duties, as predicted by Larson & Gray in *Project Management: The Managerial Process*. This was a primary factor in the project duration extending from 12 to 21 months.

9.3 COMMUNICATIONS MANAGEMENT

This Communications Management Plan outlined the framework for project communication, ensuring effective collaboration among stakeholders. It defined team communication roles and included a stakeholder directory. The *Bonus Years* group received weekly virtual updates with flexible agendas, resulting in action items and decision logs. A Microsoft OneDrive site provided document access for select team members. The Advisory Committee was engaged as needed without a set meeting schedule.

The weekly meeting became critical to progressing work and tasks. As suggested by Bradbury and Garrett in *Herding Chickens(2005)*, the meetings motivated people to complete tasks for various reasons, from providing a deadline to not wanting to let the team down.

A communication matrix aligns topics with responsible roles across project areas. Communication protocols included structured meetings, agenda distribution, and timely meeting minutes. Professional, concise email communication was required, and relevant informal updates would be shared with the Project Manager for proper follow-up.

One challenge to the project communication was scheduling meetings that accommodated each team member. The team's makeup included people from four time zones who all had primary work commitments. One tool implemented late in the project was using an online survey to schedule meetings called 'Doodle Poll.' With this tool, the meeting organizer creates a unique poll or survey that allows participants to identify the meeting slots that are acceptable to them from a selection that the organizer created. Initial results are mixed, as it depends heavily on the participation rate. However, continued use will determine whether this is an effective tool for the project.

A tool that developed into a key communication instrument was the Project Action Item Log. The Action Log was a spreadsheet that allowed tasks to be assigned and tracked as the tasks were identified during the project. Initially, the Action Item Log was intended to track activities not in the project schedule. As the project progressed and the use of the project tools evolved, the Action Item Log became the place where the team checked what was due and where the priorities were, and listed new tasks for the team as they were identified. The Action Item Log was kept on the shared drive to facilitate access. All members have read/write access, which is the correct course of action rather than restricting this to one individual who could be the communication bottleneck. Refer to Appendix H: Action Item Log for the complete list of action items.

9.4 RISK MANAGEMENT

In collaboration with internal and external project team members, the Project Manager ensured that risks were actively identified, analyzed, and managed throughout the project lifecycle. Risks were identified as early as possible to minimize their impact. *Exhibit 15: Risk Management Cycle* shows a visual representation of the process and cycle.

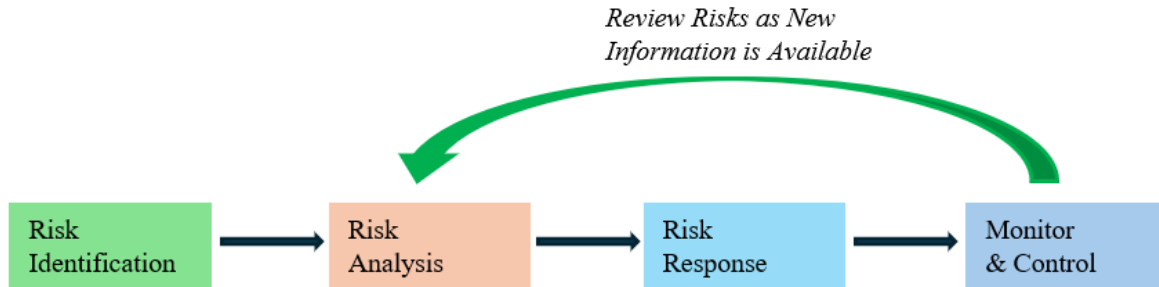


Exhibit 15: Risk Management Cycle

Identified risks were assessed to determine the range of possible project outcomes. A qualitative analysis was conducted using the Risk Register, and expert opinions were used to rank probability and consequence within a 2x2 matrix. This matrix was chosen to help screen risks that required further quantitative analysis. During the project, no risks received quantitative analysis. This is acceptable as the qualitative analysis has provided sufficient value in determining the appropriate risk response.

For this project, a high score indicated a schedule impact of more than two weeks and a cost impact exceeding \$1,000. Risks rated as $L_{\text{Prob}}L_{\text{Impact}}$ and $L_{\text{Prob}}H_{\text{Impact}}$ were accepted, as their predicted impacts remained within acceptable project thresholds.

Two issues were identified with this approach. Firstly, the 'two weeks' threshold was too low and somewhat arbitrary. The execution of this project proved that it was much more schedule-elastic than the PM initially expected. Reviewing some realized risks of schedule delay nature (threats) determined that the delay's consequence was immaterial and should not have been noted as a threat. Secondly, four risks (ID #1, 2, 3 & 7) were ranked as $L_{\text{Prob}}H_{\text{Impact}}$. Per the Risk Management Plan, these risks were accepted. Upon further analysis, the predicted impacts of three unmitigated risks were not reasonable to the project. Hence, the PM decides to mitigate them. One of these risks (ID #1 *Funding Delay*) was realized. Because

there was a mitigation plan in effect, the project pivoted and continued to execute with the alternative funding model.

9.5 CHANGE MANAGEMENT

Change Management was used to analyze, evaluate, and document project changes related to cost, schedule, quality, or performance. The Change Management Plan effectively involved the key stakeholders in identifying, analyzing, and approving the change. Additionally, the constraint and threshold requiring formal change approvals were appropriate. See *Exhibit 16: Change Management Criteria*. What was overly restrictive was the formal review and approval process using the Change Request form as outlined in the PMP. Each change was entered into the Project Change Log (Appendix F). During the project, it was determined that the review and analysis of a proposed change was relatively simple and that the team could complete it without a detailed process. Furthermore, because the team reviewed the change collectively, the approvals were implied by consensus and did not require formal documentation. By removing this requirement, it reduced the paperwork for all of the team members.

Constraint Category	Threshold Triggers	Approvals
Cost	Forecast cost of budget line item is 15% or \$500 more than baseline budget, whichever is greater	Sponsor PM
Schedule	Forecasted project completion date increases +2 weeks	Sponsor PM
Deliverable Quality	Variance from deliverable quality criteria as defined in the Design Specification	Sponsor PM R&D or Marketing Team Lead
Product Performance	Variance from design criteria as defined in the Design Specification	Sponsor PM R&D Team Lead

Exhibit 16: Change Management Criteria

The *Project Decision Log* complements the *Project Change Log* to document decisions that are important to record but do not meet the definition of a change or capture a change that does not exceed the threshold that justifies using the *Project Change Log*.

9.6 LEADING VOLUNTEER PROJECTS

9.6.1 Leading from the Center

As in any team environment with numerous individuals, there are going to be as many unique aptitudes and abilities as there are people on the team. This range of aptitudes and abilities can be extensive, considering the diverse backgrounds a group of volunteers can bring. This project contains Stakeholders and Contributors with a wide range of motivations, priorities, and capacities that have varied over time. While the PM's initial and ongoing stakeholder engagement process occurred, it was not robust enough to complete the picture of each team member.

The PM's initial leadership technique was described as managing authoritatively from the front of the team. This approach has had reasonable success in previous for-profit work environments. However, it became apparent that this style was ineffective in achieving the project's desired outcomes. What was fundamentally different in the volunteer environment was that each volunteer team member had a different reason for contributing to the project. Some of these motivations were less elastic than others. Upon reflection, it became apparent that there were significantly fewer ridged motivators than in the non-volunteer environment. This made sense in part because when one works for pay, the obligations from the worker to the employer are clear and with consequences. In the volunteer environment, those obligations are not as clear. Furthermore, the consequences of unfulfilling the obligations are even more vague. As a result, there needed to be a more tailored approach to extracting performance from the team.

9.6.2 Situational Leadership

For the second half of the project, the PM employed coaching, supporting and delegating techniques while acting more from the center of the project team. This allowed each member to have sufficient autonomy to satisfy his motivations while allowing the PM to monitor the activities and apply correction influences to pull the volunteer back towards the agreed upon path. The genesis of this style is the Situational Leadership Model, developed by Paul Hersey and Ken Blanchard, that suggests effective leadership is achieved by adapting one's style to the specific needs and readiness of the follower or team in a given situation, rather than relying on a single, fixed approach.

As outlined in *Management of Organization Behavior: Utilizing Human Resources* (Hersey & Blanchard 1988), the leader or manager should adjust his approach based on the follower's, or in this case, volunteer's, readiness and the situation. *Exhibit 17: Situational Leadership Model* shows how the different leadership styles correspond to volunteer readiness.

There are four leadership styles, each defined by varying levels of task-oriented and relationship-oriented behavior. These can also be described as 'directing' and 'supporting'.

Directing (S1): High task, low relationship. The leader provides clear instructions and closely supervises followers.

Coaching (S2): High task, high relationship. The leader provides guidance and support while also encouraging participation and feedback.

Supporting (S3): Low task, high relationship. The leader builds relationships and provides support while allowing followers more autonomy.

Delegating (S4): Low task, low relationship. The leader provides minimal direction and support, empowering followers to take ownership and responsibility.

The four states of volunteer readiness is a function of both ability and willingness to perform a specific task:

R1 (Unwilling and Unable): Volunteers lack the ability and willingness to perform the task, requiring a directing style.

R2 (Unwilling but Able): Volunteers have the ability but lack the willingness, requiring a coaching style.

R3 (Willing but Unable): Volunteers are willing but lack the ability, requiring a supporting style.

R4 (Willing and Able): Volunteers are both willing and able, requiring a delegating style.

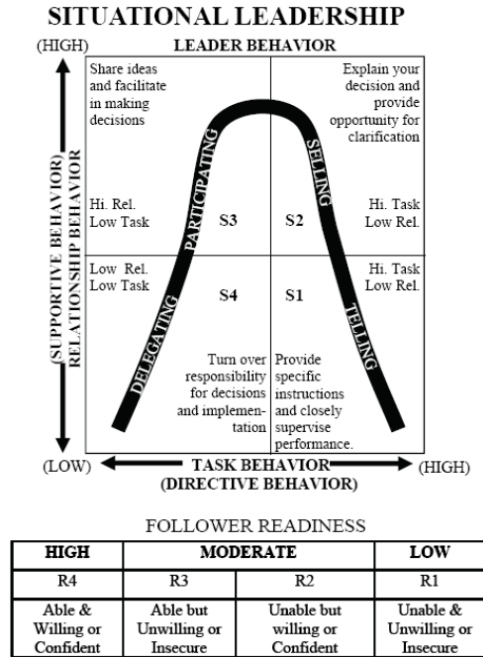


Exhibit 17: Situational Leadership Model

This sophisticated method of matching leadership style to each volunteer has shown promise in this project environment. It required considerable effort from the PM, including the willingness to engage with each team member to understand his level of readiness and then tailor the approach accordingly. It is evident that employing the situational leadership model requires ongoing effort to monitor the change in readiness and adjust the matching leadership style accordingly.

9.6.3 Authority

When managing volunteers, different types of authority can be utilized depending on the leadership style, organizational culture, and the nature of the project. Understanding the types of authority and their pros and cons helps select the most effective approach for a particular group or project. Below are the key types of authority used during this project and their advantages and disadvantages. They are based on the work presented by Greg Lalicker.

Positional (Formal) Authority

This type of authority is based on the role or position someone holds within the organization. In managing volunteers, this typically refers to volunteer coordinators, project managers, or team leaders who can assign tasks, make decisions, and ensure that volunteers follow the guidelines and procedures. The Sponsor and the Project Manager used this type of authority in this project.

Advantages:

Clear Hierarchy: Volunteers know who is in charge and who they should report to, making the project's structure clear and efficient.

Decision-making Power: The Sponsor or PM had the final say in matters related to task allocation, conflict resolution, and overall project direction, which helped maintain focus and consistency.

Established Boundaries: Positional authority allowed for clearly defined boundaries, which can help avoid confusion and ensure that volunteers know their roles and limitations.

Disadvantages:

Risk of Overbearing Leadership: If the individual with positional authority is overly rigid or controlling, it may lead to dissatisfaction or disengagement from volunteers. It can create power imbalances where volunteers feel overlooked or excluded from decision-making processes, resulting in resentment.

Lack of Flexibility: Positional authority can sometimes stifle creativity or initiative, as volunteers may be reluctant to offer suggestions or take ownership of their tasks.

Expert (Technical) Authority

Expert Authority is derived from knowledge, skills, or experience in a particular area. This type of authority is particularly relevant when volunteers are asked to perform tasks that require specialized knowledge or technical expertise. All team members used this authority at various times during the project.

Advantages:

Credibility and Trust: Volunteers are likely to respect and follow the direction of someone who has demonstrated expertise in a particular area, as they see them as a reliable resource.

Informed Decision-making: Expert authority permits highly informed decisions to improve the quality and efficiency of the project, as the person in charge has a deeper understanding of the task at hand.

Effective Problem-Solving: Volunteers may feel more confident and secure knowing someone with experience guides the project, especially when technical challenges arise.

Disadvantages:

Limited Applicability: This type of authority can be limiting in situations requiring broader decision-making skills or organizational strategy, as the authority holder primarily focuses on a specific area of expertise.

Potential for Elitism: Volunteers may feel alienated or intimidated if the expert authority figure is overly focused on their expertise and does not communicate in a way that includes or supports less experienced volunteers.

Overreliance on One Person: If too much authority is concentrated on one expert, the project can become dependent on that individual. It is risky if they are unavailable or leave the project.

Personal (Charismatic) Authority

Personal authority is based on an individual's personality, charm, and ability to influence others. People who hold personal authority typically lead by example, inspire others through their enthusiasm, and create strong interpersonal relationships that make others want to follow their lead. This type of authority relies on the individual's ability to motivate and engage volunteers through personal traits like confidence, empathy, or passion for the cause. All team members, especially the Sponsor, used this type of authority.

Advantages:

Strong Volunteer Engagement: Personal authority can create strong bonds between leaders and volunteers, fostering high commitment and enthusiasm.

Motivation and Inspiration: the Sponsor inspired the volunteers to go above and beyond, leading to increased effort and a sense of community.

Fostering Loyalty: the team felt a deep loyalty to the Sponsor, resulting in increased team cohesion and morale.

Disadvantages:

Dependence on the Leader: If the project relies too heavily on personal authority, the team's productivity may suffer if that leader is absent or not as charismatic as expected. Volunteers may not have the same motivation without the leader's presence.

Potential for Burnout: Charismatic leaders often use significant emotional and mental energy to motivate and inspire others. If not managed, this can lead to burnout for the leader, affecting the overall leadership structure of the project.

Participative (Democratic) Authority

Participative or democratic authority encourages decision-making among all members of the volunteer group. Rather than having a single person dictate decisions, participative authority involves volunteers in the planning, problem-solving, and decision-making processes. This approach typically includes team meetings, brainstorming sessions, and feedback loops, where all volunteers can voice their opinions and contribute ideas.

Advantages:

Increased Engagement and Ownership: the team members felt more committed to the project when they had a say in decision-making and had a greater sense of ownership.

Diverse Perspectives: various perspectives and ideas are considered, which can lead to better problem-solving and innovation.

Strong Team Cohesion: Theoretically, this authority type fosters a sense of community and collaboration, strengthening team dynamics and reducing feelings of isolation among volunteers.

Disadvantages:

Time-Consuming: Making decisions through group discussions and consensus took time.

Potential for Conflict: When many people are involved in decision-making, disagreements arise, causing delays or friction between team members.

Difficulty in Achieving Consensus: In some cases, it was difficult to get everyone to agree on a course of action, especially if there were strong differences of opinion among volunteers. In extreme cases, individuals went and did what they wanted to do anyway.

Laissez-Faire (Delegative) Authority

Description: Laissez-faire authority is a more hands-off approach where the leader provides minimal supervision or direction and allows volunteers to work autonomously. The authority holder may step in to provide guidance or support when needed, but volunteers are mainly free to make their own decisions and manage their tasks without constant oversight. This style was used with some success to allow individuals to find solutions independently and provide them ownership of the tasks. Unfortunately, the result was that the project schedule was compromised as individuals used this authority to set priorities and timelines independently.

Advantages:

Empowerment and Independence: The team appreciated the freedom and flexibility to work at their own pace and take ownership of their tasks.

Innovation and Creativity: It encouraged creative thinking and exploration of new approaches to tasks, which led to innovative solutions.

Reduced Micromanagement: This approach reduces volunteers' stress and pressure if they are constantly micromanaged.

Disadvantages:

Lack of Direction: Sometimes, the team struggled with unclear expectations or guidance.

Accountability Issues: Volunteers failed to follow through on their responsibilities without sufficient oversight, leading to missed deadlines or incomplete tasks.

10. CONCLUSIONS

The development of the multifunctional wheelchair mount illustrates the practical value of applying project management methodologies within a nonprofit, volunteer-based framework. This project not only addressed a critical need for improved accessibility devices for high-level quadriplegics but also contributed to a repeatable framework for future *Bonus Years* product development projects. The project achieved significant progress toward both technical and organizational objectives by leveraging planning, stakeholder engagement, and continuous improvement practices.

The successful fabrication and testing of the Generation 'A' prototype demonstrated the viability of the initial concept. Although the prototype did not meet all performance criteria required for final release, the testing yielded critical insights informing the next design iteration phase. These findings reinforced the importance of a feedback-driven development process and validated the project's use of an iterative R&D cycle. Identifying and documenting specific deficiencies—such as actuator binding, assembly complexity, and wire management—enabled the team to refine the design with greater precision and intention.

This project also highlighted the unique challenges and opportunities of managing volunteer teams. Variability in time commitment, motivation, and skill levels among team members necessitated a flexible leadership approach. Applying the Situational Leadership Model allowed the PM to tailor leadership styles to individual readiness and task complexity, improving team engagement and task completion. The project further demonstrated the value of aligning authority types - formal, expert, personal, and participative - to the specific needs of the volunteer context, enhancing team cohesion and productivity.

Perhaps one of this initiative's most enduring contributions is the creation of a comprehensive project management guideline designed for use in future *Bonus Years* initiatives. This document compiles best practices, templates, and procedural recommendations developed through active learning during the project's execution. Its utility lies not only in increasing project efficiency but also in enabling future teams to bypass early-stage inefficiencies commonly encountered in volunteer-led R&D efforts.

In summary, this project validates the adaptability and effectiveness of project management frameworks in resource-limited, volunteer-driven environments. By employing structured yet flexible methodologies, the team made meaningful progress on both a technical prototype and an organizational development front. The combination of formal planning tools, responsive leadership, and iterative learning enabled the team to overcome common barriers to innovation in the nonprofit sector. The processes, insights, and deliverables generated through this effort are expected to serve as a foundation for future accessible technology projects under the *Bonus Years* program, ultimately contributing to improved quality of life for individuals with disabilities.

11. RECOMMENDATIONS

While this project achieved numerous goals and objectives, plenty remains to be done and improved. The recommendations below describe topics or areas that are extensions of applications used or new ideas that indicate promise and justify the investigation.

Scaling of Tools and Techniques

The numerous tools and techniques lend themselves well to being scaled in complexity as a function of the project's complexity. For instance, the level of detail in the project schedule can directly reflect the level of detail required to coordinate and plan the project team. Factors that would influence this include the size of the team (for resource assignment), WBS complexity, and employing CPM scheduling or EVM. These elements suggest a scheduling software tool with logic, similar to MS Project or Primavera. If those requirements are unnecessary, then a simple Gantt chart in a spreadsheet may suffice.

An example of scaling techniques would include Stakeholder Management. If the team is relatively large (more than 8 members) or works remotely as individual contributors, then conducting interviews or one-on-one discussions would be necessary to understand each individual's motivations, concerns, and interests. On the other hand, if the team is small and has frequent interactions, the PM may be able to learn and understand the team members simply through those opportunities, with no additional effort expended.

Other tools and techniques that could be scaled include the test program, the number of prototypes being developed in parallel, weekly meetings, subcommittee meetings, and risk management.

Building Team Culture

When initiating and planning the next project, it is recommended that the project invest in the team's culture. The benefits of a strong, healthy culture allow the team to improve overall outcomes and the enjoyment or satisfaction of the work. This is done partly by encouraging trust, aligning values, and building a purpose and sense of belonging.

There are many ways to build culture. All of them require money, time, commitment, and effort. In the context of the next *Bonus Years* project, the recommendation is to bring the team together in person during the project at timely milestones or decision points.

Application of Agile Project Management Elements

Agile Project Management is a flexible approach to project execution that emphasizes continuous improvement through iterative and collaborative approaches. A study of this type of project management could yield a hybrid method that would lend itself well to the nature of the *Bonus Years* projects. For instance, the Kanban contains elements appealing to the existing team. By simplifying the status of the tasks to ‘to do – in progress – done’ and representing it visually in real-time, the team would be able to see progress and achieve a sense of satisfaction, thus encouraging more work to be done. These visualization techniques can help identify execution bottlenecks, an ongoing problem for resource-limited volunteer projects.

12. REFERENCES

- Bradbury, D. & Garrett, D. (2005). *Herding Chickens: Innovative Techniques for Project Management*. Harbor Light Press.
- Connors, Tracy D. (2001). *The Nonprofit Handbook (3rd ed.)*. John Wiley & Sons, Inc.
- Connors, Tracy D. (1995). *The Volunteer Handbook*. John Wiley & Sons, Inc.
- Gray-King, E. (2021). *Practical Project Management for Voluntary Organizations*. Directory of Social Change.
- Hillson, D., & Simon, P. (2020). *Practical Project Risk Management: The ATOM Methodology (3rd ed.)*. Berrett-Koehler Publishers.
- Heagney, J. (2016). *Fundamentals of Project Management (5th ed.)*. American Management Association
- Hersey, P. & Blanchard, K. H. (1988). *Management of Organization Behavior: Utilizing Human Resources*. Prentice-Hall
- Lalicker, Greg. *Leadership 101*. The presentation provided May 2, 2023.
- Larson, E. W. & Gray, C. R. (2018). *Project Management: The Managerial Process (7th ed.)*. McGraw Hill Education
- Project Management Institute. (2013). *A Guide to the Project Management Body of Knowledge (5th ed.)*. Project Management Institute.

13. APPENDICES

APPENDIX A: THE BONUS YEARS PROJECT MANAGEMENT GUIDE

Appendix A: The Bonus Years Project Management Guide

Bonus Years

PROJECT MANAGEMENT GUIDE

DATE	REVISION DESCRIPTION	BY
16-APR-2025	INITIAL DRAFT	RJ

TABLE OF CONTENTS

[Purpose of Guide](#) 46

[Overview](#) 47

[Initiating Phase](#) 48

[Planning Phase](#) 49

[Executing & Controlling Phase](#) 50

[Closeout Phase](#) 51

[Appendix A: Project Management Plan Template](#) 52

[Appendix B: Work Breakdown Structure Template](#) 0

[Appendix C: Roles & Responsibilities Matrix Template](#) 1

[Appendix D: Requirements Traceability Matrix](#) 2

[Appendix E: Risk Register Template](#) 3

[Appendix F: Trial Test Results & Analysis Template](#) 4

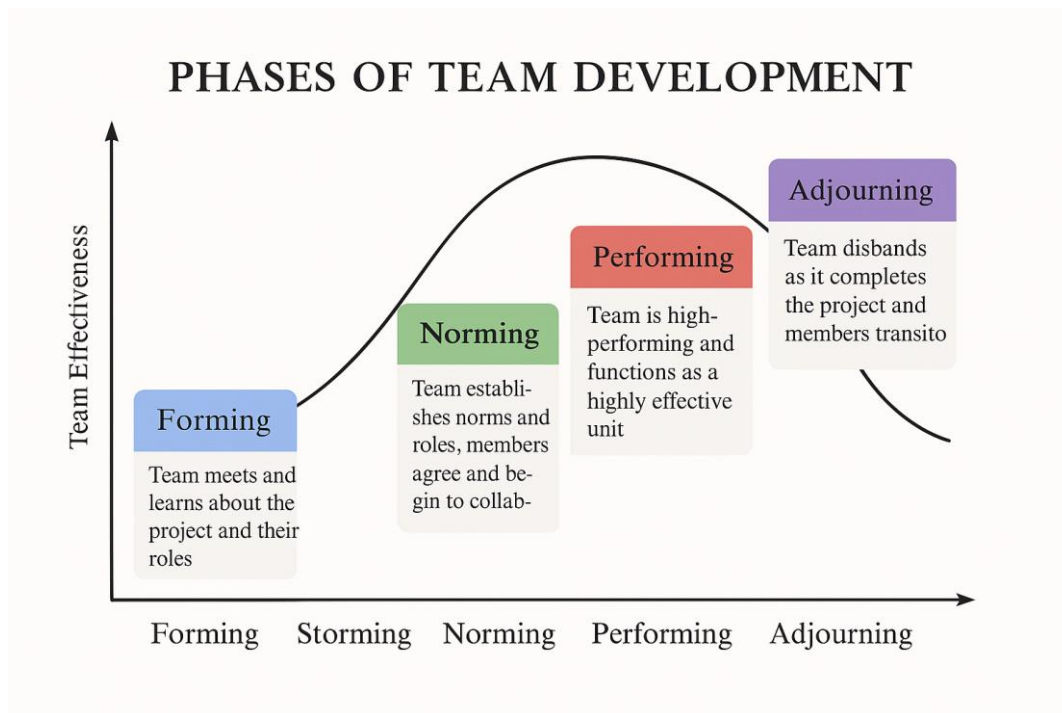
[Appendix H: Change Log Template](#) 5

[Appendix I: Action Item Log Template](#) 0

[Appendix J: Decision Log Template](#) 1

Purpose of Guide

This guideline constitutes the best practices, templates, and procedures resulting from active learning during previous Bonus Years projects. It can be considered a ‘road plan’ to planning and executing a project. One of the primary goals of this guideline is to avoid or, at the very least, minimize the *Forming*, *Storming*, and *Norming* phases of project team development, as formulated by Dr. Bruce Tuckman. The inefficiencies of those two stages are partly caused by the need to generate a Project Management Plan and the associated elements, thus improving the project's overall efficiency while decreasing potential team frustration.



Overview

This guide is divided into two parts: 1) a discussion on the processes, techniques, and best practices, 2) templates.

Each project is composed of five phases: Initiating, Planning, Monitor & Control, Closeout. This guide will discuss the goals & objectives, steps and factors to consider in each phase as they apply to a Bonus Years project. Special attention will be given to aspects specifically related to working with volunteers.

Initiating Phase

Purpose

To define the project, obtain formal authorization, and ensure stakeholder alignment. This phase confirms that the project is viable and aligned with the strategic goals of Bonus Years.

Steps

- 1) Define project objectives and key deliverables
- 2) Identify stakeholders and establish the Stakeholder Register.
- 3) Develop the Project Charter, including the Constraint Priority Matrix.
- 4) Conduct a high-level feasibility analysis and define the project's scope and exclusions.
- 5) Secure initial project funding and resources.

Consideration Factors

- A. Alignment with Bonus Years' long-term program goals.
- B. Volunteer availability and motivation.
- C. Resource constraints and external dependencies.
- D. Is Schedule a constraint or is it accepted?

Planning Phase

Purpose

To create a comprehensive roadmap for project execution and monitoring, ensuring that all knowledge areas are addressed, and all project elements are coordinated.

Steps

- 1) Develop a Project Management Plan (PMP) incorporating schedule, scope, quality, risk, communication, and stakeholder engagement plans.
- 2) Establish roles and responsibilities (RACI chart) and a skills matrix.
- 3) Prepare a Requirements Traceability Matrix (RTM) and define Design Criteria.
- 4) Conduct a targeted literature review focusing on the nature of the project and the associated technology
- 5) Identify project risks and perform qualitative risk analysis.
- 6) Prepare the Resource Plan.
- 7) Prepare budget.

Consideration Factors

- A. Need for flexibility due to volunteer workforce.
- B. Importance of situational leadership and matching tasks with volunteer readiness.
- C. Communication strategies to manage multiple time zones.
- D. Get alignment on PMP by Stakeholder by performing reviews.
- E. Strategy of volunteer/outsourced work by considering Project Constraints.
- F. Organize and plan team 'off-sites' where the group gets together. Include allowance in budget.

Executing & Controlling Phase

Purpose

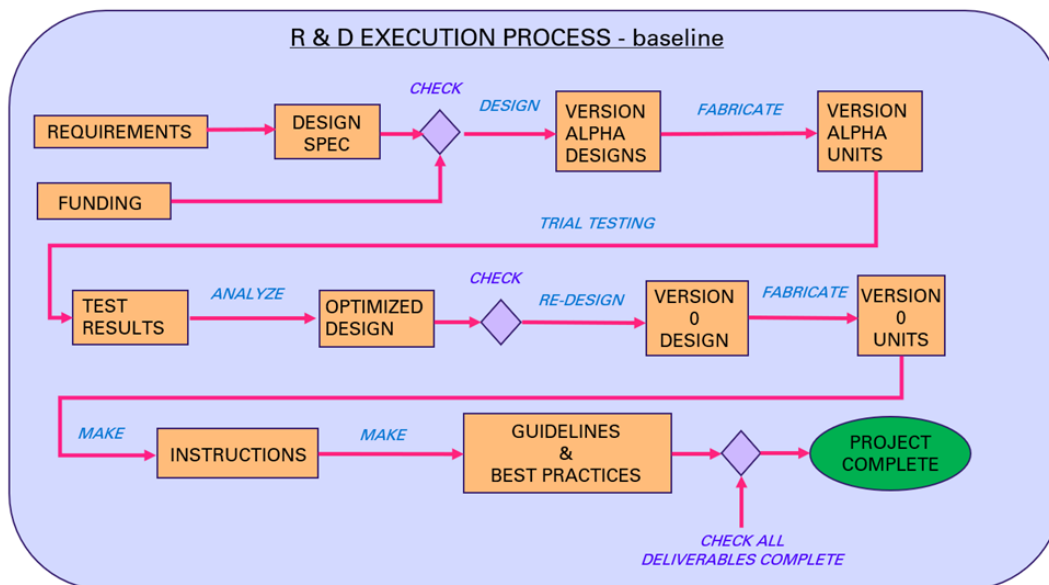
To execute the project plans while actively managing performance and adapting to changes to achieve project objectives efficiently. This is where the bulk of the time and resources are spent while creating the project deliverables.

Steps

- 1) Follow R&D Execution Process flow chart.
- 2) Conduct ongoing stakeholder engagement and manage volunteer assignments.
- 3) Implement risk responses and apply agile methodologies (Kanban, Rolling Wave Planning).
- 4) Utilize weekly meetings and shared Action Item Logs for communication and task tracking.
- 5) Apply situational leadership to manage the team and promote accountability.

Consideration Factors

- A. Impact of variable volunteer availability on schedule predictability.
- B. Importance of direct and participative leadership in motivating volunteers.
- C. Flexibility in tools used (from MS Project to spreadsheets).
- D. Managing change through simplified, consensus-driven processes.



Closeout Phase

Purpose

To formally complete the project, validate the deliverables, and capture knowledge for future initiatives within Bonus Years.

Steps

- 1) Complete testing and refinement to produce final version of the product.
- 2) Compile and archive final documentation including the project management guideline.
- 3) Validate all requirements in the RTM.
- 4) Follow up on any grant or funding obligations
- 5) Conduct post-project reviews to gather lessons learned.
- 6) Release project resources and finalize team engagement.

Consideration Factors

- A. Accurate documentation of trial testing results and changes.
- B. Recognition of volunteer contributions.
- C. Ensuring accessibility of all guideline materials for future teams.

Appendix A: Project Management Plan Template

The project management plan (PMP) is a vital roadmap for guiding this project, detailing objectives, timelines, resources, and processes. It defines roles, communication, risks, and mitigation strategies, ensuring clarity, alignment, and accountability among stakeholders.

The Project Manager will serve as the owner of the PMP for this project. The Project Manager will be responsible for the preparation and approval of the PMP and communicating its requirements to the project team. Updates will be made as deemed necessary during the life of the project.

All project and subsidiary management plans will be reviewed and approved by the project sponsor. All funding decisions will also be made by the project sponsor. Any delegation of approval authority to the Project Manager should be done in writing and be signed by both the project sponsor and Project Manager.

The project team will be a matrix in that team members from each organization continue to report to their organizational management throughout the duration of the project. The Project Manager is responsible for communicating with organizational managers on the progress and performance of each project resource.

The appendices in this PMP are considered live documents and will be updated on an ongoing basis. They are included in the PMP as references and are only accurate on the respective revision date.

Abbreviations & Definitions

CPM – Critical Path Methodology. A type of schedule management technique that optimizes the critical path of a project.

RAM- Responsibility Assignment Matrix. Used to communicate assigned project task responsibilities and roles.

R&D – Research and Development

PM – Project Manager

PMP – Project Management Plan

Stakeholder – individual, group or organization who may affected or be affected by a decision, activity, or outcome of the project.

WBS – Work Breakdown Structure. A method to decompose all and only the work that is required to complete the project.

Scope Statement

The (name) Project will deliver a working mount design that is ready for public use. The mount will be compatible with the select types of electric wheelchairs and allow different types of accessories to be attached to the mount. The target market will be high level quadriplegics. The project will utilize a collection of designers, engineers, fabricators, and field testers to progress the design from the current prototype to a version that is fit for general use as defined by the Project’s quality and performance criteria.

The scope of work includes securing funding sources, regulatory review, market analysis, research and development, and trial testing to refine and prove the design. The budget for this work is \$xxx and is expected to be complete in x year.

The acceptance criteria are:

The project scope does not include:

Priority Constraint Matrix

The priority constraint matrix for the project is as follows:

	Constrain	Enhance	Accept
Cost			
Schedule			
Performance			
Quality			

Stakeholder Management Plan

The primary stakeholders in this project are volunteers. In a volunteer organization, project stakeholder management can pose unique challenges due to the diverse nature of volunteers and their varying levels of commitment, availability, and expertise. Engaging and motivating volunteers to actively participate and align with project goals can be challenging, as they may have competing priorities and limited time to dedicate to the project. Additionally, maintaining clear communication channels and managing expectations among volunteers, who may have different backgrounds and communication preferences, requires careful coordination and flexibility. Furthermore, ensuring accountability and resolving conflicts in a volunteer-driven environment can be complex, as volunteers may not be bound by the same organizational structures and hierarchies as paid staff. Overall, effective stakeholder management in a volunteer organization requires a tailored approach that emphasizes inclusivity, transparency, and proactive engagement to harness the diverse skills and perspectives of volunteers towards project success.

The Stakeholder Management plan for this project will involve four processes:

- 1) Identification- using the Stakeholder Register, stakeholders will be identified by the PM and key information recorded.

- 2) Plan management- the PM will analyze each stakeholder and will assign an Interest-Influence score to assist in understanding their expectation and potential impacts to the projects. This and any other information will be recorded in the Stakeholder Register. This process will include researching effective methods to be used in a volunteer environment.
- 3) Manage engagement – focuses on communicating with stakeholders. Refer to the Communication Plan.
- 4) Monitor and control engagement - the PM will use the information gathered from the communication with the stakeholders to determine if the method of engagement is sufficient. It is expected that this activity can occur simultaneously during the regular communication engagement. This process is complimented by the Change Management Plan and part of the continuous improvement element of the Quality Plan.

Work Breakdown Structure

The WBS will accurately organize and represent the work required to complete the Project. The PROJECT MANAGER will create and maintain the WBS in conjunction with the Project Schedule. The Project will utilize a deliverables based WBS and will be decomposed to task level by functional group and work packages. The WBS dictionary will be included for any work package and task that requires clarification as to what is and is not included in that scope element.

Each task will be assigned a unique identifier that will ensure consistency when cross referencing the task between different documents.

The WBS will be a key input to the Project Schedule, budget, and risk register. As project scope is modified using Change Management, the WBS will be updated accordingly.

Schedule Management Plan

Integrated Schedule

The integrated project schedule will be generated and maintained by the PROJECT MANAGER using Microsoft Project. The schedule will accurately reflect the WBS and the associated tasks to complete the scope of work. Milestones will be included. Task relationships (processor and successors) will be used in conjunction with the auto-schedule function to use CPM methodologies and perform 'what if' scenarios during risk management activities. Activities that require work and progress tracking are required to be included in the schedule.

Fixed-durations will be employed as well as a seven-day work week to compliment the fact that the work will be completed during a certain window and time by volunteers when time is available.

A Rolling Wave Planning technique will be employed to additional details to the schedule as they become available and required.

An Action Item Log will be used to compliment the schedule. This list will be used to track important activities that justifying tracking but are not suitable for the project schedule; the concern is that the schedule would become too cumbersome. This list will be updated during the weekly team meetings by the Project Manager and is expected to be regularly referenced by functional group leads to manage short term priorities.

Feeder buffers will be used at strategic points in the project to provide elasticity in the project schedule. They will be assigned by the Project Manager using expertise and risk analysis.

Schedule updates will be performed by the Project Manager at a minimum of once per month that will occur during progress tracking. If there are any scheduling delays which may impact a milestone or delivery date, the Project Manager must be notified immediately so proactive measures may be taken to investigate the impacts of any schedule variances. Any approved changes to these milestones or dates will be communicated to the project team by the Project Manager.

Any proposed changes to the schedule will follow the Change Management process.

If the change is approved by the Sponsor, then it will be implemented by the Project Manager who will update the schedule and all documentation and communicate the change to all stakeholders in accordance with the Change Control Process.

Roles and Responsibilities

Roles and responsibilities for schedule development are as follows:

The Project Manager will be responsible for facilitating work package definition, sequencing, and estimating duration and resources with the project team. The Project Manager will also create the project schedule using MS Project Professional and validate the schedule with the project team, stakeholders, and the project sponsor. The Project Manager will obtain schedule approval from the project sponsor and baseline the schedule.

The project team is responsible for participating in work package definition, sequencing, duration, and resource estimating. The project team will also review and validate the proposed schedule and perform assigned activities once the schedule is approved.

The Sponsor will participate in reviews of the proposed schedule and approve the final schedule before it is baselined.

The project stakeholders will participate in reviews of the proposed schedule and assist in its validation.

Milestones

The following is a milestone summary for the project:

Kick-off Funding

Initiate Research & Design Phase

Mount Version Alpha approved for Fabrication

Mount Version Beta approved for Fabrication

Mount Version 0 approved for Use

Project completed

Resource Management Planning

Resource Management is expected to be a high-risk category for this project due to limited resources. These include funding, time, technical skills, and people to complete the work.

A key strategy in the resource management plan is to identify what resources are required as early as possible in the project and compare it to what is available. The tools used for this include: WBS and WBS dictionary, schedule, skills matrix chart. Any resource gaps will be identified and highlighted to the Functional Groups during the Team Update meetings. Brainstorming to generate ideas and cost-benefit analysis will be used to identify solutions to the resource constraints. The analysis to self-perform or outsource work will involve Procurement Management.

Resource effort planning in the Project Schedule will use 'days' of work duration and not 'hours' due the complexities of planning part-time work in a volunteer environment. What can be controlled is the window of when the work can be completed and not necessarily how much time.

As discussed in the Stakeholder Management Plan, assigning tasks, and holding individuals accountable will be key to successful resource management. Additional research by the Project Manager into tools and techniques by the that can be adopted by this project will be beneficial. It is expected that the Project Manager will require competent leadership skills to present to the Project Team and acquire adoption and implementation.

Communication Plan

This Communications Management Plan sets the communications framework for this project. It will serve as a guide for communications throughout the life of the project and will be updated as communication requirements change. It prioritizes collaboration between and amongst the difference stakeholder groups. This plan identifies and defines the communication roles of the project team members.

A project team directory is also included to provide contact information for all stakeholders directly involved in the project.

Communication with the Bonus Years group will consist of weekly team updates that have flexible agenda that range between updates and working sessions. They will be virtual given that the team is not centrally located. Action Item Lists and Decision Log updates will be produced from these meetings. A share point site will be generated where select team members will access to key documents for read/write ability.

Communication with the Advisory Committee will be based on specific project input and review needs. No formal meeting cadence is planned.

The following is the communication matrix that correlates subject matter with position:

Topic	Sponsor	PM	Advisors	Accounting	R&D	Testing	Marketing
Progress Reports	X	X	X	X	X	X	X
Design		X			X	X	
Quality		X			X		
Testing		X				X	
Outreach	X	X					X

Protocols

The project communication protocols will be established based on the information gathered during the initial Stakeholder Analysis process and updated as necessary during the project life cycle.

Meetings may occur in person or virtual using MS Teams or Zoom platforms. The Project Manager will distribute a meeting agenda at least one day prior to any scheduled meeting and all participants are expected to review the agenda prior to the meeting. During all project meetings the timekeeper will ensure that the group adheres to the times stated in the agenda and the recorder will take all notes for distribution to the team upon completion of the meeting. Meeting minutes will be distributed no later than three days after each meeting is completed.

All email pertaining to the project should be professional, free of errors, and provide brief communication. Email should be distributed to the correct project participants in accordance with the communication matrix above based on its content. Ensure the subject line accurately represents the content of the message.

Informal communication such as text messages, phone calls or unscheduled conversations are part of every project and is necessary for successful project completion. Any issues, concerns, or updates that arise from informal discussion that bear relevance to the overall project shall be communicated to the Project Manager so the appropriate action may be taken.

Change Management Plan

Change Management will involve any project changes related to cost, schedule, quality or performance. The Change Management Plan documents and tracks the necessary information required to effectively manage project change from project inception to delivery. Its intended audience is the Project Manager, project team, project sponsor and any senior leaders whose support is needed to carry out the plan. Change Management process establishes an orderly and effective procedure for tracking the submission, coordination, review, evaluation, and approval for release of all changes to the project’s baselines.

Potential changes to project scope will be vetted by the Project Manager. All changes to project scope, schedule, and budget must be approved by the Project Manager. Any change requestor is responsible for providing a detailed analysis of change impacts to the project.

Changes that exceed the following acceptable thresholds will trigger formal change management that will require the Project Manager, Sponsor and Functional Team Lead approval.

Constraint Category	Threshold Triggers	Approvals
Cost	Forecast cost of budget line item is 15% or \$500 more than baseline budget, whichever is greater	Sponsor PM
Schedule	Forecasted project completion date increases +2 weeks	Sponsor PM
Deliverable Quality	Variance from deliverable quality criteria as defined in the Design Specification	Sponsor PM R&D or Marketing Team Lead
Product Performance	Variance from design criteria as defined in the Design Specification	Sponsor PM R&D Team Lead

All change requests will be tracked in the Project Change Log and will be used to communicate any approved changes to the project team.

Cost Management Plan

Management

Cost Management will involve planning, evaluating and cost controlling.

Planning will involve setting two baseline budgets, one representing the low and one representing the high end of the potential funding, to which will be determined during the end of the funding project phase. The budget will include any WBS tasks that have costs associated with it. The budget will consider volunteer time and in-kind donations in equivalent cash value. A chart of accounts will be created to track expenses as incurred and compared budget to actual at regular intervals.at the third level of the WBS which is where all costs and performance will be managed and tracked.

Once the funding is secured, the budget will be evaluated to ensure the funding is sufficient to match the project objectives. If the budget exceeds the available funding by 10% or more, then the Change Management process is to be used to re-baseline the budget.

Control

Cost control will employ two key elements: expenditure approval and expenditure tracking. Approvals are made by completing the associated cost reference in the cost tracking sheet and requesting email approval from the Accounting Lead. The Accounting Lead will refer to the appropriate budget line item prior to any purchase request to ensure the requested expenditure matches the budget.

When a purchase request has been approved, it will be tracked as a committed cost in the cost tracker. When it has been paid, it will accrue as an actual cost. Incurred costs will not be tracked due to the expected time durations between committed and actual cost transactions (<30 days).

Project forecasts will be updated monthly in conjunction with the schedule update.

The Project Manager will be responsible for managing and reporting on the project's cost throughout the duration of the project. The Project Manager will present and review the project's cost performance. Using earned value calculations, the Project Manager is responsible for accounting for cost deviations and presenting the Project Sponsor with impacts. All budget authority resides with the Project Sponsor.

Financial performance will be measured through earned value calculations of the cost accounts. Earned work will be credited as 0%, 50% or 100% per task and rolled up to the appropriate account.

Procurement & Fabrication Plan

Procurement

The procurement Each functional team is expected to require procurement support. Procurement will be executed by the Accounting Group. Refer to Figure 1 Flow Chart to describe the procurement process. Payments that are due at the time of Goods Received or Services Rendered can be paid by either the Project credit card or by the individual. If

the individual pays, reimbursement will require the email approval from the Accounting Group as back up documentation.

Fabrication will be highly dependent on the design outcome of the R&D process. The Fabrication Plan will be developed by the R&D Lead, considering:

- 1) The design elements
- 2) Location of resources, such as rapid prototyping, welding, machining and other skilled labor and equipment
- 3) Location of compatible wheelchairs

The R&D Lead will consult with the Project Manager to confirm the Fabrication Plan is compatible with the project budget and schedule prior to approval.

Quality Management Plan

All members of the project team will play a role in quality management. It is imperative that the team ensures that all work is completed at a sufficient level of quality from individual work packages to the final project deliverable.

Continuous Improvement

The Project will support a culture of continuous improvement in all the processes and procedures. This means that at anytime there appears to be an opportunity to improve upon the status quo, then it is the obligation of the team to consider implementing a change. Ideas can be initiated by any team member and shall be reviewed by the Leads and Project Manager prior to implementation. If warranted, metrics will be tracked to document any improvements.

Design and Fabrication Quality

The quality plan for the design and fabrication mount will focus on quality control by measuring the outcomes of the deliverables against the acceptability thresholds in the design criteria as listed in the Design Specification.

The design and fabrication element of the project will take the design specifications and complete a CAD drafted design for review and approval. A key step in this process is to perform a constructability and usability review with the Fabricators and End User group to ensure the design is suitable for manufacture and use. Any changes will be noted and the design updated. It is the responsibility of the R&D Lead to manage these updates.

During the trial testing, the mount will be exposed to loads and conditions to confirm if the design as built meets the criteria. Quality of the design and assembly instructions will also be verified. Check lists, photos and logs are expected to be utilized.

Roles and Responsibilities

The Project Sponsor is responsible for approving all quality standards. The Project Sponsor will review all project tasks and deliverables to ensure compliance with

established and approved quality standards. Additionally, the Project Sponsor will sign off on the final acceptance of the project deliverable.

The Project Manager is responsible for quality management throughout the duration of the project. The Project Manager is responsible for implementing the Quality Management Plan and ensuring all tasks, processes, and documentation are compliant with the plan. The Project Manager will work with the Functional Group Leads to establish acceptable quality standards. The Project Manager is also responsible for communicating and tracking all quality standards to the project team and stakeholders.

The Functional Group Leads are responsible for working with the Project Manager to develop and implement the Quality Management Plan. The Leads will recommend tools and methodologies for tracking quality and standards to establish acceptable quality levels. The Leads will create and maintain quality control throughout the project.

The remaining member of the project team, as well as the stakeholders will be responsible for assisting the Project Manager and the Leads in the establishment of acceptable quality standards. They will also work to ensure that all quality standards are met and communicate any concerns regarding quality to the Project Manager.

Research and Development

RESEARCH SUMMARY

The research element of the project will focus on collecting application information about the mount. This includes technical information on chair compatibility and how it will be used. The Design Requirements Lead will be responsible for gathering this information in a matrix form that is input to the Design Specification.

RESEARCH METHODS

Below is a list of the research methods and the responsible project position to complete that research:

- 1) Literature review
 - a. Material selection and fabrication of mount (R&D Lead)
 - b. Trial testing (Testing Lead)
- 2) Open-ended Interviews
 - a. Guidance on R&D methods, fabrication techniques (R&D Lead)
 - b. Collect project requirements from stakeholders (PM)
- 3) Prototyping
 - a. Comparing and analyzing samples
 - b. Rapid prototyping for mock fit up or proof of concept confirmation
- 4) Design Testing
 - a. Constructability reviews
 - b. Quantitative testing and analysis of the model mounts

The research will also include fabrication strategies and component requests. This will be the responsibility of the R&D Lead and captured in the Design Specification.

Design Criteria

The Design Criteria will be a mixture of qualitative and quantitative requirements that will form the level of expectation and performance of the mount and the specific elements.

The categories include:

- 5) Safety
- 6) Reliability & Durability
- 7) Accuracy & Repeatability
- 8) Ease of Use

These requirements will be the responsibility of the Design Requirements Lead and documented in the Design Specification, a key project deliverable.

Trial Testing

The Trial Testing Plan will be developed in conjunction with the Design Criteria and Quality Plan to ensure the prototype meets the minimum acceptable standards and to collect information and feedback to improve the design of Version 0. It is expected that the sample size of the trial test will be small (less than five participants) so it will be critical that the plan is comprehensive to gain all the information the R&D Group requires. The Trial Testing Plan will be developed by the Testing Lead in consultation with the R&D Lead and PM.

Risk Management Plan

The Project Manager working with internal and external project team members will ensure that risks are actively identified, analyzed, and managed throughout the life of the project. Risks will be identified as early as possible in the project to minimize impact.

The steps for accomplishing this are outlined in the following sections:

- 1) Risk Identification
- 2) Risk Analysis
- 3) Response Planning
- 4) Monitoring and Control

Risks identified will be assessed to identify the range of possible project outcomes. Qualitative analysis will be performed on the identified risks per the Risk Register. Expert opinion will be used to rank probability and consequence in the 2x2 matrix. A 2x2 matrix was selected because the purpose of qualitative analysis was to screen the risk that require quantitative analysis.

Probability	H			High Probability: more likely to happen than not happen High Impact: substantial impact to cost, schedule or technical. Substantial action to alleviate issue.
	L			
		L	H	
		Impact		

For the purposed of this project, and High score resulted in greater than 2 weeks schedule impact and greater than \$1000 cost impact.

LL and LH risks will be accepted because the predicted impacts fall within the acceptable thresholds of the project priorities.

Success Factors and Performance Indicators

Critical Success Factors

Critical success factors are standards used to determine or judge a project’s success that refer to conditions, events and circumstances that contribute to the result. For this project, they include:

- 3) x
- 4) x

Project Closeout Plan

The purpose of the Project Closeout Plan is to mark the completion of the Project by assessing the project’s performance, identifying the lessons learned, and confirming that essential contractual and other project closure activities have been completed. It transfers assets, deliverables, and all ongoing administrative functions to an in-service organization. Included in this transfer is the commitment to measure the benefits/outcomes delivered by the project. It also releases resources from assignment or retention of this Project.

The key element of the project closeout are as follows:

Lessons Learned

Lessons Learned will be collected by a mixture of forms/questionnaire and group review sessions. They will stive to gain input from all aspect of stakeholders with the goal to capture what went well and what needs to be improved upon. The activity will focus on what was learned, looking into root causes and impacts, ultimately resulting in recommendations. Refer to Appendix M for the template.

The Project Manager is responsible for conducting the lessons learned activities.

Grants & Funding Obligations

It is expected that grants and funding that were awarded for this project will require follow up or closure in some shape or form. The Sponsor will be responsible for collecting and analyzing the follow up requirements to close our obligations.

Contract Closeout

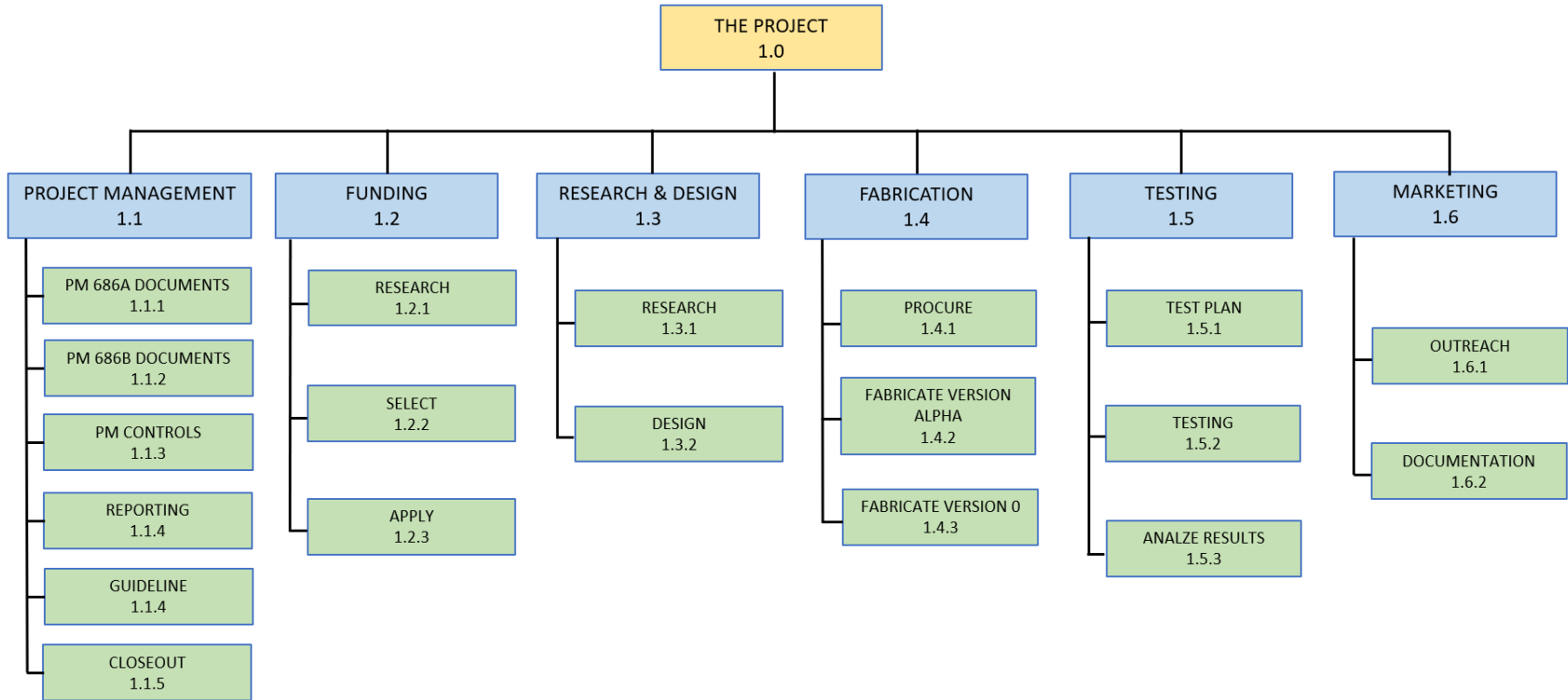
All contracts will be required to be closed out. This can occur by confirming all orders are complete and paid by referring to the procurement tracking sheet. Any warranty claims or returns are complete. Any contracts related to labor or services, be it paid or volunteer, and closed and resources released. These activities will be completed by the Accounting Lead under the direction of the Project Manager.

Archiving & Deliverables Turnover

The project deliverables, including the closeout documents and archived files will be formally turned over to the Sponsor by the Project Manager. Final KPIs will be recorded including time stamped versions of all relevant project management documents. The file sharing site will be archived and removed.

Appendix A: The Bonus Years Project Management Guide

Appendix B: Work Breakdown Structure Template



Appendix C: Roles & Responsibilities Matrix Template

Description	Sponsor	PM	Accounting Lead	R&D Lead	Testing Lead	Marketing Lead	RACI	DEFINITIONS
Manage and Update Schedule	A	R	I	C	C	C		
Manage and Update Budget	A	R	R	C	C	I	RESPONSIBLE	The person(s) who does the work. At least one person should be responsible for each work package.
Secure Funding	R	A	I	I	I	I		
Generate and Manage Design Specification	C	A		R	C			
Manage fabrication		A	I	R			APPROVAL	Approval required prior to implementation or use
Manage procurement/ purchasing		A	R	C				
Manage Quality		A	R	R	R	R	CONSULTED	Subject-matter experts whose advice is required
Resourcing	A	R	C	C	C	C	INFORMATION	People who are informed of progress. For example, project admin. or PMO.

Appendix D: Requirements Traceability Matrix

Project Name										
REQUIREMENTS TRACEABILITY MATRIX										
Revision:										
ID	REQUIREMENT INFORMATION					RELATIONSHIP TRACEABILITY				
	CATEGORY	REQUIREMENT	PHASE	PRIORITY	DESIRED BY	OBJECTIVE	DELIVERABLES	ASSOCIATED WBS	VERIFICATION	PERFORMED BY
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										

Appendix E: Risk Register Template

Project Name													date
Risk Register													
ID	WBS	Description	Reason/Cause	Type of Risk	Probability	Impact	Risk Effect	Level of Risk	Response	Mitigating Action	Residual Risk	Status	Comments
1													
2													
3													
4													
5													
6													
7													
8													

Appendix F: Trial Test Results & Analysis Template

Trial Test Results & Analysis							date
description							
ID	Field Notes	Project Requiremer	Change Required	Investigation or Research	Recommendation	Assigned To	Status
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

Appendix H: Change Log Template

<u>Project Name</u>									
PROJECT CHANGE LOG									
Revision:									
ID	DESCRIPTION OF CHANGE	SCOPE: EXISTING [E] OR NEW [N]	REASON FOR CHANGE	IMPACT SCHEDULE [T], COST [C], QUALITY [Q], PERFORMANCE [P]	INITIATED BY	INITIATION DATE	APPROVED BY	APPROVED DATE	CHANGE ADOPTED [Y/N]
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									

Appendix A: The Bonus Years Project Management Guide

Appendix I: Action Item Log Template

Project Name								
ACTION ITEM LIST								date
ID	OPEN/CLOSED	DESCRIPTION	PRIORITY	ASSIGNED TO	INITIATION DATE	DUE DATE	STATUS	RESOLUTION
1								
2								
3								
4								
5								
6								
7								
8								

Appendix J: Decision Log Template

DECISION LOG					Friday, April 12, 2024
ID	DECISION	MADE BY	DATE	REFERENCES	REQUIRED FOLLOW UP
1					
2					
3					
4					
5					
6					
7					
8					
9					

Appendix K LESSONS LEARNED TEMPLATE

Lessons Learned Template - Multifunctional Wheelchair Mount Project

ID	Phase	Discipline	Innovation or Issue	Lesson Description	Result	Contributing Factors	Root Cause	Recommendation (Recommended Changes)	Comment	Impact Area
1										
2										
3										
4				Lessons Learned - Instructions						
				Field	Description					
				Innovation or Issue	Innovation = positive - the learning comes from an opportunity or an improvement Issue = negative - the learning comes from an incident or realized risk					
5				Lesson Description	Describe the lesson in a way that someone who is external to your team / business unit can understand.					
6				Recommendation (Recommended Changes)	Describe the corrective action taken or not taken, to prevent and or avoid this issue in the future. Be specific and have explanations for the use of all infrequent jargon/acronyms.					
7				Project Phase:	Select the applicable Project Phase from the Project Management Manual: Phase I: Feasibility Study, Phase II: FEED Study, Phase III: Project Execution, Phase IV: Turnover and Closeout, Phase V: Post Project Review.					
8				Impact Area:	Select the applicable Knowledge Area from the list: Project Integration (Issues and Change Control), Scope, Time, Cost, Quality, Human Resources, Communication, Risk Management, Procurement.					

APPENDIX B: TRIAL TESTING RESULTS & ANALYSIS

Field Test Results & Analysis							4-Apr-2025
Oct & Nov 2024							
ID	Field Notes	Project Requirement	Change Required	Investigation or Research	Recommendation	Assigned To	Status
1	Overall very functional and rock solid mount - Shot about 10 rounds of Remington model 750 Woodmaster .30-06 to sight the rifle in.	Yes #12	No	None identified	Continue to use 80/20 construction and connectors.	Grant	Open
2	Last three shots at 80 yards were within a 4" group (Note: it was windy and rainy so conditions were not great)	No	Consider	1) Need to investigate ways to improve accuracy and repeatability 2) Likely part of Gen B mount	Check 'play' and slack in the linkages during assembly of first Gen B unit.	Grant	Open
3	After a day of hunting and using the rifle scope as my primary "glassing" option, the left right actuator started binding a bit at the end of the stroke. It left black marks on the lateral rail.	Yes #12	Yes	1)Send photos of binding marks 2)Need to bench test and repeat binding 3) Check alignment of actuator with rail			Open
4	It will be nice to have longer actuators to have wider viewing/shooting options without moving the chair (these actuators are 6")	Yes #11	Yes	1) Add 8" up to 12" actuators into CAD model to check fit			Open
5	The upright rear braces are still more difficult to attach than needed. There must be an easier way.	No	Yes	1) Need to brainstorm some ideas: turbuckle to adjust slack or play. Telescoping (like adj. ski poles)		Ruger	Open
6	Would be good to have 80/20 in a color that is not bright aluminum	No	Consider	1) research 80/20 surface finish options	Build one of the next Gen B units in black finish	Ruger	Open
7	The front attachment points are good and allow for easy adjustment with differing arm rest widths.	Yes #2	No	None identified	Continue to use 80/20 construction and connectors.	Grant	Open
8	It would be good if the upright vertical post could be adjusted in height easier than without having to change the whole post to make it taller or shorter.	No	Yes	1) Brainstorm ideas using CAD and photos 2) consider telescoping post		Grant	Open
9	This design does not allow for easy breakdown. It is bulky for storage and travel, but it is solid. There were no complaints about whether it can hold up to the punishment of high caliber rifles.	No	No		Defer this improvement to the Custom Mount. Add this to RTM.	Grant	Close
10	The actuators might be slower than necessary. We should try different gear ratios to see if we can go faster while still maintaining the slow creep speeds using PWM.	Yes #11	Yes	1) order a variety of actuators 2) review control options with Orrin		Orrin	Open
11	The rifle scope should be upgraded to have a wider field of view and more magnification. It would be awesome to come up with an actuator or servo that can adjust the scope magnification using a switch that can be bumped with the mouth stick or something that can activate it.	No	Consider	Agree this functionality adds value to the end user. Review where and when this can fit into the project.	Defer this improvement to the Custom Mount. Add this to RTM.	Orrin	Closed
12	Wire management is also an issue with this design. The wires are kind of all over the place right now.	No	Yes	Determine if wires should be exposed or if a loom or sleeve be used.		Orrin	Open
13	The electronics worked fine after replacing the old broken sabertooth motor control board with a new motor controller board. We still don't know what happened in Alaska, but something burned up the first motor control board so one of the directions did not work.	Yes #12	Yes		1) new motor board 2) Investigate improved more robust design	Orrin	Open
14	After Grant disassembled the mount and shipped it to Oregon, it was difficult for my 14-year-old son to reassemble the mount. Grant was able to reassemble it rather quickly, but putting the vertical post in was the most difficult. It's a matter of lining up all the screws and brackets on multiple sides, and then tightening them without missing the other sides. Hopefully we can make this easier, as I think a lot of people would struggle at least the first time.	Yes #9	Yes	1) need to make it easier to assembly and work on		Grant	Open
15	One thing that might help is a nut rail rather than individual nuts on each of the screws. Then they won't spin as much, and the nut rail can stay aligned as you slide the post down onto it. This would actually help a lot and is another idea for improved arm rest brackets on wheelchairs.	Yes #9	Yes	1) research options		Grant	Open

APPENDIX C: RISK MATRIX

Multifunctional Wheelchair Mount Project													23-Mar-2025
Risk Register													
ID	WBS	Description	Reason/Cause	Type of Risk	Probability	Impact	Risk Effect	Level of Risk	Response	Mitigating Action	Residual Risk	Status	Comments
1	1.2	Funding delayed	Funding delayed	Threat	L	H	Schedule Scope	H	Mitigate	Look for alternative funding	Medium	Realized	Funding was delayed, delaying project by 6 months
2	1.2	Insufficient funding	Insufficient funding	Threat	L	H	Budget Schedule Scope	M	Accept	N/A	Medium	Expired	Sufficient funding has been secured
3	1	MIA Team Member	Team member unable to perform role or responsibility in project	Threat	L	H	Schedule	M	Mitigate	Look for back up team members or outsource options	Medium	Ongoing	
4	1.3 1.4 1.5	Additional Testing Cycle	Results of testing-redesig task require one additional test-analyze-redesign cycle	Threat	L	H	Budget Schedule	H	Accept	N/A	Medium	Ongoing	
5	1.3 1.4 1.5 1.6	Collaboration	Work with an outside source or gain an additional team member that brings additional resources or knowledge to team	Opportunity	H	H	Budget Schedule	E	Enhance	Look for collaboration options	Medium	Realized	Collaborated with Corbin at UAA Machine Shop
6	1.5	Injury	Tester gets injured during field testing	Threat	L	L	Budget	L	Mitigate	Incorporate safety into test plan	Low	Expired	Testing has been completed with no injuries
7	1.5	Loss or damage	Prototype mount is damage or lost during transportation	Threat	L	H	Budget Schedule	M	Mitigate	Use shipping tracking and insurance	Medium	Expired	
8	1.2	Additional Funding	Received donation of Solidworks license	Opportunity	n/a	n/a	Budget	n/a				Realized	Software was donated saving \$6800

APPENDIX D: REQUIREMENTS TRACEABILITY MATRIX

MULTI-FUNCTIONAL WHEELCHAIR MOUNT PROJECT										
REQUIREMENTS TRACEABILITY MATRIX										
Revision: 12-Apr-2024										
ID	REQUIREMENT INFORMATION					RELATIONSHIP TRACEABILITY				
	CATEGORY	REQUIREMENT	PHASE	PRIORITY	DESIRED BY	OBJECTIVE	DELIVERABLES	ASSOCIATED WBS	VERIFICATION	PERFORMED BY
1	Mandatory	Create armrest undermount brackets to secure multi-function mount to wheelchair	Execute	High	Wes Price	To maximize utility	Design	1.3.2	Check final design	Design Team
2	Mandatory	Create a universal cross bar mount such that it accommodates different widths	Execute	High	Wes Price	To maximize utility	Design	1.3.2	Check final design	Design Team
3	Mandatory	Create a universal mounting device that accommodates different accessory attachments rifle mount nerf gun mount binoculars spotting scope camera (phone or SLR style or GoPro)	Execute	High	Wes Price	To maximize utility	Design	1.3.2	Check final design	Design Team
4	Mandatory	Develop outreach and advertising of availability program – includes videos and marketing material.	Execute	Low	Wes Price	To increase awareness and demand	Marketing and website	1.6.1	Website and associate contents	Marketing Team
5	Mandatory	Financial project controls maintained by Wes	All	High	Wes Price	Compliant to organization policies and procedures	Budget and cost reports	1.1.3	Monthly reports	Accounting
6	Mandatory	Mount to be made of corrosion resistant material	Execute	Med	Ruger Johnsen	Increase reliability	Design	1.3.2	Check final design	Design Team
7	Mandatory	Utilize existing material for construction (ie do not invent or develop new material)	Execute	High	Ruger Johnsen	Optimize cost and schedule during R&D	Design	1.3.2	Check during concept reviews	Design Team
8	Should Have	File sharing site needs to have a balance of security and ease of access	All	Med	Ruger Johnsen	Ensure team uses current version of documents and access has little 'friction'	Document deliverables	1.6.3	Periodically check content and access	Marketing Team
9	Should Have	Facilitate procurement process i.e. make it easy for one person to prepare a quote and purchase	Execute	Med	Ruger Johnsen	Facilitate accurate purchasing on time	Material Purchasing	1.4.1	Monthly audits	PM
10	Mandatory	Maintain non-profit status	M&C	High	Wes Price	Future viability of organization	Budget and cost reports	1.1	Monthly reports	Accounting
11	Mandatory	Rotatable mount (360 degrees vertical axis and +/- 20 degree vertical)	Execute	Med	Wes Price	To maximize utility			Check final design	
12	Should Have	Balance good quality products within the \$1500 max budget per mount	Execute	Med	Wes Price	Maximize appeal	Outreach	1.6.1	Check go-live version	Marketing Team
13	Nice to Have	Offer different 'trim' levels that reflect added features, quality and cost	Execute	Low	Wes Price					
14	Should Have	Design software	Execute	Low	Wes Price		Design	1.3.2		
15	Should Have	Be able to power actuators from either dedicated power supply for the mount or from the chair power supply	Execute	Med	Wes Price	To maximize utility	Design	1.3.2	Check final design	R&D Lead
16	Mandatory	Linear actuators need proportional control with ability to individually adjust	Execute	High	Wes Price	To maximize utility	Design	1.3.2	Check final design	R&D Lead
17	Mandatory	movement in vertical and right-left planes	Execute	High	Wes Price	To maximize utility	Design	1.3.2	Check final design	R&D Lead
18	Mandatory	Get team leaders to buy-in to project organization and roles	Planning	High	Ruger Johnsen	maximize effectiveness of team	various	all	Check KPIs	PM
19	Should Have	Weekly meetings to proceed regardless of attendees available	All	High	Ruger Johnsen	maximize effectiveness of team	meeting minutes	1.1.1.1	Check minutes	PM
20	Mandatory	Ease of assembly and disassembly by non-technical individuals	Execute	High	Wes Price	To maximize utility	Design	1.4	Check final design	PM
21	Mandatory	Reliable electronic controls system for trigger solenoid and linear actuators	Execute	High	Wes Price	To maximize utility	Design	1.4	Check final design	PM
22	Should Have	Wire management system such that wires are secured and tidy. Consider routing inside tubing or a loom.	Execute	High	Orrin Bigelow	To maximize utility	Design	1.4	Check final design	

APPENDIX E: STAKEHOLDER REGISTER

Multi-functional Wheelchair Mount Project															
12-Apr-2025	Identification Information					Assessment Information			Classification		Communication				
Stakeholders	Organization	Position	Role	Phone	Email	Major requirements	Project Involvement Expectations	Primary Concerns	Classification	Key influencers /relationships	Mode	Location	Frequency	Level of detail	Other helpful info
Wes Price	Bonus Years	President, Treasurer	Sponsor, Accounting, Testing	907-720-8900	wes@thebonusyears.org		Direct involvement in all aspects	Maintaining 501(c) (3) status	4	Wes and Grant are good friends	TEAMS	Idaho	1/wk		
Grant Smith	Bonus Years	Vice President	R&D Lead	907-365-9248	granteverettsmith@gmail.com			conflicting priorities between PM686 deliverables and completing project	4	Wes and Grant are good friends		ANC	1/wk		
Phil Wright	Bonus Years	Secretary	Board member					Maintaining 501(c) (3) status	2			AK			
Orrin Bigelow	Bonus Years	Director	R&D member	208-249-7527	orrin.bigelow@gmail.com				4	Family friend of Wes		HAWAII			
Matt Lindberg	Bonus Years	Director	Borad member					Maintaining 501(c) (3) status	2	Grant and Matt are brother in-laws		AK			
Ruger Johnsen	UAA	Project Manager	PM, R&D member	907-297-8291	ruger.johnsen@hilcorp.com				4	Coleague and friend of Grant		ANC			
LuAnn Piccard	UAA	Advisor	project advisor	970-443-1917	lpiccard2@alaska.edu	follow course plan and expectations	Academic advisor	quality and timeliness of deliverables	1	UAA colleagues		ANC			
Nasim Bahari	UAA	Committee member	project advisor	647-444-2679	nbahari@alaska.edu	follow course plan and expectations	Academic advisor	quality and timeliness of deliverables	1	UAA colleagues	Zoom	TOR			Virtual is good b/c share screens
Valeri Pettit	UAA	Committee member	project advisor	907-830-0349	Vnpettit@alaska.edu	respectful use of time	technical advisor on PM activities	efficient use of time	2	UAA colleagues	text phone email	ANC			Avoid Wednesdays I will be unavailable from March 8th through March 16th
Corbin Rowe	UAA	Machinist	Help with fabrication & design	907-903-0790	dcrowe3@alaska.edu				3			ANC			
Tim Kirk	UAA	Facility Mgr	UAA shop interface	907-786-1981	rkirk5@alaska.edu				2			ANC			
Griffen Judi		Aluminum Welder	Fabricator						2						
Pat Connelly	Baker Welding	Steel Welder	Fabricator						2						
Will Sands		Testing	Tester						2						
Greg Mann		Testing	Tester						2						
	Craig Hospital														
TBD	Idaho ME	Retired dude	3D modeling and drafting						2						
Beth Herman	Beth Herman Designs		Marketing						2						
Jonathan Flemming		Marketing	Designer												

APPENDIX G: CHANGE MANAGEMENT LOG

MULTI-FUNCTIONAL WHEELCHAIR MOUNT PROJECT									
PROJECT CHANGE LOG									
Revision: 12-Apr-2025									
ID	DESCRIPTION OF CHANGE	SCOPE: EXISTING [E] OR NEW [N]	REASON FOR CHANGE	IMPACT SCHEDULE [T], COST [C], QUALITY [Q], PERFORMANCE [P]	INITIATED BY	INITIATION DATE	APPROVED BY	APPROVED DATE	CHANGE ADOPTED [Y/N]
1	Focus the use of the mount for a hunting rifle	E	If the mount can work with a hunting rifle, it can work for other devices.	T & C: reduction due to optimization	Sponsor	3/15/2024	PM	3/15/2024	Y
2	Change literature review focus to PM and leadership in volunteer environments	E	Improved alignment with project research needs and resource constraints	T & C: reduction of 20 to 40 hrs	PM	3/23/2024	PM	3/23/2024	Y
3	Make frame of mount out of 80/20 material	E	Best available material	-	R&D Lead	3/20/2024	PM	3/29/2024	Y
4	Use Dimension Engineering Sabertooth 2X12 controller	E	Best controller identified to date	-	R&D Lead	3/29/2024	PM	3/29/2024	Y
5	Remove the formal design of the Generation 'A' unit from the project	E	By building off of the proof-of-concept unit and not deviating significantly, the need for a design is not justified.	Q: removed design calcs and drawings T: reduced schedule 4-6 weeks C: reduced cost by \$1000	R&D Lead	5/20/2024	Sponsor	6/20/2024	Y
6	Remove the Design Specification from project	E	Not required as the project will make Generation 'A' unit using trial & error process	Q: removed deliverable T: reduced schedule by 8 weeks	R&D Lead	6/10/2024	PM	6/20/2024	Y
7	Investigate use of Gearworks head for mount	N	Extension of R&D project work	P: new style of mount that may not work with hunting rifle C: additional 60 hrs of R&D time	Sponsor	7/24/2024	PM	7/24/2024	Y
8	Delay project completion to June 2025	E	Work progressing slower than planned	T: delay of 5 months	PM	8/20/2024	Sponsor	8/20/2024	Y
	Remove the formal change request from MOC process and review and approve changes using emails & meetings. Track in Change Log.	E	Reduced paper work load on team	C: decrease in paper work	PM	9/21/2024	Sponsor	9/21/2024	Y
9	Do not prepare a written testing plan per PMP. Instead, improvise what needs to be tested during field testing exercise.	E	Reduced workload as project ran out of schedule time to complete before start of testing.	T: reduction of 8 hrs T: keep testing on schedule, otherwise, 2 week delay	Sponsor	10/15/2024	-	-	Y
10	Use 'CM' = Chair Mount nomenclature to mount models	N	Satisfies naming convention need	-	R&D Lead	11/9/2024			N
11	Purchase 3D scanner	N	Needed to reverse engineer parts	C: increase in \$8000 Q: new	Sponsor	10/2/2025	PM	19/3/2025	Y
12	Added 'reliability of electrical control system' to RTD	N	Controls and electrical issues during testing	P: added testing requirement	Sponsor	1/14/2025	PM	14/2/2025	Y
13	Delay project completion to Sept 2025	E	Work progressing slower than planned	T: delay of 3 months	PM	4/3/2025	Sponsor	4/3/2025	Y

APPENDIX H: ACTION ITEM LIST

ACTION ITEM LIST								Saturday, April 12, 2025
ID	OPEN/CLOSED	DESCRIPTION	PRIORITY	ASSIGNED TO	INITIATION DATE	DUE DATE	STATUS	RESOLUTION
1	Closed	Determine which chairs we want to integrate the Gen 1 mount with	Med	Wes	29-Mar-2024	12-Apr-2024		Permobil F3 & F5 chairs Magic MobilityV4 & V6 chairs Quickie wheelchairs (various) Action Track chairs
2	Open	Investigate funding options from firearms manufacturers	Med	Wes	29-Mar-24	12-Apr-24		
3	Closed	Identify individuals through UAA to perform drafting and design	Low	Ruger	29-Mar-24	12-Apr-24	Apr 12: Tim to reach out to his contacts. Changed to low priority b/c preference is to pursue Wes' contact in Texas	Determine not required whith Scott joining the team
4	Open	Prepare a baseline project budget	Med	Wes	2-Apr-24	10-Apr-24	Wes to draft, Grant to finalize	
5	Closed	Set up Office 365 common file repository & file sharing	High	Wes	2-Apr-24	5-Apr-24		Bonus Years Mount Project
6	Closed	Reach out to UAA Machine Shop for access	Med	Ruger	4-Apr-24	18-Apr-24		
7	Closed	Determine which drafting software to use	Med	Scott	8-May-24	22-May-24		Use Solidworks
8	Closed	Determine is Gearworx is feasible	Med	Scott	22-May-24	5-Jun-24	26-Jun: no inventory. Do not know	Gearworks head a good idea. Defer
9	Closed	Ship Gen A unit to Wes	High	Grant	25-Sep-24	2-Oct-24		Shipped FedEx
10	Closed	Fix wiring prior to field testing	High	Orrin	25-Sep-24	9-Oct-24		Replaced failed servo switch
11	Closed	Issue field testing results	Low	Wes	13-Nov-24	27-Nov-24	27-Nov: in progress	Submitted to Grant for evaluation
12	Closed	Solicit feedback on Peel 3D scanner	Med	Orrin	21-Mar-25		Feed back from Orrin was not for the	Wes to purchase the PEEL ASAP
13	Closed	Pay UAA for machining services	High	Wes	14-Mar-25			
14	Closed	Send photos of binding marks on Gen A mount	Low	Wes	4-Apr-25	25-Apr-2025		Determined the result was mismatched blocks
15	Closed	80/20 surface options	Low	Ruger	4-Apr-25			Available in black (instock) or custom
16	Open	80/20 CAD files	Low	Ruger	4-Apr-25		80/20 website has ACAD and SW design plugins and files	
17	Open	Identify individuals who can use Solidworks	High	All	9-Apr-25			
18	Open	Revisit the decision to use Solidworks exclusivley or Autocad, Inventor or Fusion	High	All	9-Apr-25			
19								
20								

APPENDIX I: DECISION LOG

DECISION LOG					Saturday, April 12, 2025
ID	DECISION	MADE BY	DATE	REFERENCES	REQUIRED FOLLOW UP
1	Use 80/20 rail system for fabrication	Ruger	28-Mar-2024	Meeting with UAA fab shop	Add to Design Specification
2	2 pm AKST Wednesday for weekly team meetings	Wes	29-Mar-2024	MoM 240329	Send out invites
3	Project not eligible for Christopher Reeves Foundation funding	Wes	29-Mar-2024	Project is developing a new product which is not in the foundation mandate	
4	Use firearm as the design criteria for the mount	Wes	29-Mar-2024		
5	Improve wiring management on mount	Wes	29-Mar-2024		Add to RTM
6	Move weekly meetings to 2 pm Wednesdays	Ruger	15-Apr-2024		
7	Proceed with Anaheim -style actuators	Grant	15-Jun-2024	bench test results	confirm same mounting hardware
8	Use both metric and imperial hardware	Grant	20-Aug-2024		
9	Improve wiring management on mount	Wes	29-Jan-2025		Add to RTM
10	Solidworks license on Wes' computer	Wes	10-Mar-2025		