

IRON CLAW ROBOTICS

LOS GATOS HIGH SCHOOL



Business Plan

2017-2018

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1.0 EXECUTIVE SUMMARY

Mission Statement

"To build and foster a student-led environment where members develop the STEM, business, leadership, and collaborative skills crucial to innovation in society"

Team 972 was founded with a strong belief in the importance of student leadership. All aspects of our team—designing and building our robot, training members, fundraising, and hosting outreach events—are coordinated by students. We strive to create a hands-on learning experience for all of our members.

Throughout the fall, student leaders develop extensive curricula for members in their respective fields and teach it in a manner applicable to build season. The culmination of this preseason training is a “mini build season” where we design a game and challenge newer members to step up and apply the skills they learned in the fall. Throughout their training, members work with industry-level machines and software thanks to our access to the invaluable LGHS metalshop and woodshop.

Our cultivation of a student-led environment has extended beyond our team and inspired interest in STEM and FIRST throughout our community. Each spring we demonstrate our robot at local elementary school science fairs to spark interest in FIRST among younger children. We also believe strongly that people should be able to pursue STEM regardless of their backgrounds, and thus we have recently expanded our outreach program to include community service events for the disadvantaged. As our outreach program further develops, we endeavor to maximize the impact of our efforts in the lives of future technology leaders.

Purpose of Our Business Plan

This business plan establishes our mission, formalizes our plans for how we both operate and grow, and outlines our goals for the future.

2.0 TEAM INFORMATION

2.1 Team Overview

Rookie Year	2002
Location	Los Gatos, CA
School Affiliation	Los Gatos High School
Team Demographic	<p>44 Students (up from 20 students Rookie Year)</p> <ul style="list-style-type: none"> • 12 girls, 32 boys • 14 Freshmen, 10 Sophomores, 5 Juniors, 15 Seniors
Mentors	<p>17 Mentors</p> <ul style="list-style-type: none"> • 7 Technical • 5 Operations • 2 Teachers • 3 Alumni
Sponsors	Los Gatos-Saratoga Union High School District, LGHS NMF, BAE Systems, Intuitive Surgical, Department of Defense, The Brin Wojcicki Foundation, Qualcomm, Nvidia, Atlas Technology Group, Rotary Club of Los Gatos, Kiwanis Club of Los Gatos, Facilitron, Hall & Burnett Orthodontics, Now & Forever Studios, BR Racing, Facilitron, Digital Media Academy, Aeronet Worldwide
Community Impact	Blossom Hill Elementary Science Fair, Van Meter Elementary Science Fair, Daves Avenue Elementary Science Fair, Fisher Middle School Robot Demonstration, Shining Stars, Sunday Friends
Website	ironclaw972.org
Social Media	<p>Instagram: @ironclaw972</p> <p>Twitter: @ironclaw972</p> <p>Facebook: @ironclaw972</p> <p>YouTube: Iron Claw Robotics</p>

2.2 Team Origin

Team 972 was founded in 2002 at Los Gatos High School in Los Gatos, California. After competing for six seasons and an eight-year hiatus, the *FIRST* Robotics Competition program was brought back in the fall of 2015 by a group of LGHS juniors who had been a part of Pioneer High School's Team 668.

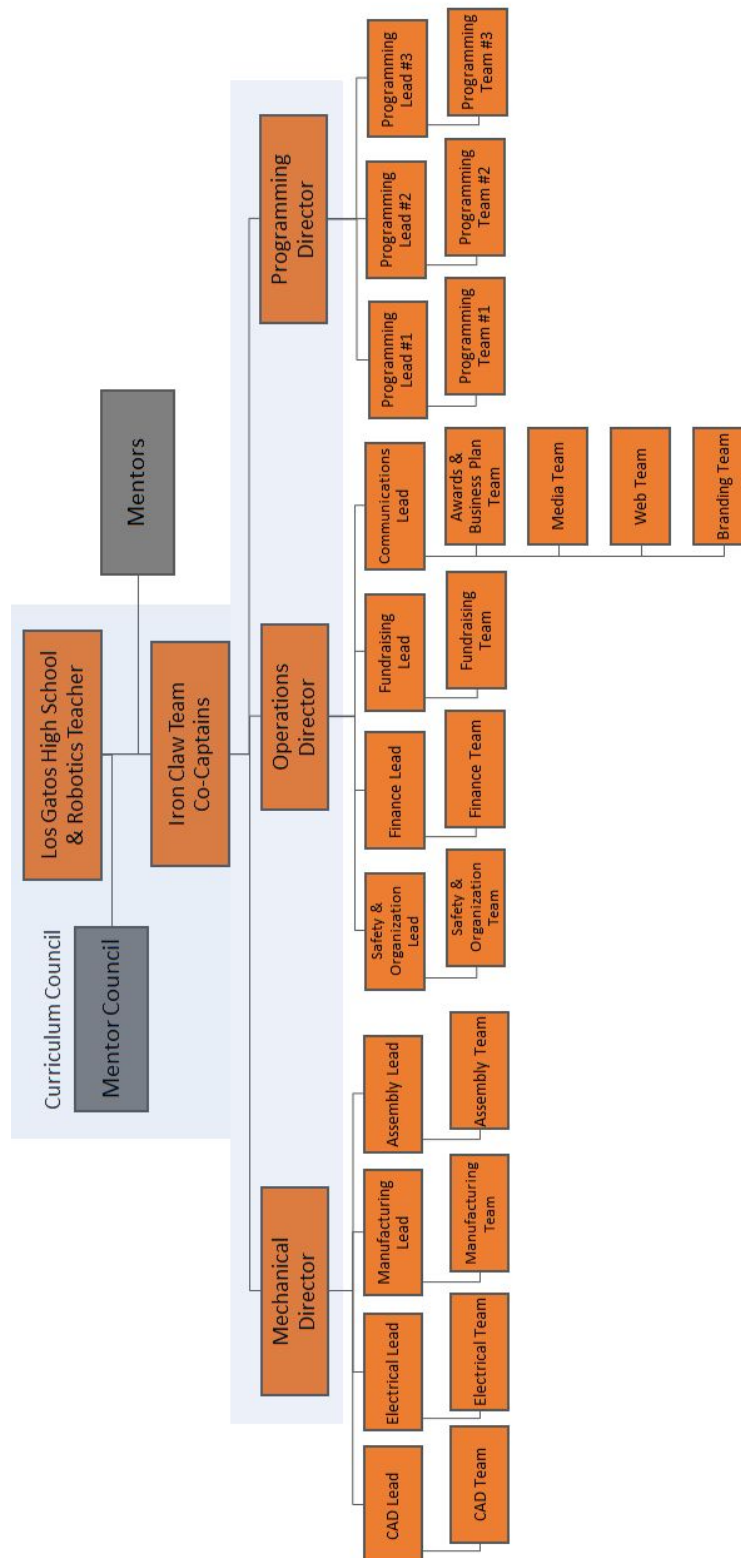
With the new name, Iron Claw, we established ourselves with the core principles of student-leadership and hands-on engagement. The loose organization of being a school club served our purpose in this start-up season, but structure was soon needed to ensure the team's longevity. Our access to the LGHS metalshop and woodshop was not secure with the school administration, and our mentors were mostly parents of graduating seniors.

To help solve these problems and ensure we avoided the fate of the original Team 972, this year we established as a unique class held during a period in which no other classes are held. Though the core operations of the team have stayed consistent, our connection to LGHS through our robotics teacher ensures we have long-term mentor support as well as improved organization of facilities.

Since our restart in 2016, our team has grown 100%, from 20 students to 40. As we head into our third season in 2018, we are better-equipped than ever for success both at competitions and in achieving our goals.

3.0 Organizational Structure

3.1 General Team Organization



3.2 Team Responsibilities

Student Members
Students interested in joining Iron Claw sign up for the Robotics Class at LGHS and are then given information about the team's objectives as well as the expectations for our members. No prior experience is required to join the team: we teach our members everything they need to know.
<p>Students...</p> <ul style="list-style-type: none">• Design, build, test, and field robots.• Make design decisions for all robots.• Raise funds and communicate with sponsors.• Maintain website and conduct media outreach.

Student Leadership Council
The Student Leadership Council is comprised of the team captains and student leaders. Membership is decided by the the previous year's student leadership council based on the extent of contribution and ability to collaborate with and lead members. The objective of the Student Leadership selection process is to form a group of leaders whose individual skills best serve their respective subteams and whose collective skill best progresses the team as a whole.
<p>The Student Leadership Council...</p> <ul style="list-style-type: none">• Plans and manage all aspects of the FRC program• Delegate work and organize students into subteams• Define organizational structure and member roles• Coordinate with teacher and mentors to create and approve class curriculum• Consult with mentors for key decisions

Mentors

Mentors are comprised of parents, teachers, alumni, and volunteers. All individuals interested in volunteering their time to the team are welcome to become mentors.

Mentors...

- Provide technical advice and safety oversight
- Oversee budgeting and fundraising
- Advise the team on communications and management issues.
- Provide support for executing logistical plans
- Are not involved in the hands-on designing, building, or programming of the robot.
- **DO NOT:**
 - Design, build, or program any robot.
 - Alter the organization of team leadership roles
 - Modify the student-led nature of the team.

Mentor Council

The Mentor Council is the group of mentors support general team operations, logistics, funds, and facilities. They frequently work with the Student Leadership Council (together known as the "Steering Committee") to make broader team decisions requiring careful consideration.

The Mentor Council...

- Offers suggestions and support for student plans and decisions.
- Enforces rules and resolve conflicts as needed.
- Works with student leads to ensure that the machine shop is clean after meetings and that tools and equipment are not lost.
- Ensures the safety and well-being of all students on the team.
- Is liaison with FIRST, the high school, district, other parents, and mentors.

3.3 Student Leadership Responsibilities

Team Captains:

- Coordinate interaction between sub-teams and team leads
- Create schedules both for build season and off-season meetings
- Keep the team on schedule
- Solve team-wide problems and ensure team unity
- Complete big-picture roles (i.e. competitions, logistics, budget, business plan)
- Guarantee engagement and training of all members
- Assign designated leads as necessary for the completion of a task
- Anything that does not fall under the roles of other team leads
- Be responsible for project management
- Work with teacher on class curriculum

Mechanical Director:

- Coordinate interaction between mechanical leads and their sub-sections
- Communicate mechanics to the programming team
- Ensure proper technical training for all members of the mechanical team
- Ensure constant engagement of all mechanical members
- Ensures timely completion of both the main subsystems of the robot as well as the robot itself
- Works with budget captain, team captains, and design lead to ensure that the team orders the parts necessary to build the robot

Programming Director:

- Ensures the programming equipment is in working conditions and has the latest firmware/software
- Ensures proper completion of sections of the code and integrates them into a cohesive, working program
- Guides the program as a whole based on the determined strategy & design
- Ensures proper training and engagement of all members of the programming team
- Works with the electrical lead in ensuring the integration of electrical components
- Ensures that the programming team will have time to test code with the robot towards the end of build season
- Communicates with the mechanical team to ensure correct implementation of a program

Operations Director:

- Coordinate interaction between operations leads and their sub-teams
- Handle communications and delegate certain communications tasks; e.g. website and social media management
- Prepares logistics for team competitions, demos, and other events
- Work with the teacher and other members of the curriculum council to create class curriculum

CAD Lead:

- Follows the design decision made by the team at the start of build season
- Unless a change is agreed upon in the leadership team
- Trains new members about CAD software and good design strategies and practices.
- Delegates CAD assemblies and ensures their timely completion
- Leads the integration of individual assemblies into a final assembly
- Works with the other mechanical leads to ensure feasibility of all parts
- Communicates with the mechanical director and the rest of the team the status of the design

Electrical Lead:

- Oversees proper implementation of electrical systems and pneumatics into the robot
- Works with the mechanical team to design and assemble the electrical board as well as other electrical components on the robot
- Works with the programming team to wire up sensors and other electrical components as necessary
- Trains members about crimping, soldering, fitting pneumatics, and other electrical skills
- Ensures completion of electrical tasks in a timely manner when necessary

Manufacturing Leads:

- Manages the manufacturing of parts corresponding to the design
- Obtains plans for parts and orders them in terms of relevance and significance
- Works with the CAD Lead to ensure the feasibility of all parts
- Trains all members interested in manufacturing on the machines
- Ensures that anyone working on the machines has passed the necessary tests
- If any members of the team have difficulty or are unsure on how to complete a part, the lead will demonstrate how to do so
- Keeps manufacturing on schedule and works with the Mechanical Team to create fallback plans if necessary
- Assists with manufacturing if the team is low on members or behind in schedule

Assembly Lead:

- Conducts the assembly of parts from manufacturing for a final, built robot
- Is knowledgeable in the specifications of tools, materials, and assembly techniques
- Teaches specifications of the tools, materials, and assembly techniques
- Trains members in efficient & proper assembly of prototypes & robot parts
- Advocates for the time necessary for assembly toward the end of build season
- Keeps assembly on schedule as parts come from manufacturing
- Helps with CAD of the parts being integrated & ensures feasibility of assembly
- Distributes jobs between the entire assembly team and ensure they are finished both on time and with the quality expected of them

Safety & Organization Lead:

- Ensures safety in both the school workshops and the pit at competition
- Completes inventory of parts and tools when deemed necessary
- Organizes the sheds, storage containers, and metal & wood shops with the help of other team members if necessary
- Manages clean up and organization at the end of each meeting and event

Finance Lead:

- Works on the bookkeeping aspects of the budget
- Ensures organization and accuracy of budget-related documents and folders
- Works to enter receipts and appropriate donations into the proper spreadsheets in a timely manner
- Works with the budget captain to complete reimbursements in a timely manner

Fundraising Lead:

- Works with team captains to create a fundraising goal and manages its execution
- Delegates and refines outreach to local businesses & organizations as well as corporations (grants, sponsorship requests, sponsor outreach)
- Secures new sponsors and develops a lasting relationship with prior sponsors
- Ensures appropriate amounts of new member involvement in fundraising
- Communicates with the team captains and budget captain about funds raised
- Serves as liaison with companies providing sponsorship or mentorship

Communications Lead:

- Develops and maintains consistent Iron Claw branding (logo, slogan, etc)
- Manages team apparel and enforces competition dress code
- Publishes regular, scheduled posts on social media
- Develops and maintains team website and blog
- Oversees business plan and other awards submissions

Programming Leads:

- Provides proper training to new programmers
- Oversees coding on assigned subteam, manages pull requests, and delegates programmers
- Interfaces with programming captain to create an effective code structure
- Keeps everyone engaged in the learning material and on track to contribute to the team

4.0 Operational Plan

4.1 Project Plan

The Project Plan is a task-management system we made to create new tasks, keep track of tasks, and help students find out what tasks they can work on.

The “Primary Tasks” tab highlights the tasks that are most important at the moment. Each row represents a task, and it includes the sub-team to which it is assigned, the name and description, the lead responsible for its completion, the members involved, the status, and the due date. The “Student Tasks” tab breaks down the tasks by student so that each student can quickly find their name and see what tasks they are involved in.

Creating a new task automatically populates in every relevant tab. We display the Student Tasks tab at the beginning of every meeting so students are aware of what they’re doing that day.

4.2 General Decision Making

- All decisions relating to team activities and robot design are made by the student leadership council and student members
- Broad decisions involving team-wide logistics, mentors, equity, or facilities are made by the steering committee

4.3 Build Strategy and Design Decisions

1. Entire team brainstorms possible strategies in groups containing both veteran and first year members
2. Each group’s strategies will be presented to the entire team and they will be compared against each other based on factors like feasibility and potential points
3. The Student Leadership and Technical Mentors will review each of the strategies and eliminate ones by either:
 - a. A two-thirds majority vote of Student Leadership, or
 - b. A unanimous vote of the Captains / Directors
4. The remaining pool of strategies will be further evaluated as a team
5. Popular vote will determine our main strategy

4.4 Communication

Relationship	Platform	Description
Inter-Team	Slack	Members use Slack to make announcements, share ideas, and ask questions through channels with specific focuses.
Student Leaders to Mentors	Email	Student leaders and mentors communicate over email to discuss logistics, supervision, and scheduling.
Team to Parents & Sponsors	Newsletter & Blog	The Team Newsletter and Blog are used in conjunction to engage parents and sponsors by updating them on what activities and projects 972 is working on.
Team to Community	Social Media (Instagram, Facebook, and Twitter)	The team posts frequently on social media platforms to update fellow robotics teams and our surrounding community with our latest projects and events.

4.5 Team Events

Events	Description	Time
Fall Member Training	Team leaders develop training curricula and members which areas they want to be trained in throughout the fall. Training involves guidance from experienced members, hands-on projects, and practice skills used in the FRC build season. Throughout their training members work with industry-level machines and software thanks to our Robotics/Engineering room and our access to the LGHS metalshop and woodshop.	September - December
Off-Season Competition	Each year we compete in off-season events (i.e. CalGames, Chezy Champs) to provide newer students the experience of working on the pit and being on the drive team.	October - November
Mini-Build Season & In-House Competition	The team leaders collectively develop an original FRC-like game and two or three teams are formed to each build a robot to compete against each other.	Early November - Mid December

Community Service Events	See <i>Community Outreach Program Below</i>	October - December
“Build-a-Bot” Fundraiser	Members are sectioned into groups and go door-to-door across their neighborhoods to see if people wish to contribute funds toward parts for future robots.	Late November - Early December
FRC Kickoff	All students, parents, and mentors gather for a brunch potluck as members review the new FRC Game Animation and begin rules and strategy discussions.	Early January
FRC Competitions	Our annual FRC robot is ultimately put to the test at competition along with our ability to strategize and adapt to change. Beginning this year we are also applying for <i>FIRST</i> awards, which are presented at competition.	Mid March - Early April
Postseason Projects	Postseason projects include advanced training in programming and mechanical, mock build seasons, and building non-FRC robots (i.e. our upcoming T-Shirt Shooting Robot designed for school and community engagement).	Late April - Late May

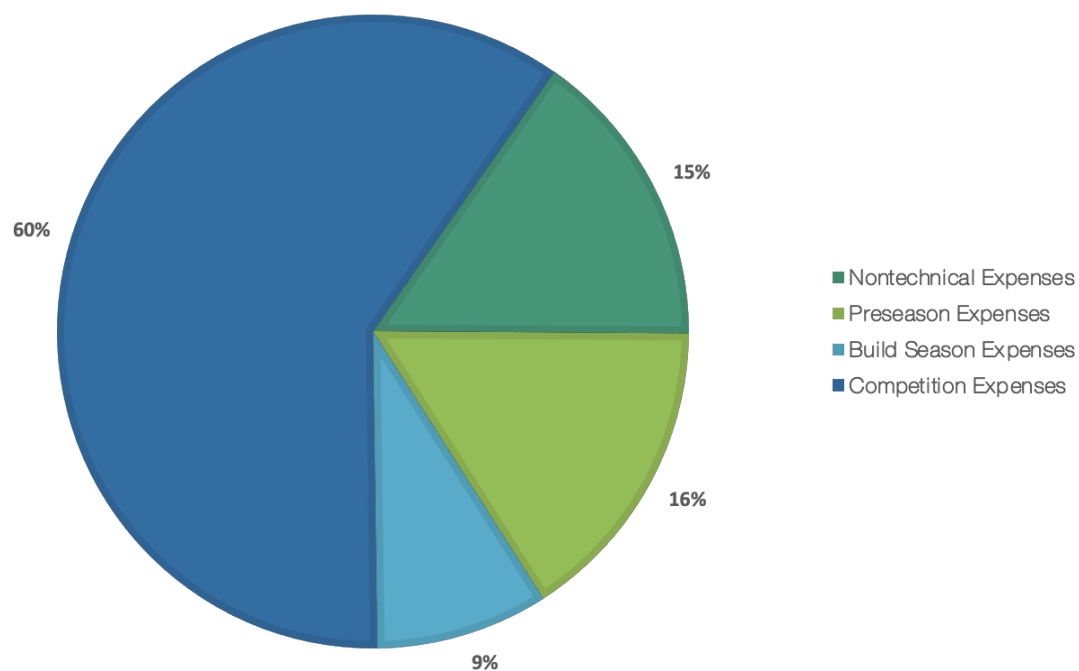
5.0 Financial Plan

5.1 Budget Overview

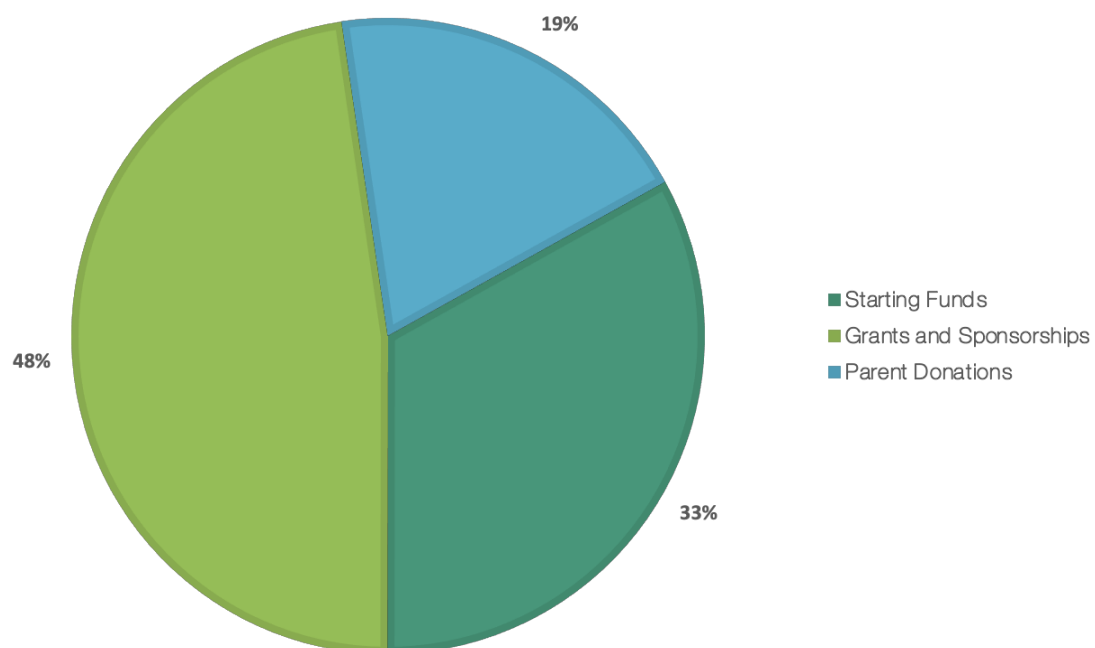
Team 972 Budget	Target	Luxury	Spent
Nontechnical Expenses			
Off Season Competition Fee	\$500.00		\$500.00
First Competition Fee	\$5,000.00		\$5,000.00
Second Competition Fee	\$4,000.00		\$4,000.00
Third Competition Fee			
Competition Expenses	\$1,500.00	\$750.00	\$50,609.28
Spirit & Marketing	\$2,500.00		\$54.06
Organization/Pit Equipment	\$2,400.00	\$500.00	\$3,436.43
Replacement of Lost Items	\$250.00		\$0.00
Technical Expenses			
Pre-Season			
T-Shirt Shooter	\$6,200.00		\$5,889.49
Robot Modifications	\$500.00	\$200.00	\$261.76
Raw Materials	\$2,000.00		\$99.79
Electronics	\$1,000.00		\$809.90
Consumables	\$1,000.00	\$750.00	\$390.25
Robot Parts	\$1,000.00		\$229.40
Tools	\$400.00	\$1,400.00	\$18.70
Programming	\$500.00		\$378.46
NMF Fall 2017	\$5,311.73		\$5,311.73
Build Season			
Raw Materials	\$2,500.00		\$1,508.88
Electronics	\$500.00		\$850.26
Consumables	\$1,250.00		\$1,207.90
Robot Parts	\$2,500.00		\$2,859.71
Tools	\$1,000.00	\$1,600.00	\$888.92
Field Element Material	\$700.00	\$300.00	\$127.49
Prototype Materials	\$700.00		\$0.00
Second Robot		\$5,000.00	
	\$43,711.73	\$53,711.73	\$84,432.41

Fundraising	
Starting Balance	\$26,782.12
Parent Donations (Wildcat Days)	\$2,370.00
Rotary Club Los Gatos Donation	\$1,000.00
Department of Defense	\$2,000.00
BAE Systems	\$1,500.00
New Millennium Foundation	\$5,878.22
New Millennium Foundation	\$5,972.24
Parent Donations (October-November)	\$8,200.00
Apple	\$5,000.00
Qualcomm	\$1,500.00
Intuitive Surgical	\$1,000.00
Facilitron	\$1,000.00
Parent Donations (December)	\$4,533.45
AndyMark Gift Certificates	\$450.00
Generations Photography	\$500.00
Atlas Technology Group	\$1,000.00
Parent Donations (January)	\$500.00
Hall and Burnett	\$500.00
Kiwanis	\$1,000.00
FIRST Clippard Voucher	\$20.00
Metal Werx Discount	\$7.50
Nvidia	\$1,000.00
Brin-Wojcicki	\$1,000.00
Atlas Technology Group	\$1,000.00
DOD	\$5,000.00
LG Police Officers Association	\$250.00
Gene Haas	\$2,000.00
Total Funds	\$80,963.53
Total Fundraised	\$54,181.41

Costs – \$84,432.41



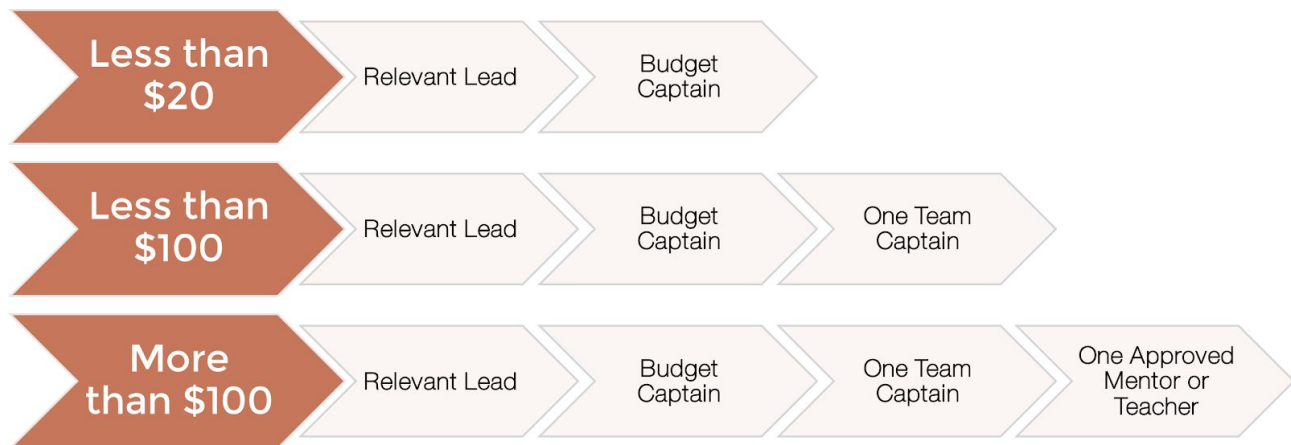
Funds – \$80,963.53



5.2 Budget Process

Task	Lead	Description	Time
Create Budget Categories	Finance Lead	Decides the organization of funds into categories (i.e. competitions, tools, consumables)	Mid August
Set Budget Amounts	Finance Lead, Team Captains	Based on spending the previous year and expected spending the current year	Mid August
Set Budget Goal	Finance Lead, Team Captains	Predict how much money will need to be spent in certain categories based on planned projects and spending in previous years	Early September
Post-Season Evaluation	Finance Lead, Team Captains	Evaluate spending in each area and see where less or more money could be used in future years	May

5.3 Purchase Approval



5.4 Fundraising Process

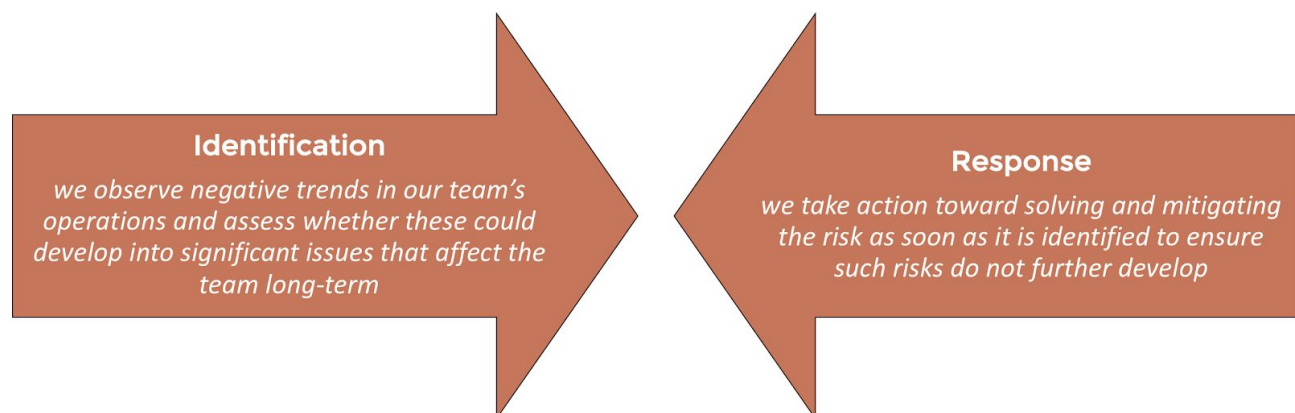
Task	Lead	Description	Time
Identify Corporate Contacts	Fundraising Lead	Polls team families for contacts within companies to “get our foot in the door”	Early September
Delegation of FIRST and Educational Grants	Fundraising Lead	Delegates sections of grants to other team leaders and non-technical members	Mid September
Review/Editing Grants	Team Captains	Review grants to check on accuracy, fluency, and influence	Late September
“Build-a-Bot”	Fundraising Lead	Team-wide fundraiser where members go door-to-door across Los Gatos to see if people wish to contribute funds toward parts for future robots	Early October
Pitches to Local Companies	Fundraising Lead	Team Leaders and interested members visit local companies and request sponsorship in person	Mid October - Mid November
Ensure Checks End up in ASB Account	Budget Lead	Keeps track of sponsorship checks to ensure the funds end up in the ASB	September - December

6.0 Strategic Risk Analysis

6.1 SWOT Analysis

Strengths	Weaknesses
<p>Student led and taught</p> <p>Accommodates new members of all abilities</p> <p>Passionate students, especially leadership</p> <p>Everything machined in-house</p> <p>Diversity of talents</p> <p>Dedicated mentors</p> <p>Fundraising</p> <p>Access to the metal shop and woodshop</p> <p>Budding emphasis on community outreach</p> <p>Excellent public speaking and communication</p>	<p>Retention rate</p> <p>Leisure time and staying on task</p> <p>Technical documentation</p> <p>Overambitious planning</p> <p>Responsibility with tools</p> <p>Commitment among some members</p> <p>Inefficiency in ordering parts and materials</p> <p>Few relationships with other teams</p>
Opportunities	Threats
<p>Supportive Administration/Class</p> <p>Growing alumni group</p> <p>Expanding community outreach program</p> <p>Robotics Summer Camp</p> <p>Fisher Middle School FTC</p> <p>Potential long-term sponsors</p> <p>Social Media Presence</p>	<p>Relationships with teachers and mentors</p> <p>Potential division between subteams</p> <p>Maximum member capacity due to facilities space</p> <p>The potential loss of student interest</p> <p>Security and storage of materials</p> <p>Lack of dedicated nontechnical members</p>

6.2 Mitigating & Resolving Risks



7.0 Community Outreach Program

7.1 Elementary School Science Fairs

Every year a few of our members demonstrate our competition robot at local elementary school science fairs where we spark interest among younger students in Los Gatos' FIRST Lego League (FLL) teams.

7.2 Community Service Organizations

Recently we expanded our outreach program to reach new audiences. We participated in two community service events: Shining Stars, an organization that benefits children with disabilities, and Sunday Friends, an organization that supports low-income families. We let children experience driving our robot, we explained the technology behind it, and we handed out flyers with resources for students to learn more about robotics skills such as programming.



8.0 Future Goals

We organize our distinct plans in a “Future Goals” document that outlines the projected completion dates for all our goals so we can both create and keep track of our goals. Here are some of our primary goals for the next few years.

Robot Demonstrations for Sponsors

One of our plans is to improve the meaningfulness of partnerships with sponsors next year by extending our robot demonstrations to all local sponsors: seeing is believing!

Improve the Engagement of New Members

Though we provide opportunities for all members to engage in team projects, some lack the confidence to assert themselves. Accordingly, we plan to improve the engagement opportunities for newer members next season by identifying specific areas of the CAD, code, machining, and assembly that can be done entirely by them.

Develop a Dedicated Nontechnical Team

Our team’s heavy technical focus gives many members the impression that building robots is all we do. Team veterans, however, know that there is far more that goes into operating the team and that there are nontechnical opportunities we have not even yet pursued. As such, over the next two years, we plan to develop a nontechnical team capable of handling not only fundraising and outreach but also the submissions of FIRST awards like Chairman’s.

Expand our Outreach Program

Our next steps in our outreach programs are to provide opportunities for students of all ages to pursue FIRST robotics. We are currently planning a camp this summer to teach elementary and middle school students applicable skills in robotics engineering.

We also recently contacted Fisher Middle School’s principal to start and mentor an FTC team there next fall. This will bridge the gap between FLL teams and our team, and thus would create a comprehensive FIRST robotics pathway in Los Gatos.

