

Running a *FIRST* Team

Karthik Kanagasabapathy – November 14th, 2007



Karthik Kanagasabapathy

- 10 years of *FIRST* experience
- Lead Mentor for Team 1114, 2004-present
 - 7 regional championships, 2 regional finalists
 - 2006 Waterloo Regional Chairman's Award
 - 11 *FIRST* judged awards
- 2005 Waterloo Regional Woodie Flowers Award Winner
- Member of the FTC Game Design Committee
- Emcee for the Canadian Regionals

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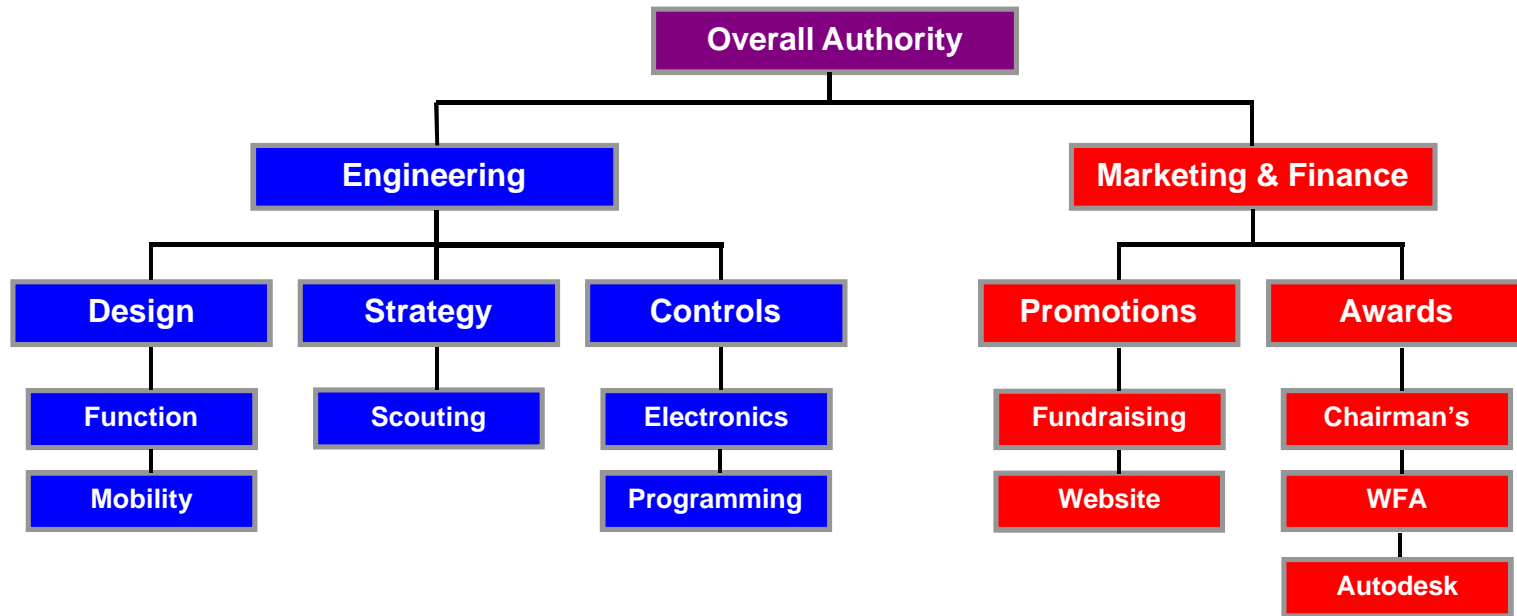
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- A *FIRST* team is much like a business
 - Work needs to be filtered through a hierarchy
 - Too much for one person to do on their own
- A strong partnership is needed between students and mentors
 - *FIRST* is not a science fair, students are not expected to, nor should they, do everything on their own
- Assign leaders to each sub-team
 - Creates a sense of ownership and responsibility

Sample Org Chart



Engineering

- “The Robot Team”
- The engineering leader is the overall authority when it comes to all robot related decisions
- Co-ordinates between the three engineering subteams, and ensures areas of overlap are taken care of (crucial)

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Design

- Responsible for the mechanical design and build of the robot
- “Makes the robot do what it’s supposed to do”
- Usually broken down into two areas
 - Mobility – the drive base
 - Function – the mechanisms
- Takes design directives from the strategy team
- At competition, responsible for maintenance and upkeep of the robot

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Strategy

- Responsible for the strategic design
- “What should the robot do”
- Analyzes the game and determines the game strategy
- At competition, they are responsible for match planning and execution
 - The drivers & coach should be a part of this team
- Scouting
 - Gathering information about opponents to help decide on match plans and alliance selection

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Controls

- Responsible for making a mechanically sound robot work
- Electronics
 - Wiring the robot and installation and design of all sensors
- Programming
 - Writing the code that allows the drivers to interface with the robot.
 - (or in the case of autonomous mode, the code that allows the driver not to interface..)



Marketing & Finance

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- “The Business Side”
- Often overlooked and neglected
- This section of the team, allows the engineering side to function
- Brings funding, recognition and distinctions to the team
- A great opportunity to expose students to science and technology
- Manages the teams books



Promotions

- Responsible for getting the team publicity in the community and at competitions
- Designs team logos, literature, and anything else to help the team establish a brand
- Fundraising
 - Raise money to finances the operation of the team
 - Much more on this later in the presentation
- Website
 - Essential for publishing team information, for both members and the public
 - *FIRST* awards the best website at each regional



Awards

- Responsible for the preparations of submissions and accompanying documentation for awards
- Most *FIRST* awards do not require a submission
 - Having a handout or display for the judges never hurts!
- The Chairman's Award
 - The highest honour in *FIRST*
 - Requires a written submission and a presentation
 - Rookie teams are not eligible, but a written submission directed towards the CA will be considered for the Rookie All-Star award



Awards

- The Woodie Flowers Award
 - Awarded to a mentor for distinguished service in communication and inspiration of his/her students
 - Teams select one mentor to nominate
 - Requires a 600 word essay
 - One winner at each regional event, and an overall winner at the Championships in Atlanta
- The Autodesk Award
 - Best animation
 - Best 3D robot design
 - Software is provided in the kit of parts
 - A huge amount of work, very rewarding



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- You don't need to have subteams for each area
 - There's lots of duplication. Choose based on the amount of students and mentors you have available
- The same goes for the award submissions
 - Don't bite off more than you can chew
- Try to have a mentor for each subteam
 - Recruit parents, industry professionals, anyone who might be interested.
- Don't restrict your team to "techies"
 - Lots of different skill sets are required for a successful team

Managing Build Season

- Now that you have a team structure in place, it's time to get started
- For most of you, this is the largest project you have undertaken
- There is a hard deadline – Ship Date
- The only way to succeed is to manage your time effectively

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Timeline – The Beginning

- Build season – 6 weeks and 3 days
 - You must stay on schedule. There's no time to fall behind
- Week 1
 - Brainstorming – Days 1-4
 - Design Freeze – Day 5
 - Established robot design
 - Mobility system frozen
 - Frozen means no more changes!!
 - General ideas for all mechanisms
 - Mechanism Prototyping – Days 5-8
 - Build Drive System – Days 5-14



Timeline – The Middle

- Week 2
 - Mechanism Build – Days 8-21
 - Programmers Begin Coding – Day 8
 - Can & should start pseudo-coding earlier
 - Robot Controls – Days 8-14
 - Drive System Complete – Day 14
 - Having the robot moving early is crucial!!
- Week 3
 - Begin Autonomous Testing – Day 15
 - Most *FIRST* autonomy only involve the chassis



Timeline – The End

- Week 4
 - Mechanism Integration – Days 22-28
 - Wiring is not a quick job
- Weeks 5-6
 - Robot Done – Day 29
 - Testing & Perfecting – Days 29-40
 - Not as easy as it sounds
 - Weight Reduction
 - Driver Training – Days 29-40
 - “Practiced drivers make bad robots win, and unpracticed drivers make good robots lose”





Timeline – Loose Ends

- The Last Few Days
 - Decorations
 - Parts Inventory
 - Photographs
 - Packing The Crate
 - Celebration
- General Tips
 - Perfectionism can kill the schedule
 - “Never let perfectionism get in the way of getting a good job done”
 - Your real lives are more important that *FIRST!*
 - Your family and marks come *FIRST!*
 - “All robots and no sleep make Johnny go crazy”

Fundraising

- *FIRST* is an expensive venture
- To ensure the best possible experience, funds must be raised
- Contact local businesses, teach them about *FIRST*
 - Send out promotional packages
 - Interactive DVD's are great items
 - "A picture is worth a thousand words"
 - Displays at community events, shopping centres
 - Monetary donations are great, but so are in-kind donations
 - Parts, tools, even space



Fundraising

- Small scale projects also work
 - Car washes, selling chocolates, silent auctions...
- Team membership fees are a good way to create initial funds
 - Can be refunded if fundraising is very successful
- Every person you know is a potential donor, leave no stone unturned
 - Work your connections!
- Get prospective sponsors out to an event
 - Fundraising can happen year round

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Miscellany

- In any project of this size, there are always areas of surprising importance which are overlooked
- Remember, this project is probably bigger than it seems

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Suppliers

- Building a FIRST robot requires various materials and parts
- A local supplier of parts is essential
 - Stores such as Canadian Bearing and Metal Supermarkets should be approached early
 - Develop a good rapport with the owners. Many tend to give discounts for educational projects like *FIRST*
- Walk through the aisles of Home Depot
- Ordering online
 - McMaster-Carr and SDP-SI have almost every robot part you could dream of
 - Beware of the costs of shipping and duty
 - High value of the Canadian dollar is very beneficial



Shipping

- More important and difficult than it sounds
 - If you show up at a regional, and your robot isn't there, you aren't going to do too well
- Put one adult in charge, who will track the robot shipment with vigilance
- Know all shipping regulations, especially those involving weight and dimensions
- Leave extra money in the budget in case of an emergency
 - Trust me, they happen...

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Travel

- Much like shipping, if you're not careful it can become a huge difficulty
- Book all hotels and flights early!
 - As soon as you qualify for Atlanta, start phoning airlines
 - It's cheaper to fly out of Buffalo than Toronto
- Bussing to Atlanta can be cost effective
 - Bus pool with another team
- If you're commuting to a local event, consider hotels for the key team members
 - Drivers, human players, coaches, key members



Driver Selection

- *FIRST* is like auto racing, events are not always won by the best robots, rather the best drivers
- Too important to be left to the last minute
 - Drivers need time to practice, and adjust to the pressure of the role
 - I prefer to have drivers picked before kickoff, but **never** any later than day 14

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Field Roles

- Driver (x2)
 - Responsible for all robot operation
 - Roles are usually divided with a Pilot and a Operator (Controls arms, pickup systems, etc)
 - Overlap can exist
- Field Coach
 - Responsible for planning match strategy, and communicating the strategy during the match
 - The overall decision maker on the field
 - Needs to understand the game inside and out



Driver Qualities

- **Maturity**
 - FIRST competition are stressful events, with loud music and thousands of screaming fans – the pressure is immense – your driver must be able to handle pressure
 - Dependability comes with maturity. You cannot afford to have a driver who will bail on you at the last minute
 - Consider students who've been through high level competitions – e.g. varsity athletes
 - Remember, maturity cannot be taught



Driver Qualities

- **Communication**
 - Must be able to listen to instructions from the co-driver, and more importantly the two coaches
 - The inability to follow pre and in match strategies will result in losses
- **Skill**
 - Driving a FIRST robot requires top flight hand-eye coordination
 - A good understanding of spatial relations
 - Aggression – you cannot be afraid to mix it up
 - Notice how skill comes after maturity and communication?



Field Coach Qualities

- **Fast Thinking**
 - Driver's have to be watching the robot at all times, they can't watch the whole field
 - It is up to the coach to be aware of everything happening on the field
 - Like the offensive coordinator of a football team, the coach calls the plays
 - Needs to be aware of and calculate the score quickly
 - Many matches have been won and lost by good and bad coaching



Field Coach Qualities

- **Authoritative**
 - The field coach must have the respect of his/her drivers
 - The drivers have to listen to the field coach without question – this is crucial in short 2-minute matches
 - The field coach must be able to get the team's point across in the pre-match strategy sessions
 - Teams are very pushy in these sessions, without a strong field coach, you'll end up with a plan that does not suit your team
 - I highly recommend that you choose an adult as a field coach
 - The only alternative is your most mature, strong willed and intelligent high school student



Other Tips

- Have more than one teacher involved
 - *FIRST* is a huge project, it can be too big for one teacher to administrate
- You don't have to do everything
 - Know your limits, do not try and exceed them
- Ask for help
 - There are many very able and willing people out there.
 - The *FIRST* community is very tight knit, and loves helping



Other Tips

- FIRST is a year round program
 - Fundraising, prototyping and promoting can and should go on 12 months of the year
- Stay healthy
 - The 6 week build is incredibly exhausting, if you overwork yourself, you will suffer
- Read the Rules
 - Not knowing the rules is a great way to shoot yourself in the foot with a grenade launcher
- Have fun!!!

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- General Resources
 - www.firstrobotics.uwaterloo.ca
 - www.chiefdelphi.com/media/search/papers
- Fundraising
 - www.usfirst.org/4vol/resourcectr/
- Suppliers
 - McMaster-Carr – www.mcmaster.com
 - SDP/SI – www.sdp-si.com



Questions?

- kkanagas@gmail.com
 - Contact if you need advice or help
 - I'm more than willing to try and visit your school or send someone else who can

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