Running a *FIRST* Team

Karthik Kanagasabapathy – November 14th, 2007

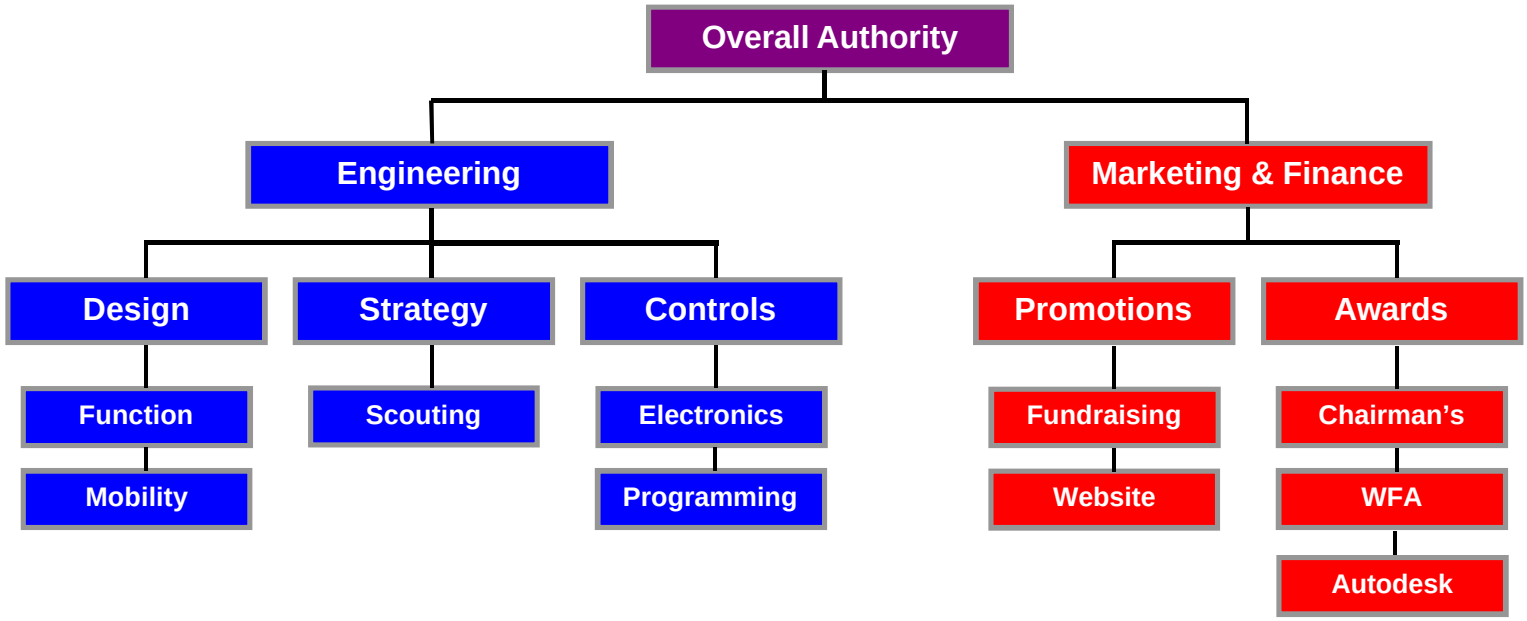
Karthik Kanagasabapathy

- 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

Team Organization

- 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

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

- “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

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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 proved in the kit of parts
  - A huge amount of work, very rewarding

Team Organization Tips

- 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

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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

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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

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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

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

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

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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…

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

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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

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!!!

Resources

- 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

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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