The Art of Leadership
By Eliot Rudnick-Cohen
Explorer Post 1010

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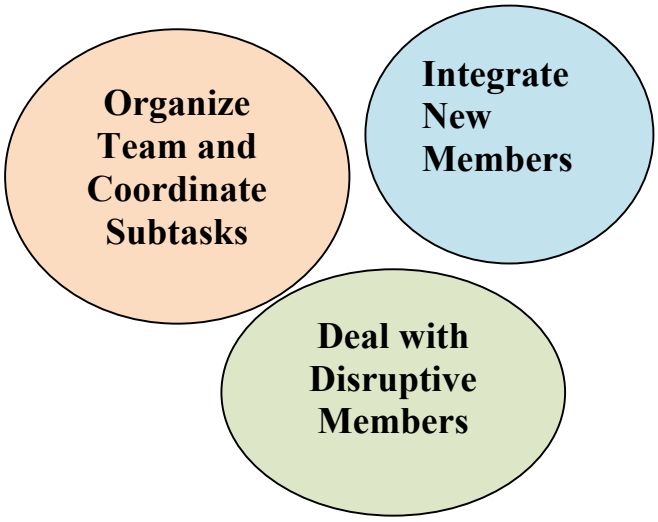
The role of team leader, essential to any team's success, is often misunderstood.. Commonly, teams assume that the leader's job is to dictate the actions of the team. Consequently these teams are then dominated by the viewpoint of the leader. Teams who decide to go with no leader at all risk the lack of task coordination. The problem with both these approaches is that they typically fail in the long run due to either disorganization or the stifling of creative thinking. These approaches fail to take advantage of the main job a team leader fills; which is to coordinate the sub-projects of a team. In this paper we will look at the art of team leadership through three of the main jobs a team leader must fill, organizing and coordinating his team's subtasks, integrating new members into the team and dealing with team members who prove disruptive to the working environment.

The Leader's Jobs



1. Team organization and the coordination of subtasks

A major organizational failure many team leaders make is failing to identify what are the various subtasks in a competition like Botball. They can also fail to properly assess their team's experience in these tasks. Botball can be organized into several sub-tasks including, planning, systems programming, mechanical design, navigation and documentation. Above all, team leaders must fully know the game plan the team is going to implement, as the team leader must make sure that all of the tasks can be completed successfully. Tasks such as planning, programming, navigation, documentation, and navigation, should each be treated differently.

Documentation is possibly the most important task for a team leader to be aware of because it integrates into almost every other task. If a team uses a dedicated documentation sub-team then a team leader should make sure the sub-team has all the information they need, while if a team is using group documentation then a team leader must keep track of each group's progress. For documentation, the only necessary skills are writing ability and clarity. Depending on the documentation guidelines, the amount of writing ability required by team members varies as their writing ability is cumulative, meaning that the leader should gauge their teams writing ability in terms of the entire documentation team's skills rather than that of individuals. Also one documentation problem a leader should be aware of is variable writing commitment, as one teammate slacking off on documentation could cost a team valuable points. This tends to be the most common reason why teams lose points in documentation.

The planning task is another important task for the team leader. During planning, a good team leader will allow his or her team to come to a consensus plan in a short period of time. This does not mean that you have one person say "this is what we're doing guys, any questions?", but typically that you evaluate proposals from the whole team. Planning skills can be roughly categorized into about four levels. The first level is a beginners perspective on planning, looking only at scoring and how to score. The second level of planning skills would be to also consider navigation. The third level of planning skills is being able to outline the programming aspects of a solution, while the fourth and final skill would be to predict the likely strategies of other teams and devise a counter strategy for them. In general a team leader should be aware of where fellow teammates fall in this spectrum ahead of time, as it can make it easier to coordinate discussions this way.

The systems programming task of a Botball team can be thought of as the base programming for the robots. This includes such functions as to move actuators and process sensors. For the most part, a team leader's main responsibility here is to make sure that the systems programming is not behind schedule and that the code being worked on is code that will actually be used. Note that this does not include navigation, which is a different task in reality. Skill levels in systems programming can often be based off how skilled a person is with using sensors, the more complex the sensors a programmer can use, is often directly proportional to their skills in systems programming.

Mechanical design is a task which the team leader should be monitoring constantly, with a focus on its integration with the other tasks. In particular the team leader should be capable of making sure that the robot under construction is the robot planned during the planning stage and also that any changes due to potential difficulties are shared among all of the other tasks. Also in particular the skills levels of a team should be considered in the mechanical design task, as often students may be skilled in both programming and mechanical design, but can only be working on one aspect at a time. A good rule of thumb is to remember that mechanical design skills tend to have sub-specialties, like claw design, base building or even servo mounting and that a mechanical task should have people with skills in each of the necessary sub-specialties working on it. This can allow a team leader to better control the design process by avoiding the danger of having too many people work on a single component, spreading the work out based on the skills of the team members.

Finally the navigation task, which is the programming that makes the robot accurately move from location to location, is an extremely important task for a team leader to monitor. Unexpected discoveries about how the gameboard functions or realizations about ways to optimize movement can occur, and a team leader should make sure that the rest of the team is briefed of these changes as they occur. Assessing skills in navigation typically boils down to two things; how effective someone is at identifying the navigation errors that occur in Botball runs, and how rapidly someone can figure out how to fix these errors. A team leader should make sure that the navigation team is able to perform these two skills, both of which are essential to completing robots in time for the competition.

2. Integrating new team members

The second major job a team leader must fill is to integrate everyone on the team, especially its new members. For older members it is typically easy for them to go to whichever project they specialize in, but a key thing to remember is that one man tasks should be avoided. This occurs when a single person does the entirety of one task, such as navigation or mechanically design typically for a single robot. At minimum, there should be at least one backup as this reduces errors, and can be invaluable when a strategy or aspect of a robot might need reassessing.

[1]Image 1New team members at Explorer Post 1010 learning the basics

The integration of the new members poses a more difficult problem in that their skills will typically not be known in advance. An easy solution to this problem is to run a practice competition before the actual Botball competition, but even then you may still be unsure of some people's skills or alternatively you might not have the time or resources to do so. In these cases, you will need to adopt some sort of integration strategy for your new teammates. This falls under the purview of the team leader to implement and indeed a good team leader should also enforce the rules once they're put into place. Below we discuss several strategies for integrating new team members.

One of the methods people often cite as being effective at integrating new teammates is simply assigning them to teams based off assumed skills. However this method rapidly backfires if you don't understand the skills of new team members, due to two reasons. The first reason is it tends to reduce motivation by creating an illusion of the new member having no influence over his or her role in the project. The second is that since part of the goal of Botball is to develop engineering skills, new members may not be experienced or may be incapable of completing the

assigned task. As a result of these two reasons it is recommended that the assumed skills approach be avoided, unless you personally know the skills of these incoming members.

Another common integration strategy that can be seen in many teams is leaving new members floating, moving from one project to the next based on what they want. This does have benefits in that it gives new members flexibility in what they actually do, but this can easily bite back on teams mostly composed of new members. Often a team will be left floundering because their new members don't actually do any work. They are simply floating from project to project, without actually achieving anything on any specific project. This method can be made to work in the right circumstances, but it requires significantly more micro-management of the team leader's part. A fact few realize that using this method requires that you keep track of whether new members actually are doing some work.

One of the most effective integration strategies for new member is education; teaching the new members the techniques they will need. However, a problem with this idea is that typically a large amount of time is expended to educate the new team members. Education involves getting started several months before the competition and can be difficult to do, especially for smaller teams. It should be noted that if your organization fields multiple teams, then this method is much easier to implement effectively. The one key thing to remember about the education method is that it is impossible to use during the actual competition; on the job learning almost always fails for most Botball teams in the end.

Another effective strategy is using the buddy system; pairing new members with veteran mentors, but several caveats should be followed if this method is used. First, the team leader must ensure that the veteran mentors understand the new member's job is not doing things like finding parts or getting them drinks, ensuring that new members will actually learn something. Second, teams with more new members than veterans tend to have serious trouble with this method. Finally the team leader should make sure that veterans don't completely dominate the new members and squash any idea they come up with, as this is a common occurrence with this method. However if successful, the buddy system can be a very effective strategy for integrating new members.

A last ditch integration strategy for either an overabundance of new members or if you lack the time to use any other strategy, is to assign most new team members to a specific sub project. If new members are concentrated into working on sub-projects during the Botball season, considerable progress can be made on the main projects by a team while their new members gain experience. The one rule to remember in using this strategy is that the team leader must monitor these sub-projects with intense care, as otherwise they may fail. In general it is recommended that these sub projects be modifications to already working robots rather than vital components as part of the experience for new members is learning though failure, and in general failure is not desired in concepts that a team plans on implementing in their actual design. Otherwise this strategy works quite well and can be easily combined with the other strategies in certain cases.

3. Dealing with disruptive team members

The last and very challenging major task a team leader must face is dealing with disruptive team members. Typically, disruptive team members fall into three categories: those that actively interfere with the completion of tasks, distract other team members or simply don't do anything at all. There are several methods of dealing with these people, and the solution utilized should be based on how much of a problem a disruptive team member poses.

[2]Image 2 Video and card games can be particularly disruptive, notice here that not only are four team members incapable of contributing to their team, but its also impossible to identify which of them is the cause of this disruption

The team leader's response to a first time disruptive team member should almost always be to try to integrate them into the team better. This can be accomplished through offering them a project to work on or encouraging them to help out with everyone else. This primary approach can be taken with the team member who does nothing and should also be used with team members distracting other team members, though in that case the suggested project should be away from the people being distracted. The method should also be used with team members who disrupt a tasks completion, but only in assigning them to a different task. If this approach fails other techniques should be explored.

The next response a team leader should use on disruptive team members is isolation; isolating the problem team member from the rest of the group. This should always be done by assigning them to a sub-project of some type, or having them hone their skills via practice. The main difference between this and the aforementioned method is that the problem team member is mostly isolated from the rest of the team while working. This method is extremely effective against disruptive team members who distract others and often can also be used against team members who impede the completion of tasks. In the later case if the reason a team member is impeding tasks is due to some disagreement with the rest of the team about strategy or mechanical design it is possible to use their disagreement as their sub-project, with them attempting to implement their idea. A key thing to remember is that this is not just throwing someone away, the team leader should check in on these team members often so that their projects can be used by the team.

If all of the above methods have failed with a disruptive teammate, you have typically reached the end of the line. The remaining options are either to have your supervisor deal with the problem or kick the team member off the team. The latter of these should almost never be done, as it defeats the educational purpose of Botball. It is extremely important to remember that these methods should only be employed on people impeding the completion of tasks. If they are intentionally holding things up it is essential to hear what they have to say, in particular, if they disagree with some aspect of a team's strategy it is unacceptable to attempt any of these methods on them if some other people agree with them. In this case conflict resolution will be your friend, and almost always a team will be better off by doing this. However, if a team member is attempting to hold up the rest of the project because they disagree with some part of it and their justification for disagreement is that they think that they're right and the rest of the team is wrong, then it is acceptable to remove the team member from the group. This final method should never be used against team members who distract others and only against team members who do no work but intend to take credit for the team's accomplishments. Suffice to say, kicking someone off a team or notifying a teams mentor is truly the last resort and should only be used when the consensus of the team agrees with the decision.

In summary team leadership is primarily made up of the jobs of coordinating subtasks, integrating new teammates and dealing with disruptive team members. If handled correctly, a team can derive immense benefits from rapid unimpeded progress. Without leadership that deals with these tasks, a team tends to suffer several problems. Without effective coordination, a team's organization drops rapidly and often projects will take much longer than expected to finish. If a leader does not integrate his or her new members into to the team, then it is likely that the team will do poorly in the following years when they need the skills of these newer members. Finally if a leader cannot properly deal with disruptive teammates, then there is the risk of a team's effort being destroyed by a single person. The team leader is an essential part of any Botball team, and it is important that the leader understands the needed tasks and ensures the jobs progress to completion.

References:

[1] "Internal Competition Team 3." Web. 1 Jun 2010. <http://exploring.external.lmco.com/Robotics2010/Internal/Pictures/team3.jpg>.

[2] " What's going on here?." Web. 1 Jun 2010. <http://exploring.external.lmco.com/Botball2004/Journal/day0320/day0320.html>.