Organizing for Reuse

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In practice, developers depend almost exclusively on their past experience and ad-hoc methods to locate assets that might be of use to them. While this is admirable, it is limited to individual expertise and a certain amount of luck. So although an ambitious developer may save you some development costs by finding components from "someplace else," the potential benefits of such individual efforts are insignificant compared to what you can achieve through systematic reuse across your entire organization. This article will discuss how to avoid common reuse inhibitors by organizing your development teams to most effectively support and motivate reuse.

Software engineers want to write code. They want to create, design, and develop. Management's job is to maximize the productivity of those creative souls. By far the best way to do this is by allowing your developers to learn about, evaluate, and incorporate available components into their projects.

Information about reusable assets can be communicated by providing easily accessible tools and developer forums. It is essential to further encourage communication by organizing your development groups in such a way that makes it routine for them to share in their development efforts. This teamwork is key to reducing development costs.

Reuse within a small team

Generally speaking, it is easy to achieve reuse success within a small development group, such as a department or programming team. This is due to two major factors; the first is the ease of communication within the team and the second is from the tighter span of control that you can exercise over the activities of the team (governance).

The first of these two factors, communication, is key to successful reuse. In small teams there are no natural boundaries to prevent communication between team members regarding what they need and the potential sources of assets to meet those needs. Reuse comes from any asset that the team would have had to build but instead was able to obtain from "someplace else." These sources are generally other projects or collections of reusable components (such as maintained in a reuse library or other tool).

The second factor, governance, is also significantly easier with small teams. It is not uncommon for all members of the team to participate in design reviews and be aware of the all the major components in the system. This means that if the team identifies the need to build a component that might already be available "someplace else," the team leader can ensure that the team investigates the use of the component and, if appropriate, verify that the component is reused rather then built again from scratch. The team leader

exercises this governance through reviews and inspections where he or she effectively controls the desired development policies and standards such as reusing components.

Organizing for Reuse on a large project

Assuming that you are successful doing reuse at the department level, how do you expand this success across a larger organization, business unit, or even your enterprise? For example, although small projects may reuse components, they rarely contribute to the supply of reusable components because there is no incentive for them to do so. Their goal is to implement their project within their cost and schedule, without necessarily contributing to the greater benefit of the organization to which they might belong. So what are the organizational issues related to scaling reuse up to large projects and how to you overcome them?

Large projects require large, coordinated development efforts. This means lots of people and the need to organize them into groups, such as departments and development teams. Once the size of any development effort gets to the point of forming sub-groups, communication becomes a major issue. Consider the development organization shown in Figure 1. The second level Project Manager must coordinate the efforts of many development teams, each of which has its own priorities and goals. Communication across these teams will be difficult or non-existent, especially if the development teams come from diverse locations or subcontractors. It's the Project Manager job to keep the overall project on cost and schedule despite the demands from each of the development managers for more resources.
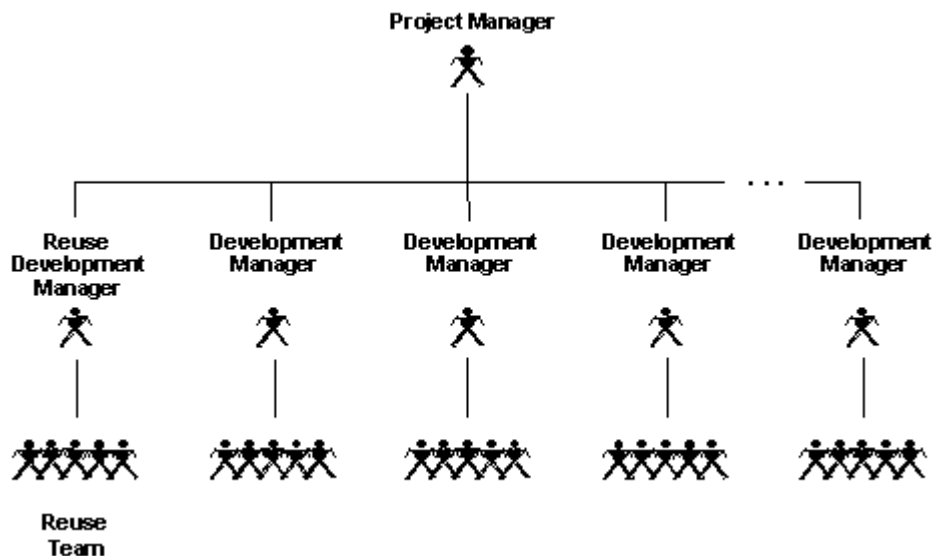

Figure 1- A successful organization for Reuse on one large project

A proven method to coordinate the teams is to set up a development team that is dedicated to supporting reuse. This Reuse Team has responsibility for identifying

opportunities for reuse across the development teams and making assets available to meet those opportunities. If necessary, the Reuse Team will develop assets for the other teams to use.

Within this organization, how does the Project Manager ensure that the design, analysis, and work done by one of the development groups is not duplicated by another? Governance takes place in both direct and indirect ways.

Direct governance takes place by establishing regular architectural reviews (such as weekly) in which representatives from all the team teams participate. During these reviews, the reuse team and technical leads inspect the subsystem designs to ensure the use of reusable components. The teams also discuss need for additional components that might be useful across the project. This "active discovery" helps ensure that the Reuse Team produces components that (1) meet the needs of the development teams and (2) will actually be used by the development teams.

Indirect governance takes place by constraining resources so that reuse is necessary to get the job done. In one successful example, the Project Manager funded the Reuse Team by taxing each Development Team 10% of their budget. He then followed up by setting a goal for each Development Team to build at least 15% of their subsystem using reusable components. If successful, this would allow each team to actually operate with a smaller budget than originally planned while at the same time encouraging their use of reusable assets out of necessity. In the end, this project achieved nearly 20% reuse, which is one way of saying that each Development Team doubled its reuse investment over the life of the project.

Organizing for Reuse across a large organization

Large organizations often have many large projects, and as the size and number of these efforts grow, so do the complexities of communication. If communicating across Development Teams within a single large project such as described above is (at best) difficult, communicating across multiple large projects is even more unlikely.

An often-used but ineffective approach to scaling up the successful organization for reuse on a large project is to simply replicate the organizational structure that we put in place for one large project. Figure 2 depicts the resulting organization, as viewed from a 3rd level manager who is responsible for two (or more) large projects. Each large project continues to have its own dedicated Reuse Team, as described in the previous section.
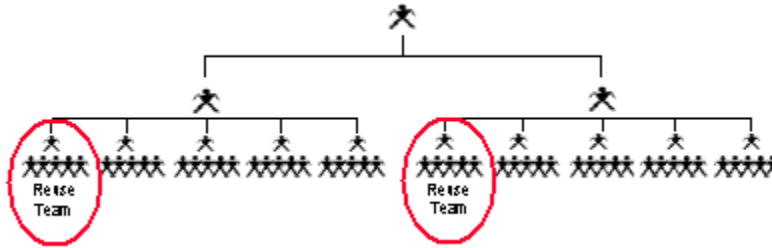
Figure 2- Dedicated support for reuse on multiple projects

Scaling up in this fashion may allow continued success within each individual project, but it does nothing to enable communication *between* the projects. If these projects are unrelated (e.g., there is little technical commonality and therefore few opportunities for reuse) then this organization may be an appropriate. However, even if the projects are related, the 3rd level manager will quickly view the dedicated Reuse Teams in each project as resource intensive and will cut the funding for all but one of them, as shown in Figure 3.
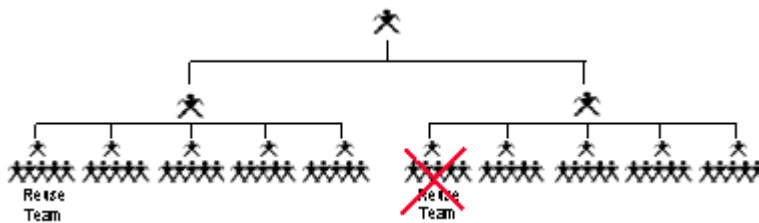

Figure 3- Sharing support for reuse across multiple projects

The problem with the resulting organization is that it does nothing to address the communication boundary caused by having a Reuse Team in one project that is supposed to support development in other projects. Even with the best efforts and tools, it is nearly impossible for such a Reuse Team to successfully engage developers from outside their project.

Fortunately, the more likely situation is that we are working within a division of a company or within a business unit that is actually developing related applications. This means that there is a potential to share effort across the projects that are under the control of this 3rd level manager. However, despite the potential for high cross-project reuse, the inherent organizational boundaries will make it difficult for the Reuse Team in Figure 3 to effectively support any project other than their own. Upon discovering this, the 3rd level manager will often respond by making the Reuse Team a shared resource for the entire organization, as shown in Figure 4.
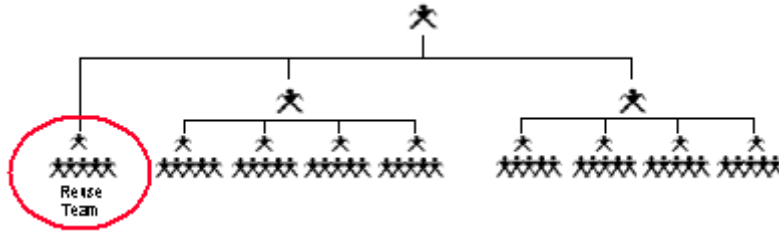
Figure 4- Shared support for reuse across multiple projects

Pulling the Reuse Team out of the individual projects and making them a shared reuse will often work in the short term. This is because the Reuse Team members will, for a time, maintain their personal ties within their old projects. This is a move in the right direction, but even with a mandate to support all the large projects in their organization, the Reuse Team will find it hard to "break into" all of the projects. In part, this is because each project is so large and complex that it is beyond the human ability to understand enough detail to really identify where each project can apply the common components. In addition, the Reuse Team will become increasingly disassociated with the real needs of the developers. The members of the Reuse Team will fall into a mentality of "build it and they will come" (which the developers don't), and the developers in each of the large projects will view the Reuse Team members as having no value-add to their real-time, schedule driven needs.

In view of these issues, Figure 5 shows the optimal way for supporting reuse in a large organization. It consists of setting up a shared reuse team that is made up of a small number of "champions" who work with part-time reuse representatives from each of the projects. Competent and enthusiastic champions are important because they need to coordinate reuse activities across a very broad scope and they will have the most success if the groups that they support respect them.
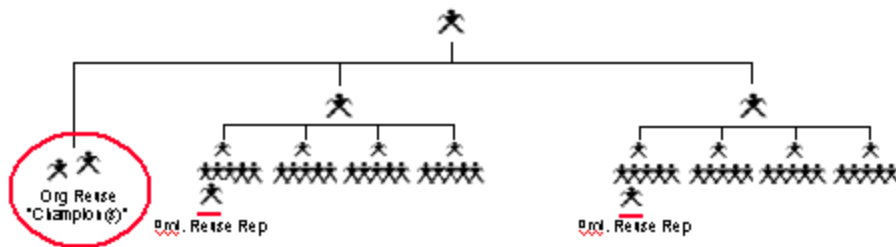

Figure 5- Recommended organization to support reuse across multiple projects

Each project Reuse Representative might spend only 10-20% of their time dedicated to reuse. They should meet with the Reuse Champions on a regular basis (e.g., monthly), but much of their effort will be spent participating in reviews (such as architecture and high level design reviews) that they would have attended anyway. The difference is that during the reviews they bring a knowledge of shared architectures and components that they can suggest for use within their project, and they are familiar with the needs of other

projects so that during a review they can actively identify components that, with perhaps a small amount of additional investment, could support projects other than their own.

To maintain a broad knowledge about the technical activities across their organization, Reuse Representatives need to rotate assignments about every 3-6 months. For example, the Reuse Representative might work directly with the Reuse Champions, where they will participate in reviews and support projects across their organization. Working with the Champions, they may also help establish shared tools and processes for use across the projects. This is good for the organization because it communicates knowledge about components and needs as well as standardizing approaches to solving those problems. It is also good for the individual as a way to broaden their experience base and grow technically.

One particularly effective rotation is to have the Reuse Representative develop a reusable component that several projects need to use. This gives the Reuse Representative end-to-end responsibility for reuse, from understanding the project requirements to supporting the use of the completed component. This level of ownership increases the chance for success as well as personal satisfaction.

Conclusion

One of the most critical requirements for reuse is the ability to communicate both (1) what reusable components are available and (2) what components are really needed. The larger the organization, the larger are the obstacles to communication. These obstacles may be caused by factors such as geographic location, languages, and organizations.

This article presented ways to organize and govern reuse on individual teams and projects, and then discussed how to scale that organization up to support reuse across a large enterprise. The basic premise is to break down natural communication boundaries by rotating key developers through positions where they are exposed to broad organizational needs and can influence those needs towards shared assets. Governance occurs through the reviews, requiring compliance with standards, requiring the use of reusable assets, and by limiting resources such that project success is contingent upon using the resources provided.