Classification Test: International Collaboration Practices and Recommendations for Academia

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ABSTRACT

The need to standardize and then proliferate best known practices within an international manufacturing environment is essential in order to achieve corporate competitiveness. Tool matching, software revision control and database management are some examples of the methods that the Sort Test Technology Development (STTD) department within Intel Corp uses. These methods maintain control of the test processes, and also gather input and monitor outliers in real-time to proactively keep the process stable and capable, while reducing the risk of yield losses. Even though the STTD department and Intel virtual factories (manufacturing centers) are separated by vast geographical locations, this series of best practices allows constructive collaboration between members that may not be obvious within an engineering curriculum. Cultural differences, physical facilities differences, time zone changes and differences in meeting management need to be handled with care, to assure the best possible performance from these cross-site teams, and also to support change requests in a timely manner. An overview of these collaborative practices, shortcomings and recommendations for engineering curriculum will be discussed.

1. INTRODUCTION

The current ultra competitive engineering environment has led to a dependance on international collaboration from not only a tooling/vendor support, but also in addressing the needs of manufacturing centers and divion partners from Research and Development teams. An example of this is Intel's STTD department, which serves as a global leader in providing robust Test Solutions for Intel's line of client, server and mobile microprocessor product. Intel is a known world leader in it's ability to manage and operate internationally, and emphasizes a strategy of collaboration and revision control processes that allow for high volume production at unparalleled quality to be achieved.

Recent college graduates (RCGs) are thouroughly trained to assist them in rapid job scope ramp in order to succeed. While an engineer may work closely with collegues within the same geographical location, a large component of the job typically requires close collaboration with stakeholders that work and reside in other countries around the world. A competent engineer requires a strong core set of communication skills, in addition to solid technical proficiency. Important skills include: global awareness, structured problem solving, rapid decision making, team management and general business proficiency (Staecker and El-Ghazaly, 2012).

Current engineering curriculums try to address the concept of team work and collaboration, through, undergraduate senior capstone projects or joint labwork actvities, but overall there remains very little exposure to interdependencies of multi-site teams and practices a new engineer will experience in industry. This presents a gap that should be addressed in order to better prepare graduates for the real world workplace.

2. EARLY ENGAGEMENT

As with any large and technically complex project, it is a best practice to maintain healthy communication with all external stakeholders in order to monitor and keep track of changes or new developments. While pathfinding during the early development phase, consultation with the virtual factory site is frequent, to address and close all high volume manufacturing testing related issues. This process is highly coordinated and requires close attention to ensure equipment, tooling, and resources are in place to meet the planned production schedules. The focus of these projects typically involve technological or equipment upgrades, new tooling development, and cost considerations to reduce budget impacts within the VFs. Stakeholders are consulted and our Research and Development team works on generating possible solid technology solution paths and early prototyping in order to demonstrate proof of concept, well before the product needs.

Interestingly enough, (Zhu et al, 2008) provide a description of a design-manufacturing chain that focuses on the relationships between the design and manufacturing groups of different companies. A typical design company would likely contract an external manufacturing or foundry company to produce their product. However, since STTD and our VFs are all part of the same Intel Corporation parent company, there still exist some similarities within the engagement process in order to maintain quality and minimize risk of module induced yield loss.

While the nature of testing technology development varies depending on hardware, thermal test requirements, product design, vendor engagement, manufacturing site, software design. and the actual processors and packaging Intel sells, some basic process controls and business processes are well established and utilized. These are: 1) Early vendor/customer engagement; 2) Software/recipe revision control; 3) Copy exactly (CE!) practices and 4) Tool and Process Matching procedures.

3. Software Revision Control and CE!

Essentially, software revision control is a standard that must be adhered to within any globalized project. STTD creates and manages hardware and tooling recipe versions and proliferate these changes to both our Divisional (design) partners and the VF sites. While test program content may be pushed from our Divisional partners, it is through close collaboration with the VF engineering teams, that tool matching and analysis may indicate a need for test program content changes. Examples of this may be limited to a simple limits rule set change, or a greater change such as targeted structure testing or pattern generation.

In either case STTD works with our VF engineers closely engaging these VF engineers by bringing them to the technology development site, to work together directly with the TD engineering team for a period of several months. Once these VF engineers have completed this training and learning period, they return to their VF sites, and STTD maintains communication with them to ensure that large scale production startup is monitored and supported as needed. This may or may not require STTD engineers to travel off-site to directly support the VF for some period of time, as the process begins to come on line. Intel has provided a meeting time scheduler that indicates optimal meeting scheduling time based on the site locations trying to collaborate. All of this is in an effort to better assist in a healthy work/life balance for all stakeholders.

4. Recommendations

How can an engineering student attain better exposure to working in an international and collaborative environment during the course of their studies? This is an issue that many have simply attributed to the student needing to obtain a summer internship or focusing on teamwork within the course of their senior capstone projects. While these are good suggestions, there is still a gap in the discipline and coordination it requires to be successful in working on truly globalized team based projects.

Best practices such as software revision, CE!, and process matching controls can be better practiced and taught by possibly establishing more relationships with not just local companies, but at companies that are not located close to a particular university. Partnerships with international organizations and industries to establish work training in the engineering fields could provide students with the early exposure they would need to become more effective in these areas. Projects can be managed by using teleconferencing or Web collaboration tools that have become affordable and increase the speed at which cross border work can be completed (Hira, 2012).

5. Conclusion

While the true scope of true high volume manufacturing needs may far exceed the student's senior capstone projects, there is still an opportunity for increased student exposure to working on projects that cross geographical boundaries. Being mindful that internships are a good opportunity for exposure to large scale manufacturing and design collaboration, there should be a more active effort from academia to bridge the gap and approach industry to establish partnership projects. These projects should focus on both the technical aspects of the discipline, but also allow remote team collaboration on more globalized projects. Additionally, students should take advantage of professional development workshops such as Toastmasters, team building workshops and project management in order to better equip themselves for today's global workplace.

References

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