



Computer Science Industry Advisory Board Meeting Minutes  
September 28, 2007

Industry Members Present:

- Davis Almanza, IAB member representing Computers Unlimited
- Kevin McManus, IAB member representing Zoot Enterprises
- Craig Spanning, IAB member representing Spraying Systems
- Tom Jinneman, IAB member representing RightNow Technologies
- Phil Sherburne, IAB member representing Cisco
- Bill Ivanich, IAB member representing EchoStar
- Ryan Gruss, representing MSE, for IAB member Richard Clark

Montana Tech Representatives Present:

- Celia Schahczenski, C.S. Dept. Chair
- Frank Ackerman, C.S. Faculty
- Jeff Braun, C.S. Faculty
- Michele Van Dyne, C.S. Faculty
- Gary Mannix, C.S. Faculty
- Tami Windham, C.S. Administrative Associate
- Mikeal Day, S.E. Student
- George Cox, C.S. Student
- Kyle Nelson, S.E. Student

**I. Welcome**

Chancellor Frank Gilmore welcomed the board members to MT Tech and emphasized the importance of their advice to the department. Dr. Gilmore also expressed his appreciation to the board members for their time and efforts put in to the Computer Science program.

Doug Abbott, Vice-Chancellor of Academic Affairs welcomed the board members and thanked the members for their time and any financial contributions they may have contributed to MT Tech. Dr. Abbott congratulated the C. S. faculty members on their ABET report.

Doug Coe, the Dean of the College of Letters, Sciences and Professional Studies, welcomed the board members to MT Tech and expressed his appreciation for the great faculty members of the C.S. department and the students in the program. Dr. Coe also, emphasized on the recruiting efforts of the department to enlist new students into the Computer Science and Software Engineering programs and stressed the importance of the advice and information that the board gives the C.S. department. Dr. Coe thanked C.S. faculty for the hard work they did to prepare for the ABET visit and congratulated them on the ABET report.

**II. New Happenings at MT Tech, Mike Johnson, Vice Chancellor of Institutional Advancement and Development, President, Montana Tech Foundation**

Mike Johnson, Vice Chancellor of Institutional Advancement & Development, President, Montana Tech Foundation welcomed the board members back to campus and expressed his excitement with the changes going on around MT Tech.

- Sidewalks
- Renovation of the stadium – new reserved seating section
- New gym
- Ground breaking for new building
- Renovation of classrooms

Mr. Johnson was proud to inform the IAB members that 2007 was a great year for the foundation. The endowment last year improved from 17 million to 24 million last year due to the market appreciation as well as investments. Mike discussed his concerns with recruitment and fundraising for scholarships and feels MT Tech could do a better job. He extended an invitation to the C.S. department to use the foundation to assist them in their fundraising and recruiting efforts.

### Questions, comments, and suggestions:

- What have the enrollment trends been at MT Tech? *Last year was excellent and he expects this year to be the same.*
- What about recruiting internationally? *Right now most of the international recruiting is done for the major degree programs; however, we can do a better job. Frank Ackerman feels the C.S. department could recruit in China specifically Taiwan and has prepared a proposal to recruit internationally. Mike expressed interest in reviewing the proposal and encouraged the C.S. department to continue with their recruiting efforts.*
- What is the long term goal of recruiting foreign students – outside of graduation? *Kevin McManus expressed his concerns with the present foreign student visa status, from his perspective he would like to come to MT Tech to recruit so he has people he can employ right here in Montana and with foreign students there are external restraints that are really limiting the ability to keep the students here.*
- The C.S. department needs a tenure year track position to keep offering the classes they need to offer to the students to keep them here.
- What percent of the freshman class are out-of-state students compared to what percent are in-state students? *Comparison has not been done.*
- One of the things that helped increase numbers this year and will help again this coming year is a National Science Foundation grant that provides scholarships for outstanding freshmen in chemistry, biology, mathematics, computer science and software engineering, who might have trouble paying for school; The scholarship provides \$6,000 each year for four years.
- Does the C.S. department feel they are you losing students to on-line university courses? *No, usually we lose the students to other Tech programs that use computers but don't do what we do.*

### III. Introductions

Introduction of all attending the meeting were made. Celia Schahczenski announced that she would be stepping down from department head in December and introduced Jeff Braun as the new department head. Celia also informed IAB members that the C.S. department would be honoring Kevin McManus at the Alumni Recognition dinner and the Mathematical Science department would be honoring Davis Almanza.

### IV. Report on the recent accreditation Visit from ABET

Accompanied by a PowerPoint presentation Celia Schahczenski discussed the team chair members for the ABET visit and gave an overview of the accreditation process.

#### Engineering Accreditation Commission

Team Chair: Dr. Winston Erevelles, Dean – School of Engineering, Mathematics, and Science, Robert Morris University  
Program Evaluator: Dr. Donna Reese, Associate Dean for Academics & Administration, Mississippi State University

#### Computing Accreditation Commission

Team Chair: Dr. Richard Helps, Chairman of Information Technology Department, Brigham Young University  
Program Evaluator: Dr. Richard Wasniowski, Professor of Computer Science, California State University of Dominguez Hills

Doug Coe stressed to the IAB members that the Computer Science and Software Engineering program got a lot of scrutiny during the visit. More so than other programs due to the fact there were two team chair members and two program evaluators. Out of the six people here four of the members were associated with the C.S. and S.E. program.

Celia informed the IAB members that in the past new programs such as SE have been accredited for only three years. The Computer Science program can be accredited for a maximum of six years. Celia clarified that no results are official until July and in fact what can be disclosed to the public is accredited-non-accredited. In January the program will get a draft and once again nothing is official until the ABET meeting in July. However, in July if SE is accredited it will be retroactive back to October 2006. The ABET team felt the most positive thing about the program were the students and the alumni. Celia felt that the ABET visit went very well.

#### Overall ABET reported 2 weakness and three concerns:

**Weaknesses – (2) weaknesses for both programs** (Weaknesses means: we were doing it, but the extent that we were doing it isn't adequate)

- **Program Objectives and Outcomes:** The program has collected data on their objectives and outcomes, but it has been incomplete and has not been evaluated consistently. (The ABET team notes that while the employer form was developed, it was never used). Curriculum changes do not appear to be driven by the results of the formal assessment process. The program has not defined achievements to be used to determine if our objectives and outcomes are attained.

**Concerns – (2) concerns for the Computer Science program and (3) concerns for the Software Engineering program** (Concern means: you are doing it and you are doing it adequately, but they are just not sure that the situation isn't such that you might not be doing it in the future)

- **Faculty:** While the program has managed to offer the required courses, without replacement of the non-tenure track faculty member who left unexpectedly in the summer the team is concerned that this may not continue. Without a tenure track position the team feels the program may lose faculty members. Celia informed the IAB members that they have support from the dean for the tenure track position.
- **Institutional Support:** Team is concerned that the faculty salaries may be inadequate to attract qualified faculty.
- **Maintenance (concern for SE program only):** While students are exposed to all phases of the software development cycle there is a potential for students not to be exposed to the maintenance phase.

#### **Questions, comments, and suggestions about the ABET visit:**

- In the future is the program going to continue to have that scrutiny? *Probably, however in the future the ABET Engineering and Computing Accreditation committees are going to coordinate those aspects that are common to both so that preparing for two visit might not be so difficult.*
- What are you doing to recruit faculty? *While our salaries are low we were able to hire highly qualified faculty in 2006 so we expect that we can do that again. Celia stressed that it is the year-by-year, non-tenure track contract that was the problem.*

#### **V. Industry Reports**

Michele Van Dyne invited the IAB members to discuss what their coding and development standards used at their companies are, as well as requirements and testing tools, trends in this area, and how they are working?

- **Bill Ivanich:** PVCS was dropped approximately one year ago as EchoStar's version control system and they have moved to ClearCase. EchoStar has also hired a ClearCase administrator to manage software. The debugging tracking system used is Mantis. A tool they are looking at implementing is Coverity which basically scrubs the code and looks for things like invalid pointers, uninitialized variables, and problems which may cause a stack overrun. EchoStar tries not to use Coverity unless extensive changes have been made. Bill stated that the coding standards used are basically there already being used on the project.
- **Davis Almanza:** Computers Unlimited uses PVCS for their version control system. They are attempting to get to a point where they are programming for unit testability. Their standard code base is enSynergy, which is a procedural language they have been developing for almost the entire 30 years that they have been in business they are now progressing to C++. They do not have documented procedure for code review but they expect their engineers to do them. They use Test Complete for their regression testing, which is an automated testing procedure. Davis discussed the coding standards his company follows; most people try to follow whatever was in the code base that they started with.
- **Ryan Gruss:** The bug tracking software MSE-TA uses is Bugzilla. They have no version control system, however, Ryan is working on selecting a system; it will probably be Subversion, an open source version control system. MSE-TA has a common code base from which developers can pull a section of working code to modify. Once they get the code working they can put the code back into the common base. MSE-TA has two types of code; the first is in C and is a core program which they rarely change because the program has been around for many years. There are libraries used by this code base and the majority of changes are to this library. The other type of code is in Dulfite for graphic interfaces. For this they use the debug features that Dulfite provides and run dynamic analysis using a tool called MemProof. There are no coding standards used at the present time, except those communicated verbally. There is however, a header at the top of the file, so when changes are made these are documented in the header. Because they are such a small shop the programmers do their own testing. After the entire release is done the documenters and engineers do high level testing.
- **Phil Sherburne:** Cisco uses ClearCase for their version control system. They also do a lot with static analysis tools. They use software called CETS for defect tracking. A lot of what they spend vast amounts of money and people on are test automation. Phil expressed his concern that students are not being taught how to build test systems. At Cisco all tests are all put in to a test tracking database, which allows one to extract the test from the database and run it. They also do load testing, which is how one loads these systems up and stresses them. The goal of the coding standards is to make the code easy to maintain, so it is important to write code that is consistent to what was there before. Cisco does not have one coding standard they have many, many coding standards.
- **Kevin McManus:** Zoot does not adopt any particular process. They have the best of each method and create their own process. The main focus is on delivering quality code. They emphasize that coding is shared by the team along with test driven development. At Zoot they feel you should have a high level of confidence when making a change to code. Under test driven development one generates a fresh test every

time. The process is automated. Every night the entire system is checked in and unit tests are run. This generates a webpage for the next morning. In the morning the team can take a look to see if anything is broken and can see what percent of the system was unit tested. One unit testing tool used is called Clover. The team has set a goal of having 70% of the system tested every night. Zoot feels unit testing is very important. One of the tools they use for defect tracking is Jira. It is open source, through Allison. There is a \$1,100 fee to get the workload component added. For a defect tracking standpoint this is decent software.

- **Tom Jinneman:** At RightNow Tom is not involved with development but described what he knows. The product they use is Flagship which is a software to service CRN product. RightNow uses PHP, C and C++ on the server side; and .net on the client. Their only coding standard is to make the code self-documenting. RightNow uses Rational to test for memory leaks. They use Load Runner to put a load on a web server and determine its breaking point
- **Craig Spannring:** Spraying Systems uses Subversion for version control. They use a system called Quant for bug tracking. They are a small company and don't have an elaborate development process but they make certain that their systems are accurate.

## VI. Proposed Development Standards:

Frank asked IAB members before starting the presentation the following two questions:

- Help for teaching Software Engineering? *Frank would like an old system put on a server to work on with the students.*
- Keeping current –what's going on? *Frank would like to look into the possibility of doing a one month internship for faculty during the summer.*

Accompanied by a PowerPoint presentation Frank Ackerman gave an overview of the proposed development standard explaining the MTM Structure (Montana Tech Methods for software development) and MTM Status. Frank's presentation continued with caveats, stating that most of his program development experience with these techniques has been with procedural programming, although some of these techniques have been used in C++ instruction in classes. Many of the ideas apply to OOP but he has not had a lot of experience in that domain. Currently what he is showing is based entirely on personal experience; he does not have any objective data. He also said obviously there are many different ways to write correct code that can be rigorously inspected. Frank claims, without any scientific evidence, that the MTM requires the programmer to provide only the minimal commentary necessary for correction arguments and rigorous inspection. He also claims that this is aligned with the way most programmers think and can be used with most of today's code editors. He also claims that the MTM process significantly enhances the ability to teach programming to novices. Frank discussed what the MTM for single module programs consists of and showed several concrete examples of spec sheets for members to review. He discussed bracing and once again provided several examples to review. Frank concluded his discussion with pedagogy, stating there is a great need to get CS/SE students noticing details, following instructions and being aware of syntactic rules. These requirements provide a detailed, complete, and absolute standard for the students.

### Questions, comments, and suggestions about the proposed development standards:

- Davis stressed that variable names should indicate the positive.
- Doxygen tool is a good documentation system and would be helpful to see how these relate.
- Phil *"The fact that you are adopting this as an engineering discipline around software development is great."* *"The fact that there is a methodology is very important and sometimes is missed."*
- Kevin *"keep in mind that code is continually revised."* *"You are never going to write a perfect piece of code, I have never seen a perfect piece of code, I don't know of anyone that has written a perfect piece of code and if you are always striving for perfection you are never going to get anything to work."*
- What do you do when you have a student who doesn't want to follow the standard? *I try to reward the student for following the standard.*
- How many students coming into the program have done a reasonable amount of programming? *Less than 20%.*

## VII. Competitive Programming

Frank Ackerman presented a PowerPoint presentation on the competitive programming at Tech – What is it? Competitive programming is creating programs that solve problems in a limited amount of time. The competition is only open to college students. There are roughly 40 regions worldwide. Winners advance to the World Finals which is presently sponsored by IBM. The teams consist of three people and one computer. The competition is five hours with seven to nine problems. The CS department will be sending 3 teams to Salt Lake City in October to compete. We had a special study course in the spring where the students practice these kinds of problems and we are trying to develop a play book. We have a regular competitive course this fall that meets once a week for a lecture on techniques on how to solve these problems and then we have a two hour shortened practice where we take half of the problems and try to solve them. The students can bring to the contest any kind of written material, which would include our play book. One aspect that Frank really likes is that the entire faculty is getting involved in this course. Frank provided the IAB members with an example problem for them to

review. Frank's objective is "if we don't win this year and if we don't win next year, we are just going to keep doing this until we do win!"

#### **Questions, comments or suggestions concerning competitive programming:**

- Do students help the professor with the evaluation process? *Yes*
- What do the students get out of this?
  - *Horizontal exposure to problems*
  - *Group experience*
  - *Glory (Money)*
  - *Job search points*
  - *Fun*
- What does the school get?
  - *Educational enrichment*
  - *Publicity*
  - *Retention*
- How do small schools compete with larger schools? *You only need three really good students.*
- We would be willing to come to your company and run a little contest, especially if the company was willing to give a prize at the end.
- Would you be interested in sponsoring a team? *No response*
- Bill *"This fits right in with my company; Pride, Adventure and Winning!"*
- IAB members had concerns about coding standards with programming contest. *Frank stressed this is presented as an exception for this kind of event.*
- Mikeal Day *"Students are very aware that this is a hacking contest. It is dirty, it is fast but the students have no delusions about it – this is not how it is done at work!"*
- Is this a required course? *No*
- The idea of a play book shows there is actually a process. The book is a good idea.

### **VIII. Curriculum Discussion**

Jeff Braun began his discussion of the curriculum with a couple changes in the last year. Formally the C.S. program had an Assembly Language class which has now been changed to Embedded Systems Development class. This class still covers assembly language but will also cover C programming for embedded systems. This is a new course for the fall; instead of working on simulators as they have done in the past, the students, will be working on microprocessors. Something that came up when preparing for our accreditation is that our Engineering Applications Option is not valid right now because it is two credits shy. Engineering Applications hasn't been a popular option with the students so we will be either looking at a replacement for this option or we will need to modify these options.

#### **Questions, comments or suggestions concerning curriculum:**

- What are the other options you have? *Electronic Control Systems, Business Applications, Statistical Applications and Technical Communication.*

#### **A. How much web development should be included?**

Jeff discussed web development – should it be included in our curriculum? Currently there isn't a course that specifies any type of web development. It has been covered in the software engineering course for last four or five years. The project that it involves is the famous CRTS; this is an on campus course for setting up a website to track curriculum changes. The students have received really good experience from these projects. Some have gone out and gotten jobs in industry. However, if software engineering decides to do a different project they might not get exposed to web development. The goal is to give students experience in different domains. One of the things ABET wants is for the engineering students to be exposed to different application domains.

#### **Questions, comments or suggestions concerning web development:**

- IAB members, what if you had to choose the application domains for the students to be exposed to, what applications would you choose? (It sounded like web development isn't high on the list) *Students should be exposed to web development but it should be integrated in with a backend database or other systems. Exposing students to the latest web technology is important, they may not do web design but they should understand what is possible and what is not.*

#### **B. How should we go about getting system testing into our curriculum?**

In the past we have considered adding a system testing course. One idea was to take Senior Design and not make it a year course but to split it up so one semester could be a system testing course. It is hard to add another course to the curriculum, and we don't have the resources to teach another course, but replacing a semester of Senior Design would not require more

resources. Should this be incorporated into the software engineering sequence or should it be a part of the Senior Design course? If it is part of Senior Design the CS students will not be exposed to it.

#### **Questions, comments or suggestions concerning system testing:**

- The software engineering course is a full year so could this be incorporated into it? *Frank has struggled with this. He would like to have a project – in the class. Previously we have extended the project over the two semesters and tried to combine the text book learning with the project. Frank’s experience is that it was too hard to do either of them justice. We certainly will cover system tests as a concept and what it involves but the problem with that is we can’t extend the schedule.*
- You have done a good job with implementing system design, why can’t you do the same with system testing? *System Design comes at the beginning*
- Why can’t testing be conducted at the beginning as well? *We could put more emphasis on testing and still stay with in our frame work.*
- Frank - The ideal situation would be to have a laboratory setup where I could take the student through a project that has been completed in advance. The student would start off with week four, work on that aspect for a couple of weeks and then jump ahead to week eight, so they would get all of the different phases of a project. This would be a highly structured environment and we could do this the SE II class.
- Do you have facilities to do this available to you? *We can basically get whatever servers or machines we need – this hasn’t been a problem.*
- Real world application would benefit the students.
- IAB members would be very interested in identifying small projects for students with real world applications.

#### **C. Should we incorporate games into the curriculum?**

One possibility for incorporating games into the curriculum is making it an option. Jeff explained the CS department doesn’t have enough resources (faculty) to offer gaming courses within the department. Options are more or less courses offered outside of the department. There is new professor on campus in the PTC department who is trying to incorporate some gaming into his courses. Some of the courses in the gaming option would be; New Media II, Video Productions, Virtual World Design, and Game Theory. We would use the gaming not only as a recruiting tool but as a retention tool.

#### **Questions, comments or suggestions concerning games:**

- There is such a small market for gaming. I don’t feel it should be necessarily brought into the curriculum.
- Could give students the wrong idea that they are going to become game programmers when they graduate.
- Female students complained that they were not familiar with many of the games that were being offered in class.
- Games were incorporated into a previous course and 40% of the gamers are actually woman.
- What is the fundamental difference in a game developer and a standard developer? *I don’t think there is much difference.*
- You don’t want to give the student the false impression that they can get a gaming job – when it is highly unlikely. There is lots of competition for game development jobs.

#### **D. Robotics**

Jeff continued, should we be incorporating robotics into our courses?

#### **Questions, comments or suggestions concerning robotics:**

- Could you use them as a retention tool? *Yes, robotics is similar to games; there is some special technology used with them and students could use there technologies when doing programming exercises. This would keep the students interested.*

### **IX: Capturing and Keeping Student Interest:**

Frank gave a PowerPoint presentation on recruiting and retention. Frank began the presentation with an overview of the meeting the C.S. faculty had with the admissions office discussing the recruiting efforts they did in the spring to entice new students into the CS program. Writing personal notes to the recruits on the back of Tech business cards and including the card with the recruitment letter is one example. The faculty made personal phone calls to the most qualified prospects. Each faculty member has a section of the alphabet and they are responsible for contacting students whose names fall in that section. The admissions staff have a database that the faculty use to find information on the students they are responsible for recruiting. In additions to the calls, on-campus workshops were given. Local fifth graders came to campus workshops. Other workshops were given for Tech Days (when high school juniors and seniors came onto campus). We have been using the Alice Programming Language for the workshops. Alice is a free program, it is fun to use but it covers all the constructions that are covered in CS I and CS II. At this time Frank did a demonstration for the IAB members of Alice. Frank will be doing a presentation and full day workshop at the Montana Teacher’s meeting next month. His goal is to get one semester CS0 course based on Alice in schools throughout Montana. Frank will be applying for a grant for a teacher workshop on

campus for the summer of 09, but will also continue to do on-campus workshops. Frank feels that if he can get Alice classes offered in Montana Schools at the elementary and high school level, interest in computer science will increase. It will also provide programming experience to students before they enter the computer program at Tech. Frank would also like to visit high school math and science classes showing Alice, introduce the students to “Computer Science Unplugged” games and show some promo videos about what you can do if you have a computer science degree. He is trying to encourage students to think about the possibilities of what computer science and software engineering opens up to them. Frank also discussed the issues with retention in the Computer Science program. The problem with retention is really the first year. If students coming in have the right expectations we would have a better retention rate. Frank stressed the plan is not to discourage the students but keep them interested and give them confidence they can do the program. The department is also looking at doing a monthly event to get students communicating with each other.

**Questions, comments or suggestions concerning capturing and keeping student interest:**

- I think you are on the right path, I think the promo video from Washington University should be shown again at the end of the year to once again get the students excited about what you can do if you have computer science degree.
- Are student leaving the school or just the program? *The student often stays at MT Tech, but not with us.*
- Are they moving into engineering or something that isn't quit as difficult? *Often into fields such as: PTC, BIT and HCI and some into engineering.*
- What is the average salary in Computer Science? *\$46,000 - \$48,000. Software Engineering is \$52,000 - \$53,000.*

**X. Wrap Up**

Before wrapping up the meeting Celia asked the IAB members for their permission to make changes to the assessment plan.

- IAB members granted the Computer Science department permission to make changes to the assessment plan.

Celia asked IAB members if they would take a moment and fill out the feed back form in their packets and once again thanked the members for the attendance and support to the Computer Science program.

Respectfully submitted,  
Tami Windham