Computer Science
MONTANA TECH OF THE UNIVERSITY OF MONTANA

Computer Science Industry Advisory Board Meeting Minutes
October 1, 2010

Industry Members Present:
- Brent Foley, IAB member representing Hewlett-Packard Co.
- Julie Evans, IAB member representing Synesis7
- Terry Brandt, IAB member representing Zoot Enterprises, Inc.

Montana Tech Representatives Present:
- Michele Van Dyne, C.S. Dept. Chair
- Frank Ackerman, C.S. Faculty
- Jeff Braun, C.S. Faculty
- Rick Joyce, C.S. Faculty
- Celia Schahczenski, C.S. Faculty
- Tami Windham, C.S. Administrative Associate
- Matt Morris, C.S. Student
- Tony Morasco, C.S. Student
- Miles Pennell, C.S. Student
- Zach Wormgoor, S.E. Student

I. Welcome and Introductions

Introduction of all attending the meeting were made. Michele Van Dyne welcomed the board members to MT Tech and thanked the members for their input to the department.

II. Update on the Computer Science Department (Michele Van Dyne)

- **New Developments Since Last Year**
  - **Faculty**
    - Celia Schahczenski is back from sabbatical
    - Frank Ackerman was granted tenure
    - Rick Joyce accepted tenure track position
  - **Equipment**
    - New department server is up and running
  - **Accreditation**
    - Accreditation visit this fall for both CS and SE

- **Progress on Department Goals 2009** – Accompanied by a PowerPoint presentation Michele gave an overview of the department's goals for 2009 and progress towards reaching those goals. Michele informed members that the department's major goal is to increase enrollment. Rick will be talking about enrollment trends next, and you'll see some numbers that indicate why recruiting and retention have to be the department's major priority right now.

  - **Department Goals 2009**
    - **Increase Enrollment**
    - **Decrease Administrative Overload**

- **Ensure Faculty Continuity**
- **Enhance (External) Image**

- **Progress** – To address recruiting, enrollment and retention; Michele informed the IAB members of the R.E.A. L. scholarship developed by the CS department to encourage students to apply for when they complete online modules. Last year was the second year the scholarship has been offered. Brochures containing information about the scholarship was distributed throughout the community to local agencies, high schools, Enrollment Services recruiters and visiting counselors. She continued her presentation concerning decreasing administrative overload; informing members that the department adopted a new assessment process. The process was used for the full year this year. In Michele's opinion the new process simplified the assessment process. Michele spoke on the importance of faculty continuity. She informed members that a tenure track position was approved and filled. Rick Joyce accepted the tenure track position. Michele continued with her next topic "Enhance (External) Image; stating that the department has more work to do on this. She informed members that part of this is social networking but the department also needs to get out there where people are going to see us. The department website needs to be more dynamic and more interesting and the department needs more Tech-wide visibility campus wide. The plan to achieve this would be part of the department's 2010 goals.

- **Department Goals 2010**

  - **Increase Enrollment**
  - **Decrease Administrative Overload**
  - **Enhance (External) Image**
  - **Obtain Maximum ABET Accreditation (6 years)**

- **Plan (Increase Enrollment)**

  - **REAL Scholarship Program – Year 3**
  - **Alumni Involvement**
  - **Social Networking Medium**

- **Plan (Decrease Administrative Overload)**

  - **Streamline procedures**
  - **Make more information available to all**
  - **Assess ABET program outcomes directly**

- **Plan (Enhance External Image)**

  - **Social Networking**
  - **Website**
  - **Tech-wide Visibility**

- **Plan (Attain Maximum ABET Accreditation) (6 Years)**

  - **On-Site Visit 10/24 – 10/26**
  - **Track Record using New Assessment Process**
  - **Self-Studies Completed (6/30/2010)**

III. Welcome from Doug Coe, Dean of the College of Letters, Sciences and Professional Studies

Doug Coe, Dean of the Colleges of Letters, Sciences and Professional Studies welcomed the board members to MT Tech and emphasized how valuable their advice is to the department. Doug informed the members that the CS faculty has been stabilized with the hiring of Rick. He also emphasized that the program has some challenges; which Michele has begun to outline what those challenges are and has a number of efforts started to meet those challenges. Dr. Coe expressed his appreciation to the board members for their time and efforts put into the Computer Science program.

IV. Enrollment Trends, Recruiting Efforts (Rick Joyce)

Rick Joyce began his presentation asking "Why are we here?" (the department). He continued stating that "Our graduates get top paying jobs, they have different abilities than an I.T. person; yet we have no students!" The national average is on an increase; Tech is not following that curve. Rick presented data over the last eleven years of the Computer Science and Software Engineering program enrollment. According to the combined data the enrollment was monotonically decreasing in the year 2000 and has been steadily decreasing. He emphasized that this has been a trend in other universities and is a systemic problem for Computer Science but most places have seen a bottoming out in the past two to three years. Rick presented to members a copy of the 2008-2009 Taulbee Survey to help members understand what is going on nationally with CS programs. There has been an 8.5 % increase in the number of new CS majors; total enrollment +5.5% over last year. According to the survey undergraduate CS enrollment continues rising; doctoral production drops. Concluding observation is the fact that student interest in undergraduate computing programs continues to increase is heartening to our profession and consistent with the interests of governments in nurturing STEM disciplines. Rick emphasized that Tech is not following the national trend. He continued his presentation informing members that Tech CS program has no female students enrolled in their program. Nationally about 11% of bachelor graduates are female. At the masters level it is at 22%. A four-year study of woman and computing at the School of Computer Science at Carnegie Mellon University concluded cultural differences were a critical issue. Carnegie Mellon implemented several changes that helped create a more welcoming culture and improved the recruitment and retention of female students. The proportion of incoming female students increased from 7% to 42%. Rick also informed members that after visiting high schools his perception was; students don't know what it means to have a career in computer science. He emphasized that this is a systemic societal problem that needs to be addressed. Question was asked to the CS students attending the IAB meeting; why did you choose Montana Tech? The students had interest in math, game design, creating something out of nothing, logical thinking, and stressed that the Montana Minds Scholarship was one major factor why they choose Tech. IAB members emphasized to faculty to keep the quality of their program high, the students will value that when they graduate.

Questions, comments or suggestions:

- Do you know what Carnegie Mellon University did to improve female recruitment and retention and what can the program do for recruitment and retention in general?
    - Carnegie Mellon created a more welcoming culture to improve the recruitment and retention of female students. (*AAUW article Why So Few?*)
    - Carnegie Mellon has a variety of programs that are more artistic applications towards games and drama; if we do that it would be weakening our Core directions and I don't feel we should do that. We should concentrate on our Core applications. *(Frank Ackerman)*
    - We have high quality people graduating (*Rick Joyce)*
    - I would like to see you put out the strongest person you can; I don't understand why a good job in Computer Science is not attractive to women? *(Doug Coe)*
    - How much is it a factor that the fact of 4 years of computer science is fairly challenging? *(Doug Coe)*
    - Why does electrical engineering have a good % of woman when it is as equally tough? *(Michele Van Dyne)*
    - I don't think a lot of kids understand what computer science is; I don't think guidance counselors and teachers know where the world is going. As far as Tech is concerned; I

- think a large part of the population thinks Tech is a petroleum school. You need to do a lot more selling of the whole department of computer science. (*Terry Brandt*)
- There is a lot of interest and money behind dual enrollment with high schools. Most high schools don't have a lot of curriculum in computer science. Some kids may have the interest but no way of satisfying it. You may want to work with your high schools on dual enrollment programs. *(Doug Coe)*

V. Assessment (Jeff Braun)

- **Program Outcomes Assessment**

  Jeff Braun began his presentation with a general overview of the Program Outcomes Assessment process. There are 17 program outcomes which map to ABET EAC and CAC outcomes. The program outcomes are achieved by establishing course outcomes for each of the CS/SE courses and then associating each course outcome with one or more program outcomes. The mapping of course outcomes to program outcomes permits the faculty to use a matrix that shows which course covers or contributes to each program outcome. For each program outcome the faculty can also specify how that outcome will be assessed. Two courses fell below the 70% cut off; CS/SE 8 *(Understand the need for professional development and historical perspective)* and CS 14 *(Be able to apply skills gained in math, science and logic). (See table below*)

	Number Outcomes	Number Students	CS/SE 1	CS/SE 2	CS/SE 3	CS/SE 4	CS/SE 5	CS 6	SE 6	CS/SE 7	CS/SE 8	CS/SE 9	CS/SE 10	CS/SE 11	CS/SE 12	CS/SE 13	CS 14	SE 14	CS/SE 15	CS/SE 16	CS 17	SE 17	
Number Courses			8	5	14	3	10	7	12	1	8	6	4	13	5	2	5	6	14	4	2	4	
CS1006/SE1000	2	20	0.50								0.70												60.00%
CS2106	4	14						0.79	0.79					0.71					0.71				75.00%
CS2116	4	12						0.92	0.92					0.84					0.84				88.00%
CS2156	4	19						0.84	0.84					0.79					0.84				82.75%
CS2656	9	13	0.69	0.69	0.77	0.92	0.77				0.46		0.69	0.92	0.69								73.33%
CS3166	2	11															0.60	0.60					60.00%
CS3316	8	11	0.82		0.82			0.82	0.82					0.82			0.82	0.82	0.82				82.00%
CS3326	7	14			0.47			0.77	0.77					0.32			0.55	0.55	0.75				59.61%
CS3356	5	3			1.00			1.00	1.00		1.00			1.00									100.00%
CS3406	4	8			0.88		0.75				0.88								0.75				81.50%
CS4386 (not offered)		0																					
CS4406	8	4			1.00		1.00				0.50	1.00		0.75			0.75	0.75	1.00				84.38%
CS4526	4	4			1.00		1.00					1.00							1.00				100.00%
CS4556	6	3			1.00		0.67				0.00			1.00	1.00		0.67						72.33%
CS4606	7	1			1.00		1.00	1.00				1.00	1.00	1.00						1.00			100.00%
CS4916 (none taken)		0																					
CS4946/SE4940	4	4	1.00				1.00				1.00				1.00								100.00%
SE3250	10	8	0.50	1.00	0.83		0.50		0.83		0.83				0.50	0.83			0.83			0.67	73.20%
SE3260W	12	5	1.00	1.00	0.33		1.00		1.00			0.33	0.67	0.33					0.33	1.00	1.00	1.00	74.92%
SE3280	12	5	0.50	1.00	1.00	1.00	1.00		1.00					1.00				1.00	1.00	1.00	1.00	1.00	95.83%
SE3300	7	6		1.00		1.00			1.00			1.00			1.00	1.00			1.00				100.00%
SE4270	4	4			1.00				1.00					1.00					1.00				100.00%
SE4920	10	4	1.00		1.00				1.00	1.00		1.00	1.00					1.00	1.00	1.00		1.00	100.00%
Percent Meeting Performance Criteria			75.13%	93.80%	86.41%	97.33%	86.90%	87.76%	91.44%	100.00%	67.13%	88.83%	84.00%	80.60%	83.80%	91.50%	67.74%	78.62%	84.77%	100.00%	100.00%	91.75%	

Jeff continued with his presentation informing IAB members of the Senior Assessment Exams – ETS Major Field Test which is administered to senior students. A major advantage of the ETS Major Field Test is that it provides a standardized method of comparing our students' performance and the efficacy of the program to other programs across the nation. Jeff informed members that the CS students do quite well; they are in the top 5%. *(See table below)*

Computer Science Major Field Test

	Mean*	2008		2009		2010	
		Score	Percentile	Score	Percentile	Score	Percentile
Total Score	149	160	85%	167	95%	164	95%
Programming Fundamentals	56%	74%	95%	71%	90%	75%	95%
Discrete Structures and Algrithms	35%	47%	90%	55%	95%	46%	85%
Systems (Archtecture, OS, DB, Networking	43%	45%	80%	62%	95%	60%	95%

*Mean is based on 193 instituitions

Acceditors also look at a measurement for writing, science and math. An outside source to provide measures of the CS program outcomes pertaining to oral and written communications is the MAPP Test which is administered to students their junior or senior year. *(See table below)*

Computer Science & Software Engineering (2008-2009)

	Total score	Critical Thinking score	Reading score	Writing score	Math score	Humanities score	Social Sciences score	Natural Sciences score	
Link to the MAPP Web-Site	http://www.ets.org/portal/site/ets/menuitem.1488512ecfd5b8849a77b13bc3921509/?vgnextoid=ff3aaf5e44df4010VgnVCM10000022f95190RCRD&vg								
Link to comparative data:	http://www.ets.org/portal/site/ets/menuitem.1488512ecfd5b8849a77b13bc3921509/?vgnextoid=f54aaf5e44df4010VgnVCM10000022f95190RCRD&vg								
	< 92 % means that 92 % of these institutions scored lower than Montana Tech								
30 Doctoral/Research I & II Universities (N = 62,922)	**87%**	**93%**	**87%**	**73%**	**90%**	**87%**	**87%**	**97%**	**% Institutions Scoring Lower than Tech average**
118 Master's Comprehensive Colleges & Universities I & II (N = 150,910)	**94%**	**98%**	**94%**	**86%**	**99%**	**95%**	**97%**	**99%**	**% Institutions Scoring Lower than Tech average**
All Tech Average (N = 252)	**458**	**116**	**122**	**116**	**119**	**118**	**117**	**120**	
30 Doctoral/Research I & II Universities (N = 62,922)	**99%**	**99%**	**99%**	**99%**	**99%**	**99%**	**99%**	**99%**	**% Institutions Scoring Lower departmental averag**
118 Master's Comprehensive Colleges & Universities I & II (N = 150,910)	**99%**	**99%**	**99%**	**99%**	**99%**	**99%**	**99%**	**99%**	**% Institutions Scoring Lower departmental averag**
Computer Science & Software Engineering Average (N = 4)	**482**	**122**	**127**	**120**	**128**	**124**	**122**	**124**	
CS	485	120	130	120	128	129	122	121	
SE	485	124	127	120	126	125	122	127	
SE	471	118	123	118	128	116	119	122	
SE	488	124	129	120	128	125	124	127	

Jeff continued with addressing the two weaknesses CS/SE 8 and CS 14 emphasizing that CS students do not fare well on historical questions. He also noted; that students who fail the class and/or fail the final are in the statistics. Another factor is; non- major students are in the courses and are not well prepared for math. One student can have a big effect on our scores especially when you have 2 or 3 students in your course. Jeff informed members; that if the national norms are correct; we really are not deficient in these areas; maybe it is how we measure it.

Questions, comments or suggestions:

- How should we address the weaknesses in CS/SE 8:
  - Inform students they are going to be tested on historical questions and to pay attention. (*Celia Schahczenski)*
  - As a student this does not affect me; if they noted this is going to be on a test I would pay attention. Outcomes do not affect me.(*Tony Morasco)*
  - In Senior Project lifelong learning is covered by: examples, stories and quizzes. *(Frank Ackerman)*
  - Students should have the desire to have lifelong learning. This makes a difference who succeeds and who doesn't in industry. (*Terry Brandt*)
  - Have alumni write short essay stories of personal examples for real life learning.
  - Lifelong learning is not stagnant in industry. (*Julie Evans*)
  - Present case studies of companies that did not change, that did not develop, to students. *(Terry Brandt*)
  - Present case studies of companies that did change, that did develop, to students. (*Terry Brandt*)

Questions, comments or suggestions:

- How should we address the weaknesses in CS/14:
  - Give students program that they can use programming assignments.(*Terry Brandt*)
  - Problems should have science background. (*Frank Ackerman*)
  - Apply scientific methods into CS program.(*Frank Ackerman*)
  - Locate a text book that has more applied problems. (*Celia Schahczenski*)

Questions, comments or suggestions:

- Instead of using the CS Program Outcomes; can we us the ABET Outcomes?
  - **Noted:** All present IAB members concur to use ABET Outcomes.
    - Julie Evans –yes
    - Terry Brandt – yes
    - Brent Foley – yes

VI. Industry Update – IAB Members

- **Davis Almanza, Computers Unlimited: (Not present at meeting – emailed information)**

Projects: We are busy finishing up a new major release due out late this year. The release itself became a big project. Most notably we revamped our posting process from forcing our users to use an unattended nightly batch process to post daily orders through to the General Ledger and sales reporting data. We made the process more efficient and now allow our users to post throughout the day without locking out daily processes. This allows our customers to have better real time data analysis. In addition to that, we rewrote our General Ledger package, and provide more meaningful detail that can be "drilled down" on more effectively by our users. We continue to eliminate our legacy file structure in favor of a full database backing. Going forward we have several product initiatives we plan on addressing. The consistent theme is to be efficient and simple while providing a consistent look and feel for our users.

Hiring Trends: Like many other businesses impacted by the economy we tended towards doing more with less or with the same resources. To that end, our hiring has been limited to replacement of necessary job functions if someone should leave our organization. In addition, CU is starting to move forward in technologies that are outside many of our current employee's skill set. In order to bridge that gap we are partnering with another company to infuse experienced developers in the desired technology. We are working together with that other organization in order to be more efficient in our new development. They understand the technology, we understand our business and current development practices. Currently, we are having good success with that recipe. However, we still look at the universities for good talent.

Development and Documentation Standards: Because the industry demands it, we are heavily focused on the user experience. Our software and the business we serve is quite complex because billing Medicare and private insurance companies is extremely dynamic. Couple that with the fact that we have many customers that often do things procedurally different and our challenge becomes quite obvious. We are also very much a Microsoft shop. Due to that, we are planning on adopting the Microsoft windows user experience interaction guidelines for our applications. We intend to customize as our industries demand, but our goal is to use as much of the default guideline windows behavior as possible. Ideally, providing a consistent and familiar environment for the user. Regarding development we continually define and follow our own database and coding standards. These standards have built over the years from many different sources and continue to evolve.

Vision of Skills Needed in the Future: Since it is a hot topic for us, those developers that have experience with UI design and implementation from a user's perspective are highly valuable. In addition, we are adopting more of an Agile/Scrum development model. So people with that background are increasingly valuable. As always, those developers that can effectively communicate with non-technical people will remain extremely valuable as well.

- **Brent Foley, Hewlett Packard:**

Projects: HP have multiple teams that work on all different kinds of things. When we do the interview process we look at where a person will fit in best. I personally worked on a qualifications and tools team for our products. We are always doing different stuff with different tools that are needed in the lab. For example: building testing frame work for our products.

Hiring Trends: HP has not hired until 6 months ago and internships have not been hired until this year. Now we are growing and hiring a lot. We just hired 20 people and are starting to interview again. Before we were only hiring college graduates; now we are hiring both college graduates and people with experience.

Skills: HP cares a lot about Objected Oriented Programming; C Sharp (is a bonus for knowing), C++, and Java. Test driven development; we don't see any students graduating from college with the skill writing unit tests with code or even testing methodologies. It is a huge plus for new hires to know the concepts of what test driven development is; we definitely look for that.

Development Process and Tools: HP uses Agile development process. We have server farms that do testing that run for 24 hours. We are trying to get our process even more automated.

Documentation Standards and Tools: HP documentation standards are done in code. We have strict analyses warnings. We are not very good at writing documentations standards; we are still learning.

Vision of Skills Needed in the Future: Knowledge of the fundamentals of data structures.

- **Julie Evans, Synesis7:**

Projects: Synesis7 is mostly developing web applications. New hires should have strong skills in Java, JSP, and GUI Design.

Documentation Standards and Tools: At Synesis7 we feel it is not important what tool you use for documentation but to know who your audience is and if they can clearly read your documented information.

Vision of Skills Needed in the Future: Database and GUI. On the server side of development; understand security issues and advance experience in web application from end to end, connected and disconnected mode.

- **Terry Brandt, Zoot Enterprises:**

Projects: Zoot current projects evolve around the philosophy that our software is a service. All of our tools are developed around the application provided as a service. We improve and develop our tools for clients to use to make changes to their business logic.

Hiring Trends: Zoot has not hired in the last two years. Zoot continues to expand their client base so we maybe hiring this year. The new hires we will be looking for will come from Business and Technology programs. Some of the question we ask during our interviews:

- Ability to work in a team environment
- How well do you handle stressful situations and conflict
- How do you think and solve problems
- How are your communication skills
- Do you have a desire to learn and are you innovative

Skills: Java, C++, Python, database, and SQL

Development Process and Tools: Zoot uses Agile development process. As far as tools; we use Eclipse and our own tools.

Documentation Standards and Tools: Zoot does not have a lot of documentation tools. A template was developed for developer to input there documentation. Documentation is still a struggle. A reliable conversion tool Zoot uses is CS converter.

Vision of Skills in the Future: Students should understand in the real world you don't get to do a redo, there are no time extensions, and students should be able to carry a project from the very beginning to the end. Terry also noted that most graduate appreciate having to take the Technical Writing course. New hires should have; code security, security in general and testing mythology.

Questions, comments or suggestions:

- Should CS majors take more computer science courses instead of options outside of the department?
  - Students would be more marketable if they take more CS Options. (*Brent Foley*)
  - No Option – Option: If they meet their credit requirements do we care what courses they take? (*Michele Van Dyne*)
  - If students only take CS Options will the students be broadened enough in other areas – I really don't think this is a worry. (*Julie Evans*)
  - Having a CS Option is intriguing. (Zach Wormgoor)

- Option should not be a HPER option. (*IAB/faculty/students*)
  - **Noted:** All present IAB members recommended a CS Option.

VII. Discussion and Wrap-Up

Michele did a brief summary of the meeting and thanked the members for their attendance and support to the Computer Science program.

Meeting adjourned.

Respectfully submitted,
Tami Windham