

Previous Research Essay

Describe any scientific research activities in which you have participated, such as experience in undergraduate research programs, or research experience gained through summer or part-time employment or in work-study programs, or other research activities, either academic or job-related. Explain the purpose of the research and your specific role in the research, including the extent to which you worked independently and/or as part of a team, and what you learned from your research. In your statement, distinguish between undergraduate and graduate research experience. If you have no direct research experience, describe any activities that you believe have prepared you to undertake research. At the end of your statement, list any publications and/or presentations made at national and/or regional professional meetings.

Throughout college, I played an active leadership role on multiple projects. In the first months of my undergraduate years at Butler University I saw that the student paper was being influenced by the administration. Upon investigating alternative news sources, I discovered that while there was another paper online, it was far from an alternative; it mostly reused printed content. I suggested to the administration that perhaps with some funding, a healthy alternative could be created, but the response I received was disappointing. They felt the ability for students to publish in such broad manner was dangerous.

Seeing an opportunity to change way the campus received and delivered news, I gathered a handful of developers and writers to begin building a real alternative. We worked in our free time and under our own supervision to build an autonomous site with a low learning curve. A professional, student designed online newspaper was a new idea at the time, and to succeed it needed more than code – it needed a name and a movement. We called our system Dawgnet and launched an advertising and recruiting campaign to announce our arrival. In the months following, hits on the site surged, staff numbers increased, and Dawgnet rose to compete fully with the print paper.

Dawgnet's role was further clarified on Sept 11, 2001. The weekly paper had gone to print the night before the Twin Towers fell. With no way to express their shock and sorrow, students, faculty, staff and even neighbors of the university turned to Dawgnet as their hub of communication. On that day, we proved that the ability for everyone to publish was not so dangerous after all. A few years after the launch, Dawgnet was recognized as a finalist in the National Associated Collegiate Press' Online Pacemaker competition.

As I look back on my Dawgnet experience, I realize I learned more than just software development or how to manage a publication. I gained skills that are necessary for successful research. By challenging the norm, I was able to identify an interesting problem that had social impact. I successfully recruited and retained a multi-disciplined team. By communicating my vision effectively, I motivated the value of the end product. With the help of my team, I was able to complete a long-term project that added real value to its users. Dawgnet convinced me that with a good idea and a strong team, I could make a difference. That lesson drove me find more interesting problems.

Because of my dual bachelor's degree track in computer science and electrical engineering, I wanted to try my hand at hardware as well. Radio frequency identification (RFID) was becoming a hot field, and yet there seemed to be little consideration for using these passive tags to automate processes. I learned Dr. Michael Kneiser, a professor at the Purdue School of Engineering, Indianapolis was working with a local pharmacy on a number of projects. He was looking for a team to investigate the feasibility of RFID tags in automating workflow. I assembled a team of four and volunteered to give the project a try.

My team worked on the RFID project independently. We had to understand the problem we were trying to solve, perform tests to confirm the limitations of the technology, design a system around those limitations, and finally build a working prototype. In addition to leading the team, I was also responsible for ensuring the hardware could communicate with the software.

A few weeks after the project idea was suggested, we were able to deliver a prototype to the pharmacy. As orders were received online, employees would mark each order with a reusable tag. The uniquely tagged orders would flow through a conveyor system as the order was filled. Once filled, the order would move to shipping where it could be sent to the buyer. The prototype excited the pharmacy and work is still being done on fully implementing RFIDs into their workflow.

While the RFID project grew my interest in academia, I felt my broader background would hamper any graduate work and thus I began a career in industry. As an engineer at Raytheon Technical Services Company, I built both hardware and software systems. I designed applications that simplified the document retrieval processes for engineers, sped up on-site printing of schematics, and demonstrated ways of cutting costs through document digitization. On the hardware side, I designed components that increased the accuracy of F/A-18 radar test equipment, led a team in redesigning a digital magnetic anomaly detection device, and provided analysis of avionics in air combat electronics. I also spent time troubleshooting production of avionic spares and managing project budgets and timelines.

Although I sampled a variety of activities, my most rewarding experience came when I was tasked to create a proof of concept device for aircraft technicians. Technicians in the Air National Guard face what can be a daunting job. There are a seemingly infinite number of problems that can occur in their fighter fleet. Despite this, an aircraft is at its core a set of mechanical and electronic boxes connected by wires. When there is a problem, it is likely the issue will be within a wire or within a box. To troubleshoot problems, technicians carry a large set of schematics, a few diagnostic tools, and a notepad. The results of their tests are then stored in a computer system at the end of the day. Out-dated schematics, poor note taking, and mistakes in measurements only reveal themselves once the data is tabulated. These mistakes regularly result in a misallocation of the funds required for parts and repair.

I had to find a solution that could be used across the fleet and do it in thirty days. With such a short turnaround, I had no choice but to think creatively. I learned that most boxes and wiring could be outfitted with a unique barcode identifier. I also learned that the process of diagnosis was relatively simple to implement in software. Using the feedback I had gathered, I built a system consisting of a handheld PDA, a barcode scanner, and a wireless card. The entire device was slightly thicker than the PDA itself and coupled with a standard web-server and some software, it delivered the full functionality the technicians needed in a handheld form-factor.

With the device in hand, technicians could walk to an aircraft and pull schematic information by scanning the barcodes. Their diagnostic results could then be entered on the handheld and sent directly to a central database in real time. By mirroring the process the technicians used in software, I was able to guarantee easy adoption while eliminating mistakes.

I met the deadline and the system received rave reviews at the Aging Aircraft Expo a few weeks after it was built. While the proof of concept was successful, it never went into production. The idea that a working system could not reach those who needed it frustrated me and I simply could not reconcile the company's goals with mine. While I had learned how to work independently and think creatively on my projects at Raytheon, I soon came to understand that my wish was to freely and openly address larger issues. I now knew my broad background was indeed an asset that would serve me well in graduate school. I resigned my position and came to the University of Washington.

Although I have only been at UW for a few months, I know that I should have been in here all along. While the majority of the projects I have worked on are not research, I believe the skills I have demonstrated will make a good leader, a good team player, and a good researcher.