

**2006-2446: SUCCESS, FAILURES AND NEXT STEPS FOR ENGENIUS
SOLUTIONS: REAL WORLD IDEA LAB FOR ENGINEERS**

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Success, Failures and Next Steps for Engenius Solutions: Real World Idea Lab for Engineers

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The process of producing new products is difficult and filled with challenges not typically taught in an engineering curriculum. While many students are exposed to product development, due to time constraints and meeting course objectives, these classes tend to offer either structured projects or surface level introduction to product development and especially new product development. The projects developed, in Engenius Solutions Lab, are not structured and require a level of commitment not generally required in the student inventor's classes.

Over the past five years, Engenius Solutions has worked with over 20 different projects which span the various engineering disciplines and product lines. The Board of Directors and staff have accumulated a reservoir of knowledge in assisting students with product development. This paper is a reflection on the successes, failures and next steps for Engenius Solutions, a grant funded, student run, product development organization, at Rose-Hulman Institute of Technology. This paper provides an update to a paper written in 2004 titled Engenius Solutions: Changing How Undergraduate Engineers Think by Batta, Andrew, et al.

Traditional engineering education + Entrepreneurship

The mixing of engineering education with entrepreneurship and new product development has broadened the career pathways and knowledge base for many students. The growth of conferences focused solely on entrepreneurship in engineering and engineering+business education provide an indication of the importance many engineering and business leaders are placing on this integration. The Roundtable on Entrepreneurship Education (REE) [<http://ree.stanford.edu/>] and the National Collegiate Inventors and Innovators Alliance (NCIIA) [<http://www.nciia.org/>] are two such conferences. The rapid growth of the ASEE Entrepreneurship Division provides another indication of the number of institutions, faculty, and entrepreneurs actively involved in entrepreneurship program development. In the past, traditional engineering education has prepared the student for traditional career pathways primarily within traditional corporate entities. However, according to the Small Business Administration (SBA) website (1), small businesses, those with fewer than 500 employees, create 60 – 80 % of the net new jobs annually and produce 13 – 14 times more patents per employee than large patenting firms. Because of generally limited resources, smaller firms typically require the newly hired engineer to have a broader set of skills. The new engineer must be familiar with marketing and accounting as well as their particular engineering disciplines.

As economies continue to become more global, American industries must rely on innovation and technology to remain competitive. These companies must create new products faster with more features. An understanding of the product development cycle and how it fits into the corporate planning structure, i.e. financial planning, marketing, sales is essential. A student that gets

exposure to the new product development process and entrepreneurship will be better able to quickly provide value for their employer or their own company.

Many schools are offering courses and extra curricular resources for students that are interested in developing new products. Stanford and Case Western University continue to excel at providing both an environment and curriculum that supports undergraduates, graduates and faculty in their entrepreneurship endeavors. There is a natural fit between engineering and entrepreneurship education. However, it takes more than marrying the two disciplines. The whole school needs to embrace entrepreneurship and new product development. New product development is a mindset that must be cultivated and nurtured at every level and corner of a campus. In other words, Entrepreneurship must be embedded within the curriculum for the programs to be truly successful.

Over the past tens years, Rose-Hulman has made great strides in introducing entrepreneurship to the student body. In addition to Engenius Solutions, Rose-Hulman has developed a Masters in Engineering Management, which offers classes to both graduate and undergraduate students in entrepreneurship and management, established Rose-Hulman Ventures, another Lilly Endowment funded program, many departments have encouraged and supported student teams in developing entrepreneurial based proposals for external funding from organizations such as NCIIA. All of these programs provide entrepreneurship development opportunities for the Rose-Hulman student body.

While the current programs and opportunities are good, the authors believe a bridge needs to be developed to extend entrepreneurship into the class room. Engenius Solutions and Rose-Hulman Ventures are purely extracurricular. The student inventors work on these projects on their own time. Allowing students to get academic credit for working on their Engenius Solutions projects has not been successful.

First and foremost, the students at Rose-Hulman attend to obtain a math, science, or engineering degree and with the high cost of their education, most do not have the luxury of going beyond four years. This leaves a finite amount of time and those who are interested in developing their project ideas must, in many cases, decide between getting their degree within four years or extending their graduation and developing their idea. A better integration of entrepreneurship programs such as Engenius Solutions and Rose-Hulman Ventures into the curriculum may allow these inventors and innovators to both develop their ideas and obtain their degree within the four year time period.

Our Process

Submitting an idea to Engenius Solutions is simple via our online application. Upon receiving an application, the student management team discusses the idea and then performs a brief patent and internet product search. Those ideas which pass our criteria for sponsorship are accepted. The review and product analysis selection process allows the student managers to learn more about evaluating ideas for further investment. In a product development cycle, this iteration review is important.

Engenius Solutions accepts ideas from the student body, faculty and staff, and from outside inventors. Our experience has shown that projects generated from students offer the best success rates. Developing an idea, articulating that idea for acceptance and then managing that project are all steps in developing new products and in developing an entrepreneurial mindset.

Engenius Solutions was originally intended to be a place where students would post product ideas and the organization would help develop the idea and then try to license or sell the technology. Engenius Solutions has evolved into an organization which sponsors student projects by providing both technical and financial assistance. This evolution has provided more opportunities for students to get involved in the product development process. Furthermore, there is a reluctance for industry to purchase or license ideas without working prototypes or proof of concepts. Engenius Solutions sponsored a project that garnered some interest from a company. However, the company wanted to see a working model. Because Engenius Solution was not able to produce model, this lead and potential partner moved forward and the opportunity was lost.

The results and assessments after three years have been mixed, two patents have been filed and student awareness of Engenius Solutions is good. The number of discontinued or incomplete projects is, however, large. This is especially true when the seniors graduate and there is no one left to “drive” the project forward. A discussion of what is being done to combat this lack of drive to push a project to completion is addressed at the end of the paper.

Engenius Solutions Objectives

The mission of Engenius Solutions is to promote and offer opportunities to participate in new product development and entrepreneurship. The promotion of entrepreneurship is delivered via an on-campus lecture series, open houses, presentation to campus groups and a student-tailored website. Students participate in new product development by submitting their ideas via our website and then working on the development of their idea or by working as a development team member for one of the ideas accepted by Engenius Solutions.

Promotion Objectives

Engenius Solutions is one of the only campus organizations whose objective is to promote new product development and entrepreneurship. In the past, Engenius Solutions did a good job, as identified by various assessment processes, of promoting itself through a series of presentations, by participating in student group fairs and by word of mouth. However, it did not have the resources, via space and staff, to actively promote new product development.

Engenius Solutions now offers an on-campus lecture series which has hosted entrepreneurs, patent attorneys, and venture capitalists. The topics of the lectures are meant to provide insight into entrepreneurship not taught in classes. One of our lectures was titled, “In the Trenches: Life in a Startup.” The presenters started a company about a year and a half before the lecture. One founder was the president of a division of a large multinational before working in the startup. They talked about the different challenges entrepreneurs face everyday. The lectures are suppose to provide insight not taught in class.

A series of open houses open to the entire Rose-Hulman community were held in the fall of 2005 as a complement to the general beginning of the year promotions to freshman. The open houses allowed for more specific, one-on-one, discussions about what Engenius Solutions can do and to connect on a personal level. This series of open houses also provided opportunities to talk about upcoming events. The series of open houses proved to be beneficial for the promotion and discussion of Engenius Solutions. The number of entries in our fall design contest was a result of introducing and promoting through open houses.

Participation Objectives

The first step toward increasing student participation was the development of an *Idea Lab*. In the past, the management team resided in a small office. The space had just enough room for the management team and was not laid out in a manner that allowed open communication. The arrangement was akin to four individuals sitting in individual cubicles where students interacted with them only when they submitted ideas and at presentations.

The *Idea Lab* is approximately one thousand square feet which houses booth space, tools, and a small development library. There is also a meeting space and managers work stations. It contains no interior walls and creates an open and stimulating environment. However, the space is not designed or intended to be a lounge or recreation space. The lab contains 8 booth spaces (workbenches); however, the space is actually constructed to accommodate roughly 8 major and 20 “*sandbox*” projects. Sandbox projects are concepts with potential but are farther from development or more novel than a major project. This allows a student to become engaged and at the same time develop their idea. Engenius Solutions provides limited financial but more technical and business assistance.

Because of the bigger space, the staff is able to conduct weekly inventors meetings and design sessions with the individual inventors and team. During these weekly meetings, all of our inventors get together. We select one project and assist that project with design, technical or administration issues. Unlike a conference room, this open feel allows the students to get comfortable and open to new ideas.

In prior years, Engenius Solutions supported three to four student projects. Each project had three to four participants. The projects were mainly associated with senior design projects. While some have been good projects, the student groups have not had the time before graduating to fully complete their projects. Therefore, many of these projects were not completed.

One of the main objectives this year was the attraction of freshman and sophomores and keeping them involved for several years. This group, freshmen and sophomores, generally wants to get engaged in groups and is enthusiastic about attending school. Furthermore, they have more time until graduation to develop and learn the new development process. This time allows for them to make corrections in their product before they graduate. Because students do not have much spare/free time, the key is to keep them engaged over a much longer time frame. This allows for periods of inactivity. For example, Rose-Hulman is on ten week quarters and then a finals week. Out of this eleven week period, the students have roughly 4 weeks with enough free time to work on their projects. The Engenius Solutions staff sees about two weeks of work at the beginning of the quarter and about two weeks of work in middle.

Initial progress and activities over the last two quarters indicate that Engenius Solutions has been successful in greater student involvement and interest. In the past, very few freshmen and sophomores were involved other than as part of the student management team while the majority of students involved this year are in this academic level. This year there are seven freshman and sophomores.

While the senior students have a level of maturity and experience, they do not seem to have the time nor interest. Their focus is on graduating and employment. However, while they might not be the target market for student inventors supported by Engenius Solutions, they do make invaluable resources for working and assisting on projects. Seniors working on projects enjoy the challenges associated with our projects and allows them to use the knowledge the accumulated over the past four years.

To increase the number of projects, and therefore the number of participants on the projects, Engenius Solutions had a design competition in the early fall that was open to all students. The design competition was very open-ended with no direction in project type or engineering discipline. As an incentive, the top three winners received product development awards, access to the lab, and a prize. First place received \$2500; second place received \$1500 and third place received \$1000 in product development support. The money can only be used to pay for services and products directly related to the projects.

The design competition yielded sixty ideas from thirty students. Some students submitted up to five different ideas. The project ideas ranged across the different engineering disciplines offered at Rose-Hulman and from a broad range of classes. The top three winners included a civil, biomedical, and electrical engineer major and a freshman, sophomore, and junior. A spring competition was also held. The spring competition was divided into three categories: 1. social global, 2. social networking, and 3. consumer products. The winner in each category received \$2000.00 in product development costs. As mentioned above, the spring design competition yielded 11 ideas from 10 inventors. While the numbers were lower than our previous contest, the management team expected their to be a drop in the numbers because the competition was during the winter quarter, a typically tough quarter at Rose-Hulman and the specific nature of the categories.

Over the past several years, Engenius Solutions has operated with a business, marketing and technology manager reporting to the CEO. The CEO's had responsibility for running the day to day operations and managing the organizations interaction with outside constituents. The Marketing Manager worked on marketing Engenius Solutions and the client projects. The Marketing Managers assisted with the commercialization of the completed projects. The Business Managers worked with Engenius Solutions on product development implementation. They also assisted in the development of business plans. The Technology Managers developed and maintained the website.

This arrangement allowed for vertical integration with the student managers being able to focus and learn about one part of the development cycle. The organization structure did not allow the students to get cross functional experiences and did not provide accountability. The structure of

the organization did not provide the officers with direct project management experience and very little hands on management of the projects. This lack of interaction with the projects allowed for many project teams to slip from their timelines and therefore mandated more project management reports and documentation.

The new structure is based around the projects. Engenius Solutions now has a Managing Director and Product Managers. The Managing Director role is similar to the CEO in the previous organizational structure. However, their responsible is for managing the product development process and for providing guidance to the individual Product Managers. The real change comes in the creation of the Product Manager position.

The Product Manager position has two responsibilities. First, they are in charge of one aspect of running the organization. For example, one is in charge of marketing Engenius Solutions and available services to the target market. This role is very similar to the function of the previous Marketing Manager. Another Product Manager is responsible for obtaining or finding equipment requested by the inventors. This is very similar to the role of the Business Manager in the previous organizational structure. The third Product Manager maintains the website as did the Technology Managers in the past. However, each one of them is also responsible for managing a particular project or projects.

Finally, to promote continued interest in their projects, the management team meets weekly with all of the inventors and devised a monthly incentive plan called the *Moment of Truth*. At each *Moment of Truth* meeting, the inventor stands up in front of the group and presents their successes or failures since the last meeting. After everybody has presented, the members vote on who has accomplished the most since the last *Moment of Truth*. The Managing Director's vote is used to decide ties and to decide if anyone deserves the prize. This allows everybody to openly discuss their successes and provides the peer pressure that pushes the inventors to continue developing their idea. The product development process is long, hard and prone to failure. This monthly incentive keeps their hopes high and makes them feel some short term positive reinforcements.

While time will tell whether these changes will improve our success rate for project completion and promotion of entrepreneurship on campus, the improvements and feedback have been very positive based on initial assessment results. The management team will continue to improve the new product development process as well as promotion of entrepreneurship across the curriculum and campus.

References:

<http://www.sba.gov/advo/stats/sbfaq.html>

Andrew Batta, Aaron Capazzi, Jonathon Fructhe, Ron Zuckerman, and Dan Moore, “**Engenius Solutions: Creating an Entrepreneurial Revolution at RHIT**”, Presented at the 2004 Summer ASEE conference, Salt Lake City, UT, TN, June, 2004.

Andrew Batta, Aaron Capazzi, Jonathon Fructhe, Ron Zuckerman, and Dan Moore, “**Changing How Engineers Think**”, Presented at the NCIIA conference, San Jose, CA, March , 2004.

Nathaniel Bowe, LaMarr Taylor, Kyle Smith, Ron Zuckerman, and Dan Moore, “**Getting Engineers to Think and Act like Entrepreneurs**”, Presented at the 2003 Summer ASEE conference, Nashville, TN, June, 2003.