

Incubating Entrepreneurial Engineers: The Rose-Hulman Ventures Experience

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Incubators' popularity has waned somewhat since the fate of many, especially for-profit, incubators through the dot.com bust has not been good. However, the idea of affiliating an incubator with a university is still an intriguing one, and more are starting every year. Their appeal is natural. They appear to be a good way to channel university-based research results into commercialization, and they usually provide very public evidence that the institution is working to stimulate economic development. The advantages of incubators include such things as low cost space, internet connection, shared services, business advice and proximity to the technology, equipment and personnel of the university. At Rose-Hulman Ventures, two grants from Lilly Endowment for a total of \$54.6 million have made it possible to provide all of these services and more and at the same time provide unique opportunities for faculty and students to work and learn.

BACKGROUND

Rose-Hulman Institute of Technology has been working to engage students in realistic engineering practice as part of their educational experience for almost two decades. In the 1980's, the school established an Entrepreneur-in-Residence program to bring inventors who were struggling to commercialize their inventions to work with students and faculty in laboratories and independent work. There were also a number of initiatives for outreach to existing technology-based industry, especially in the area of optics. Later the

Center for Applied Optics Studies expanded into the Technology Assistance and Services Center which provided expertise for projects related to most of the campus' technical disciplines. Curriculum restructuring reinforced these efforts by moving toward requirements or at least strong suggestions that all students complete an externally sponsored project as part of their undergraduate engineering and science degree programs. At the same time, there were efforts to get students involved with hi-tech start-ups through entrepreneurial intern programs. In fact, the well-known Kauffman Entrepreneurial Intern Program was piloted at Rose-Hulman. Academic coursework in entrepreneurship was elected by more and more students, some of whom launched businesses with the help of various levels of incubation provided by the Institute. By the end of the Nineties, new product development was the basis of many students' project course work, an initial Lilly Endowment grant had begun the Technology and Entrepreneurial Development Program and federal funds had enabled the construction of the Myers Center for Technological Research with Industry.

All of the above activities certainly had some economic development benefits, but Rose-Hulman's primary motivation was educational. There was a conviction by faculty and administrators that preparing young people to be quickly productive in their careers demanded that they take on realistic efforts and be held accountable for presentation of useful results in written and oral reports. While their work frequently generated useful outcomes for their sponsors, it should be stressed that the first emphasis on the campus was and is the student's development, not commercial success.

ESTABLISHMENT OF ROSE-HULMAN VENTURES

Lilly Endowment has always been supportive of educational initiatives at Rose-Hulman, but they had other objectives in addition to fostering quality higher education. The state of Indiana has for many years been educating thousands of young people who have had to leave the state to find appropriate job opportunities. Consequently, the state ranks near the absolute bottom of percentage of college graduates and professional workers in its population, which further contributes to a lack of the emerging new businesses that have brought new economic vitality to other parts of the country. The groundwork of new product projects at Rose-Hulman made the Endowment receptive to the proposal that eventually led to establishing Rose-Hulman Ventures at the end of 1999. Rose-Hulman Ventures is physically located about 5 miles from campus, although it is a part of the Institute just like an academic department or the athletic program. Ventures' mission is to

- Foster creation and growth of innovation-based businesses by providing access to:
 - Infrastructure
 - Technical Support
 - Business Support
 - Capital
- Thereby providing:
 - Faculty/student educational experiences
 - Economic growth for Terre Haute and Indiana

And it does this by providing the following special features

- A Technology-Based Incubator
- New Product Development Labs
- Information Technology Infrastructure
- The Entrepreneurship and Business Planning Group
- Rose-Hulman Venture Dollars (RHV\$)-for in-kind investment

- The Success Fund – to provide seed cash
- Internships for students to work with technological entrepreneurs
- M.S. in Engineering Management assistantships for entrepreneurial engineers
- Innovation Fellows - a learning and contributing experience for technical experts
- Alliances with other schools, business, etc.

The infrastructure of Rose-Hulman Ventures is an impressive 35,000 square foot building that houses a staff of about 25, laboratories and equipment which emphasize rapid prototype development (such as an SLS machine for prototype development and facilities for RF radiation determination), burstable T-3 access to the internet and office space for some of the two dozen or so clients that have projects with Ventures at any time. Many clients primary operations are located elsewhere in Indiana such as Indianapolis or Bloomington, but they have significant work being conducted at the Ventures building. The new product development labs have an impressive array of equipment with all of it devoted to rapidly generating the prototypes and initial products needed by clients.

Included in the staff of Rose-Hulman Ventures are permanent employees that include 15 experienced engineers and technicians and seasoned business professionals, as well as the students and faculty who work part-time. The experienced engineers and technicians are an important differentiating feature of Rose-Hulman Ventures. Many university-based incubators provide access to university facilities, and faculty members are often involved.

However, the development of the right product in a timely fashion requires more than students and even faculty bring to the effort to successful completion. People who have managed projects and client relationships are invaluable parts of the overall operation because they keep the activities on track. The business professionals are also critical for a number of reasons. First, it should be stressed that technology-based businesses seldom fail due to faulty technology – the serious challenges are usually business issues like determining the market and a way to access it, capturing sufficient value to cover costs and effectively raising funds. Therefore, there needs to be serious business screening of potential clients to get at least some assessment of the potential for commercial success and ready resources to aid entrepreneurs when they need rigorous business counsel. Rose-Hulman Ventures' also has engineering management graduate students and interns from business programs who analyze business plans and carry out specific business related projects for Ventures and its clients. For example, we have one entrepreneurial fellow who is spending two years with Ventures before going on to graduate business study. After being project manager on the development of a system to screen applicants, she has taken on the primary role in making the review and selection process effective. In addition, she is on business assistance teams working with an experienced Innovation Fellow. This use of interns is cost effective for Ventures and a great experience for those involved.

The presence of Innovation Fellows is another useful way to bring reality to Ventures' activities. Universities have often used scholars and writers and artists-in-residence to

add to the environment and perhaps produce something significant from their part-time and/or temporary involvement. Rose-Hulman Ventures has used experienced entrepreneurs, business executives, inventors and faculty from Rose-Hulman and other schools in both part-time and full time, but short-term roles. For example, one new faculty member used his fellowship status to initiate commercialization of technology he developed as part of his dissertation research. Other faculty members have contributed their particular expertise to help client firms. We have also used business executives who are between positions and experienced entrepreneurs who have launched successful businesses to provide business mentoring that has been both realistic and extremely helpful. These Innovation Fellow arrangements have allowed flexibility and access to talent that otherwise would not be available.

THE PROCESS AT ROSE-HULMAN VENTURES

A typical scenario for a Rose-Hulman Ventures client would be an application to the multi-stage screening process using the form provided by the web site at www.rose-hulmanventures.org . The candidate provides technical and business information that enable the Ventures staff to determine the appropriateness of the technical work for Rose-Hulman students, the potential to build a successful business and the congruence of the business' needs and Rose-Hulman Ventures resources. If the match looks good, a deal is negotiated to provide in-kind services in return for a financial position in the company. These in-kind services may include space, office equipment use and internet access, especially for resident companies. In addition, there is always an agreement for technical and perhaps business project work for which the client pays in the form of debt or equity

position. These in-kind arrangements charge services to predetermined lines of credit in Rose-Hulman Ventures Dollars. The intent is that these investments will provide a return in three to five years so Ventures can operate indefinitely. The use of either debt or equity depending upon the situation allows Ventures to avoid the possibility of having equity positions in “life style businesses” that may never become liquid.

After a period of time to establish a relationship, client companies may also seek a cash investment from Rose-Hulman Ventures’ Success Fund. The grants from Lilly Endowment have included \$15 million of funds that are part of Rose-Hulman’s endowment to be invested in client companies. There is a subcommittee of Rose-Hulman’s Board of Trustees who approves these investments based upon Ventures’ staff recommendations and their own experiences in venture capital. A typical deal with a client firm may involve \$500,000 of Rose-Hulman Ventures’ Dollars for specific services and then a \$500,000 cash investment from the Success Fund for spending on the other requirements for launching a business. Not every client has also gotten Success Funds, but those who have are finding that it also helps attract other financing.

INVESTMENT AND ECONOMIC DEVELOPMENT BENEFITS

Since its first investments in 2000, Rose-Hulman Ventures has been fortunate. Well over 300 firms have been at least interviewed and over one hundred have had serious due diligence performed. This work has resulted in investments in 32 client companies. These range from barely out of the idea stage to businesses that have been struggling to get launched for some years and others that are starting new product efforts. The rather high ratio of investments to opportunities presented is due to the fact that funding is from a

grant that constrained candidates to be those who would impact Indiana. Obviously, the three-year life of Ventures to date has not been in a good time for emerging technologies and the businesses that base their future on them. Nevertheless, the results have been very encouraging. In fact, the additional \$24.9 million Lilly Endowment grant was undoubtedly received because the Endowment was pleased with the impacts. While a few firms have failed and some investments have been written down, most are still quite viable and there appears to be a few that could produce the large returns that all seed capital investors must count on. Just as importantly, these investments have helped the State of Indiana create an environment that appears receptive to technical entrepreneurship. For example, the *Indianapolis Business Journal* listed the year's top 25 venture investments in the state, and 11 of them were those of Rose-Hulman Ventures to its technical clients. Moreover, two of the firms had come to Indiana, at least in part to work with Rose-Hulman Ventures.

The 32 firms and the Ventures operation have already directly and indirectly created over 300 new jobs with average pay over \$45,000, according to a third-party economic impact assessment of the first couple of years. Moreover, the cost per job created is estimated to be under \$20,000, which is well below the typical economic development project figures. The other universities in the state are increasing their efforts to have businesses affiliated with them, and the state is launching a new economic development effort that hopes to capitalize on educational assets more. A recent visit by the Lieutenant Governor confirmed that Rose-Hulman Ventures is providing a model of how to build an innovation-

based economy. As activities increase in other parts of the state, Rose-Hulman Ventures will continue to play a significant and somewhat unique roll. While most university based-incubation and business development efforts are based upon transferring technology from university labs to commercialization, Ventures has shown that it can embrace technologies from elsewhere (including Silicon Valley) and provide the important functions to take them from concept through prototype and commercialization. The set of skills involved in these processes may be as important as specific technologies in building a critical mass of innovation-based activities in Indiana.

EDUCATIONAL BENEFITS

This paper began with the assertion that Rose-Hulman is involved with technical entrepreneurship because it believes strongly in the benefits for quality preparation of technical professionals. Independent surveys of more than 200 students and faculty who have been involved confirm that Rose-Hulman Ventures has been successful from an educational point of view. Faculty members have commented that the work they have done has been intellectually stretching in a way that their research has not. They have also gotten great practical experiences to share with students to illustrate their material. Students similarly appreciate the “real” aspects of their work, as well as the money from working in their fields instead of a typical student job. They have also commented that they learned about things that classroom work does not produce. For example, a Capability Maturity Model survey of students revealed their clear understanding of the fact that the “waterfall” model of software development is unlikely to work for new technologies because requirements must change as new things are learned about the

market. There is also new appreciation for the value of project management as a critical companion to good technical work. At the same time, the students have stressed that their Ventures' experiences have paid off handsomely in their job seeking. Employers are very interested in the students' experiences, and the anecdotes they can tell show potential employers how much they have learned about being productive.

CONCLUSIONS

Rose-Hulman Ventures has obviously been extremely fortunate to receive the injection of resources from Lilly Endowment, but the results generated to date have produced lessons that should be applicable to other institutions with less funds. First, students really are excited about the opportunities to work on new products, they learn a lot in the process, it often affects their career goals and it helps them even when they take a traditional first job in a large, established corporation. Second, faculty members can benefit from working with client start-ups to get hands-on experience in technology development and the business context in which it occurs. Third, new ventures take time to reach fruition, and most are not going to be very successful. Expectations for economic development or flows of money back to the institution must be tempered by the reality that much can go wrong. Successful investors must make a lot of investments to spread these risks through the portfolio and increase the chances that one or two will be home-runs. There are great lessons from the failures, but they will be no more popular than the life lessons that come from a struggling athletic program. Nevertheless, the opportunities to be part of the creative processes and the exposure of students and faculty to the talents and world views of entrepreneurs will pay significant dividends on whatever investment can be made.

