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UNM'S SCIENCE AND TECHNOLOGY CORPORATION: THE IMPACT OF START-UP COMPANIES

Prepared for
Office of Institutional Advancement
University of New Mexico

July 2004

UNIVERSITY OF NEW MEXICO

BUREAU OF BUSINESS AND
ECONOMIC RESEARCH



The University of New Mexico

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TECHNOLOGY CORPORATION:
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University of New Mexico

Executive Summary

The UNM Science & Technology Corporation (STC) is the embodiment of UNM's technology commercialization program and a vital tool in the economic development of a high-tech industry in New Mexico.

Economic Impact of STC Start-ups

	Direct	Indirect	Induced	Total
Output	\$ 21,287,500	\$ 3,563,267	\$ 12,175,083	\$ 37,025,850
Employment	73	15	56	143
Compensation	\$ 6,755,000	\$ 1,069,425	\$ 2,346,430	\$ 10,170,855

Source: BBER using Implan

STC has a portfolio of inventions and patents that have resulted in eight start-up companies in New Mexico. These eight companies have

- Attracted \$12.5 million in venture capital money to the state;
- Had sales of \$8.8 million in sales;
- paid \$6.8 million in salary and benefits;
- 73 employees with average salaries of \$80,000, well above the New Mexico average.

The amount of venture capital that has been attracted to the state has yielded an indirect impact on the state of

- \$3.6 million in additional economic activity;
- 15 full and part time jobs;
- \$1.1 million in compensation.

The expenditures of the employees of the start-ups have yielded an induced impact of

- \$12.2 million in additional economic activity;
- 56 full and part time jobs;
- \$2.3 million in compensation.

The start-ups are in industries that represent

- 10% of the New Mexico economy;
- 18% of the New Mexico compensation;
- 210% of the average New Mexican compensation.

All of STC's technologies awaiting licensing are in industries with above average compensation, making STC a driver for good jobs for New Mexicans and an effective conduit not only for UNM research but also UNM graduates who want to enter the high-tech field.

STC Tech Commercialization

The University of New Mexico Office of Institutional Advancement asked the Bureau of Business and Economic Research to conduct a study of the economic impact of UNM on the New Mexico economy. The study consisted of three parts: a traditional economic impact of the expenditures on goods, services and payroll of UNM; an analysis of the role UNM plays in developing New Mexico's workforce, and an analysis of the commercialization of technology that fosters economic development in the high-tech industries. That report, published in January of 2004, is available at the BBER website (<http://www.unm.edu/~bber>). This study elaborates and enhances the research done in that study on the Science & Technology Corporation and its role in high-tech start-up companies since 1997.

Over the past 7 years, the Science & Technology, Corporation (STC), a subsidiary of the University of New Mexico, has spun off or has been material in the start-up in 12 companies in the physical and life sciences fields. These companies use inventions and patents generated from UNM research that range from high tech computer modeling to one-handed syringes. STC has been effective in the commercialization of UNM technology by supporting and encouraging these companies. Eight of these companies are New Mexico companies (Attochron, Picodyne, Virtual Silicon Technology, and Novasite Pharmaceuticals are not New Mexico companies). Table 1 describes the companies (with further detail in the appendix).

Table 1: STC Start-ups based in New Mexico

	Date of Start-up	Description
MesoSystems Technology Inc	2000	Airborne biosafety and security products
Global Haptics, Inc	2000	Computer-mapping technology to shape and navigate in 3-D
Zia Laser, Inc	2001	Quantum dot lasers
Concise-Logic Inc	2001	Semiconductor design software
Qynergy Corporation	2001	Power solutions for Microsystems
CoMeT Solutions Inc	2003	Computational modeling toolkit for engineering
Exagen Diagnostics Inc	2004	Genome marking tools
AVANCA Medical Devices	2004	Medical devices and syringes

Source: STC

The level of STC's involvement varies from company to company. Some of the start-ups simply license the technology from STC and obtain financing and venture capital on their own. Others have relied on STC's expertise in writing

business plans, recruiting top executives and setting up shop. STC also has equity relationships with several of the companies indicating an ongoing investment in the start-ups. A final note is that the companies are companies that have been identified as “Start-ups” by STC and not necessarily by the company.

A simple accounting of STC’s impact on the state of New Mexico compiles the number of jobs, the amount of payroll, the level of sales and the amount of outside venture capital attracted to the state.

Table 2: Direct Impact of Start-ups

Millions of 2001 dollars except for employment

Employment	73
Payroll	6.8
Sales	8.8
Venture Capital	12.5

Source: Surveys of companies, NM Dept of Labor, press releases.

Methodology

The data presented here is in aggregate to protect the confidentiality of the companies who have provided information. The data was compiled from surveys, NM Department of Labor data, and published accounts in press releases and newspapers. Each company was sent a survey with follow-up phone calls. Some of the companies are still in the very early stages of viability and so have neither sales nor employees while others have matured and one has even spun off another company.¹

Using an *input-output* model, appropriate multipliers for the indirect and induced effects can be developed that will show how the production of a particular industry affects the rest of the regional economy. A standard input-output model measures the interactions amongst hundreds of industries using the BEA “Make” and “Use” tables.² Each industry in an economy makes a certain amount of goods or services that are either used by other industries, purchased by institutions (households, government, etc), or exported outside of the region of analysis. Additionally, each industry uses as inputs goods and services from other industries as well as purchases inputs from households (labor) and imports from outside the region. These transfers within the region and without are assembled mathematically to determine the multiplier effect, or the number of times a dollar is spent in an economy. The transfers from an industry to other industries create *indirect* effects as those transfers get transferred again. The transfers to institutions—e.g., households—create *induced* effects as those institutions spend those transfers in the region. The ratio of the total impact to the direct impact is known as the “multiplier.”

¹ MesoSystems spun off MesoFuel, which is not included in this analysis

² The Bureau of Economic Analysis produces these tables as part of their Regional Economic Information Service (REIS) and updates them every five years.

For this study, Implan Pro 2.0 was used to determine the multipliers.³ Implan Pro 2.0 is a regional economic modeling and impact analysis application that works with a proprietary New Mexico input-output database, using 2001 data with North American Industry Classification System sectors. Implan Pro 2.0 calculates how much of any given expenditure stays in-state and traces the economic impact on New Mexico industries. Implan Pro 2.0 is widely used in performing economic impact analyses. BBER has validated Implan Pro 2.0 results for New Mexico in other studies, where both Implan and BBER's FOR-UNM model have been used to estimate economic impacts.

The analysis is composed of two different sections: an analysis of the economic impact and an industrial sector comparison. The first section uses the amount of venture capital received by each company and the total sales to determine total economic impact of the start-ups. The last section shows the industrial sectors for the STC start-ups and the corresponding levels of output, employment and compensation of the entire New Mexico economy.

Economic Impact

One of the characteristics of high-tech start-up companies is their ability to draw investment dollars to the state that would otherwise be invested elsewhere. The STC companies were able to draw over \$12.5 million to the state from venture capitalists who invest nationally and internationally. While a significant portion (around 40%) is then re-spent out of state, the dollars that remain are spent on infrastructure for the company and preparing the products for the marketplace. Most of the startups are still in the development stage and are not currently generating significant revenues. The total sales was \$8.2 million. The total direct impact was \$21.3 million.

One way that start-up high tech companies distinguish themselves from other start-ups—and what makes them such an integral part of economic development—is they typically have high wages. Whether it is because of the skills and education required or a premium for the risk of joining an unproven company, the average compensation for all of the surveyed start-ups was \$92,500, far above the average New Mexico compensation. These high salaries in a low wage economy like New Mexico's creates significant induced impacts.

Using Implan Pro 2.0 multipliers for output, employment and compensation, the amount of venture capital, revenues and salaries have been modeled to derive indirect and induced economic impacts. Since start-ups tend to have more legal, marketing and research costs than the industry as a whole, these numbers will be subject to some error. Also, some of the output (venture capital plus revenues) is “leaked” out of the state in the way of domestic and international trade. This is particularly salient for high-tech industries. In total, the output that remains in the state generates an estimated \$15.7 million in additional economic

³ Minnesota IMPLAN Group, Inc., IMPLAN System (data and software), 1725 Tower Drive West, Suite 140, Stillwater, MN 55082 www.implan.com

activity in the state, supporting 71 jobs and \$3.4 million in compensation. Table 3 shows the detail of the indirect and induced impacts.

Table 3: Economic Impact of STC Start-ups

Millions of 2001 dollars except employment

	Direct	Indirect	Induced	Total
Output	\$ 21,287,500	\$ 3,563,267	\$ 12,175,083	\$ 37,025,850
Employment	73	15	56	143
Compensation	\$ 6,755,000	\$ 1,069,425	\$ 2,346,430	\$ 10,170,855

Source: BBER using Implan

Industry Analysis

Another way to look at STC's role in the economic development of the state is by looking at the start-ups' industries. Table 4 shows the start-ups and their respective industries. These are clearly industries that should be targeted if the goal of technology commercialization is economic development. While the industries make up 10% of NM's industrial base, they make up 18% of the total compensation. The last column of Table 4 shows that the salaries are much higher than the average—two times the average salary. This translates into significant induced economic impacts as the employees of the STC start-ups spend their earnings in the local economy. It is important to recognize that the information in Table 4 is for the industries and not specific company information. The table suggests nascent industries like "Medical Equipment and Supplies Manufacturing."⁴ All of these industries are primarily export industries, selling on the national and international markets; a key strategy for economic development.

⁴ This industry barely exists in New Mexico and will be significantly affected by AVANCA.

Table 4: STC Start-ups With New Mexico NAICS Industry Information^{5, 6}
 Millions of 2001 dollars except employment

	NAICS Code	Industry Description	Industry Sales in NM	Industry Employment in NM	Industry Compensation in NM	Average Industry Salary in NM
Global Haptics	541511	Custom Computer Programming Services	\$ 212.6	3,416	\$ 201.5	\$ 58,987
MesoSystems	541710	Research and Development in the Physical, Engineering, and Life Sciences	1,164.2	18,372	1,065.9	58,015
Qynergy	541710	Research and Development in the Physical, Engineering, and Life Sciences	1,164.2	18,372	1,065.9	58,015
Zia Laser	334413	Semiconductor and Related Device Manufacturing	1,338.8	7,437	573.0	77,051
Concise-Logic	334413	Semiconductor and Related Device Manufacturing	1,338.8	7,437	573.0	77,051
AVANCA Medical Devices	339110	Medical Equipment and Supplies Manufacturing	4.0	28	0.9	33,536
Comet Solutions	541511	Custom Computer Programming Services	212.6	3,416	201.5	58,987
Exagen	621512	Diagnostic Imaging Centers	1,279.4	8,972	332.7	37,084
		Total for STC Industries	\$ 6,714.7	67,450	\$ 4,014.4	59,517
		NM Total - All Industries (private)	\$ 64,990.3	796,806	\$ 22,620.4	28,389
		% of All NM	10%	8%	18%	210%

Source: Implan

Available Technologies

In addition to the technologies currently being licensed by the start-ups, there are an array of life-sciences and physical-sciences technologies that are awaiting entrepreneurs. Table 5 shows the available technologies (as of 2003). An effort was made to identify sectors in Implan that matched up with the technologies in order to show New Mexico sales, employment and compensation information. The sector codes are Implan sectors and they can be matched to NAICS codes. Implan uses a variety of sources to compile information on the New Mexico economy. Since some of the data is based on combining the BEA regional industrial information, national numbers and the Survey of Current Business, the values may not exactly match other data published by New Mexico government agencies. However, this method creates an internally consistent description of the New Mexico economy.

⁵ North American Industry Classification System

⁶ The source for this table is Implan and may not match exactly with employment figures published by the NM Department of Labor.

Table 5: STC Available Technologies with NM Market Information
2001 dollars except employment

Technologies	# in Portfolio	% of Total	% of Group Implan Sector(s)	Industry Sales in NM millions 2001 \$	Industry Employment in NM	Industry Compensation in NM millions 2001 \$	Average Industry Compensation in NM 2001 \$	% of NM Output
Life Sciences	59	38%	100%					
Diagnostics	4	3%	7%	1,279.4	8,971.9	332.7	\$ 37,084	1.6%
Drug Discovery/High Throughput Screening	10	6%	17%	1,279.4	8,971.9	332.7	37,084	1.6%
Drugs/Therapeutics/Compounds	6	4%	10%	126.8	356.5	21.5	60,234	0.2%
Heat Shock Proteins	3	2%	5%	126.8	356.5	21.5	60,234	0.2%
Medical Devices/Syringes/Etc	10	6%	17%	4.0	28.2	0.9	33,330	0.0%
Miscellaneous (Chemicals, other)	0	0%	0%	16.4	14.6	0.6	39,376	0.0%
Non-genetic Assay Methods & Techniques	13	8%	22%	1,164.2	18,372.2	1,065.9	58,015	1.5%
Nutritional/Hydration supplements	1	1%	2%	1,164.2	18,372.2	1,065.9	58,015	1.5%
Probes/Genetic Engineering/Virus Protection	12	8%	20%	134.5	663.8	14.4	21,727	0.2%
				1,279.4	8,971.9	332.7	37,084	1.6%
				4.0	28.2	0.9	33,330	0.0%
				435.8	2,035.3	135.5	66,553	0.5%
Physical Sciences	98	62%	100%					
Computer Technologies and Algorithms, Circuit Design, and Signal Processing	14	9%	14%	212.6	3,416.1	201.5	\$ 58,984	0.3%
Environmental Engineering and Hazardous/Radioactive Waste Technologies	5	3%	5%	166.5	1,727.4	70.2	40,626	0.2%
Lithography, Semiconductor Fabrications, and Electronic Materials	21	13%	21%	1,338.8	7,436.5	573.0	77,056	1.7%
Materials, Chemistry and Chemical Engineering	28	18%	29%	1,164.2	18,372.2	1,065.9	58,015	1.5%
				9.3	33.3	1.4	41,515	0.0%
Mechanical Engineering and Misc. Devices	4	3%	4%	8.2	16.5	1.5	88,787	0.0%
				1,164.2	18,372.2	1,065.9	58,015	1.5%
Optoelectronics & Lasers	26	17%	27%	19.6	261.1	14.7	56,261	0.0%

note: note some technologies are cross-listed: source = STC, BBER using Implan

As Table 5 shows, all of the technologies awaiting licensing are in industries that have high wages. Further, most of the industries identified are considered “export” industries meaning that the products and services produced in New Mexico are sold on the larger national and international markets. In other words, the revenues generated by companies in these industries are inflows into New Mexico where they are in turn spent, to a certain extent, locally on goods, services and employment.

Appendix – Detailed Information on STC Start-ups

AVANCA Medical Devices

Avanca Medical Devices is the most recent STC company. This start-up has licensed 8 devices and one testing methodology from STC. The primary technology is a reciprocating syringe that is more reliable and safe than conventional syringes. Widespread use could lower the rate of accidents and thus malpractice insurance. The company was founded by Dr. Wilmer Sibbitt who is also a professor at UNM's School of Medicine. The CEO is Kathleen Kelleher.

NAICS Industry: Medical Equipment Supplies and Manufacturing

CoMeT Solutions

www.cometsolutions.com

The firm's Virtual Prototyping Environment allows manufacturing companies to make more effective use of existing resources, such as software for computer-aided design and engineering, while at the same time reducing the need for physical prototype testing prior to manufacturing. Malcolm Panthaki is the CEO.

NAICS Industry: Custom Computer Programming Services

Concise-Logic

Concise Logic now employs about 26 people and will soon move into larger offices in the Science and Technology Park on University Boulevard. Concise Logic will produce software developed by UNM's Microelectronic Research Center for the computer chip industry. Cliff Schweiter is the CEO.

NAICS Industry: Semiconductor and Related Device Manufacturing

Exagen Diagnostics

www.exagendiagnosics.com

Exagen is a start-up molecular diagnostics company with the mission to develop and clinically validate novel molecular diagnostic products based on the discovery of multi-feature gene and protein biomarkers for early detection, prediction of clinical outcomes and therapy monitoring in cancer and emerging infectious diseases. They were originally spun out of Quasar International. Waneta Tuttle is the CEO.

NAICS Industry: Diagnostic Imaging Centers

Global Haptics

www.globalhaptics.com

The principal product of Global Haptics is the GeOrb, an input device that "applies patented computer mapping technology to enable users to shape and navigate in 3D simply and intuitively." STC owns the patents and helped in the original set-up of the company, particularly with the patent process. Michael Wallace is the CEO.

NAICS Industry: Custom Computer Programming Services

MesoSystems Technology **www.mesosystems.com**

Founded in 1998, MesoSystems has technology and products that test the air for bio-hazards. BioCapture, a portable air sampler, is the most widely used airborne collector for bioterrorism response. A personal “badge” and a continuous sampler (AirSentinel) are in development. Charles Call, Ph. D, is the CEO.

NAICS Industry: Research and Development in the Physical, Engineering and Life Sciences

Qynergy Corporation **www.qynergy.com**

Qynergy develops safe, compact energy sources which have distinct advantages over other batteries. The usable life is much longer, potentially several decades, and there is no need to externally charge the battery. The technology makes the battery scalable so there are nano-technology and “power-on-a-chip” applications. In addition to commercial applications in the electronics and computer industries, there is significant demand in the space industry where long lasting energy sources are critical. Paul Shirley is the CEO.

NAICS Industry: Research and Development in the Physical, Engineering and Life Sciences

Zia Laser **www.zialaser.com**

Zia is a high-tech spin off from the Center of High Technology Materials (CHTM), a research center created by the University of New Mexico. They are the innovator in quantum dot semiconductor laser products. Quantum dots (QD) are semiconductor nanostructures that act as artificial atoms by confining electrons and holes in 3-dimensions. System developers can use Zia’s products to build cost effective systems. Ken Westrick is the CEO.

NAICS Industry: Semiconductor and Related Device Manufacturing