University, Entrepreneurship
and Technology Transfer
Agencies as Systems for
the Competitiveness of
the Territory

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ABSTRACT

La “Case Western Reserve University” (Cleveland Ohio), partner dell’Area Science Park di
Trieste, rappresenta un modello di successo sia nella riorganizzazione del trasferimento
technologico all’esterno della realtà accademica, sia nell’interazione con le imprese.

Alla luce del suo crescente successo, concretizzatosi nell’affermazione sul mercato di pro-
mettenti spin-off universitari quali ad esempio CardioInsight, la CWRU ha deciso di condi-
videre la sua esperienza nel settore con l’Area di Trieste, rendendola partecipe della formula
per una strategia vincente che ha reso possibile la commercializzazione della ricerca.

La formula del successo è il trinomio “people-technology-capital”, ossia “risorse uma-
ne-tecnologia-capitale”.

L’obiettivo dell’Università era costruire un centro d’eccellenza che attraesse “menti illu-
stri e capitali”, in grado di contribuire non solo allo sviluppo tecnologico in settori di pub-
blica utilità come quello medico-sanitario, ma anche di favorire lo sviluppo della regione
attraverso la commercializzazione del prodotto tecnologico nato in contesto accademico.

Per fare ciò è stato necessario il contributo di aziende private, incubatrici di capitale
(Jumpstart e BioEnterprise), Stato e Governo.

Uno dei maggiori problemi iniziali è stato prendere coscienza del fatto che fisiologicamente
vi erano visuali opposte tra università e industria: la prima, infatti, vede la ricerca
come naturale conseguenza della teorizzazione scientifica, la seconda invece la percepisce
come fonte di profitto. Per le università è fondamentale la libertà intellettuale, di ricerca e la pubblicità dei suoi risultati, mentre le aziende danno più rilievo alla confidenzialità della ricerca e a una apertura limitata al pubblico.

Una volta appurate le divergenze, la Case University ha puntato a valorizzare quelli che potevano essere i punti di consonanza fra università e imprenditorialità: produrre tecnologia innovativa, utile e commercializzabile.

CWRU è riuscita così a valorizzare e collegare sinergicamente le finalità accademiche con quelle imprenditoriali, facendo leva sulle rispettive ambizioni – prestigio e ricerca da un lato, concorrenzialità e profitto dall’altro.

Il risultato del modello Case è il seguente: le università hanno l’opportunità di fare ricerca finanziata, fornire servizi alla comunità, insegnare e collaborare con ospedali e cliniche fornendo tecnologie innovative, mentre le aziende hanno la possibilità di trarre profitto dalla ricerca e possono commercializzarne i frutti.

Per fare ciò, la CWRU si avvale delle risorse umane più dotate nel settore della ricerca, attingendo sia all’Università stessa che all’esterno. Le industrie giocano un ruolo fondamentale in questo quadro poiché rendono possibile la commercializzazione delle tecnologie sviluppate in ambito universitario attraverso finanziamenti che si vanno ad aggiungere ai fondi statali e governativi. Rintracciare il capitale è stato frutto di una complessa operazione di mappatura del territorio del Nord-est Ohio risultata nella stesura del rapporto “Greater Cleveland venture capital report”, nel quale sono stati definiti i livelli di finanziamento e rintracciati i fondi circolanti nel Nord-Est della regione.

Al fine di effettuare concretamente il Technology Transfer – o Trasferimento delle tecnologie – è stato necessario sopperire a un assetto disorganizzato della gestione di ricerca e tecnologia, nonché alla mancanza di risorse e di risultati rilevata nella gestione precedente al 1994 del patrimonio tecnologico-intellettuale universitario.

La riorganizzazione è avvenuta sulla base di
– centralizzazione delle attività;
– customer service;
– staff competente e specializzato nella gestione economico-finanziaria;
– libertà gestionale nelle transazioni economiche e libertà contrattuale.

Adesso la Case University è al primo posto nello Stato dell’Ohio per commercializzazione tecnologica e rientra nella top ten delle start-up degli Stati Uniti, secondo Entrepreneur Magazine.

Una valida esemplificazione dei risultati ottenuti dalla collaborazione tra università e industrie è senza dubbio la “veste” a elettrodi della CardioInsight: una tecnologia innovativa che consente il monitoraggio delle attività cardiache di superficie senza essere invasiva.
I am honored to have the opportunity to take part in this exciting conference, and I feel privileged indeed to be included on such an esteemed panel.

I also want to thank AREA for not only hosting my participation in this conference but more importantly for their continued collaboration with my institution, and partnership with the city of Cleveland, and the State of Ohio. Our budding relationship will add significant value to your regional research and enterprise system, as well as ours in the United States.

First, since my perspectives, like yours, are shaped by my professional experience, let me tell you a bit about myself. My current position is Vice President of Research at Case Western Reserve University in Cleveland, Ohio. Case is a major academic research institution where we conduct over $400M in research annually. We have a $1.6B endowment, $800M operating budget and my division manages several thousand transactions per year.

I am an engineer by training and have worked in industry, government, and academia. I have also held various engineering, marketing, and business development positions in those sectors. In addition, I have been an entrepreneur and an early stage venture capitalist. I believe all of these experiences have broadened the perspective I bring to this subject.

Before we begin, let me note also that I recognize the system we work under in the United States is different than the one here in Italy. It is truly my hope that you find some ideas and tools that you can borrow from what I am about to share with you. I encourage you to look for the similarities, not the differences.

The universal truth we all share – as true in Italy as in the United States and everywhere else in this wildly competitive modern world – is that there is a simple, three-ingredient formula you have to follow if you want to build a forward-looking, 21st Century economy. Here’s the formula:


That’s it. I told you it was simple. All you need are: People, including world-class talent, educators and students; Technology, to drive our skill-based industries; and Capital, in the form of venture capital, institutional dollars, and private investment.

Bringing all three elements together and maximizing their effectiveness is the hard part, however. That’s what we are trying to do at Case. I’m very proud of our success in re-energizing the commercialization effectiveness of our research enterprise, and I’d to share some of our experiences with you.

I also want to highlight some of the strides we have made recreating and strengthening the Technology Transfer Office since I joined the university in 2001.
The very term “research commercialization” suggests that what we are talking about here is not strictly an academic endeavor. Industry plays a critical role in making technology transfer happen, so it must be a major part of the equation.

In America, industrial-sponsored research is still relatively small compared to federal and state funding, but it is a rapidly growing source, accounting for 5-15% of total academic research dollars, about $50B a year.

In bringing the worlds of academia and industry together, we must recognize that the cultures of companies and universities have pronounced differences. The two have conflicting motivations even where commonality of interests exists, as this slide demonstrates. Universities are drawn to translational research for reasons of institutional prestige, which I’ve labeled “Ego and Envy.” Companies are motivated by a desire to make a profit and beat their competition, which I’ve summed up as “Fear and Greed.” Similarly, their conceptions of time are very different, with industry generally displaying a much greater sense of urgency than the more leisurely-paced academic world.
And it is not just culture that separates industry and academia – their missions, goals and objectives are very different as well, as you can see in this slide.

For the university, the pursuit of knowledge is its own reward. For the company, knowledge is an asset to be managed for profit. The university prizes academic freedom and open disclosure. The company values confidentiality and limited public disclosure.

But despite these diametrically opposed outlooks, there exists a clear alignment of common interest: namely, the commercialization of new and useful technologies. Their motivations may be entirely different – the university sees an opportunity for teaching, conducting research, service to society and economic development; the company hopes for profit and product R&D – yet there it is, nevertheless: a huge mutual interest.

And in that commonality lies an enormous opportunity.

We are capitalizing on this opportunity at Case through direct funding, consortia and other innovative approaches, such as government matching fund programs to leverage investment dollars.
Allow me to tell you a little bit about my school, of which I am very proud. Case Western Reserve University is located, as I mentioned, in Cleveland, Ohio, on the shores of Lake Erie, the smallest of the five “Great Lakes” in the “Great Lakes Region” of the United States and Canada. The region immediately surrounding Cleveland is known as Northeast Ohio or NEO.

Our campus is situated at Cleveland’s University Circle, a picturesque, 500-acre, park-like area that is home to more than 40 cultural, medical, educational, religious and social service institutions.

University Circle, I might add, is adjacent to the Cleveland neighborhood known as Little Italy. Many descendants of the city’s first Italian immigrants still live there, and it is home to a number of popular restaurants, bakeries and shops.

Case is the only independent, research-oriented university in a large region bounded by Pittsburgh, Pa. and Rochester, N.Y. on the east, Nashville, Tenn. on the south, and Chicago, Ill. on the west.
Under dynamic new leadership, Case Western Reserve University has re-defined its mission – to **Improve, Imagine, Enrich, Influence** – and its role as a 21st century research institution.

Known informally as CWRU, or simply “Case”, it is one of our nation’s leading research institutions.

Its roots stretch back to Ohio’s wilderness days with the founding, in 1826, of Western Reserve College. Its present form was shaped by the unique merger in 1964 of Western Reserve University and the Case Institute of Technology.

Case is distinguished by its strengths in education, research, service and experiential learning, and offers nationally recognized programs in the Arts and Sciences, Dental Medicine, Engineering, Law, Management, Medicine, Nursing, and Social Sciences.
In the fall of 2008, the University had an enrollment of 4,356 undergraduates and 5,458 graduate and professional students, representing all 50 states and 87 countries. It has approximately 2,600 full-time faculty and 110,000 alumni.

Last year, Case awarded 793 undergraduate degrees, 951 master’s degrees, and 718 doctorates, for a total of 2,462.

The school’s primary research areas are Medicine, Engineering, and Biomedical Engineering.

With over $407 million in total research funding in 2008, it is listed as one of the Top 25 medical schools in the United States. Its funding sources include the National Institutes of Health, the National Science Foundation, state and local government, and support from industry.
When I arrived at Case, the Technology Transfer Office was in pretty bad shape. The program was disorganized, suffered from a lack of resources and resolve, and was, in general, producing very poor results. But gradually, through diligence and hard work, we began to see some successes by focusing on capital and talent.

Technology Transfer was re-organized around several basic principles, including tighter, more centralized control, improved customer service, a business-savvy staff, and the authority to move quickly on deals.

A key to the turnaround was our involvement in something called the **Early Stage Capital Task Force**, made up of a group of people in Northeast Ohio who were trying to precisely define the venture capital situation.

It took us three years to understand the issue in all its complexities, but we eventually identified the stages of funding and tracked amounts of funding to Northeast Ohio.

The result was called **The Greater Cleveland Venture Capital Report**. This document has become the roadmap to building the venture capital industry in our region.
Two of the innovations springing from this effort are called JumpStart and BioEnterprise, both of which I will describe in detail later.

The report identified what we needed to do to address the lack of available capital and talent. Specifically, it paved the way for collaboration, cooperation and partnership among research institutions, foundations, angels, venture capitalists and the state.

Even more importantly, it was designed to reduce risk and increase deal flow in order to attract more venture and capital to the region.

Here is where we stand today.

Case’s Technology Transfer Office, from its dismal numbers in 2001, is now ranked Number One in Ohio, and in the Top 10 nationally, for start-ups, licensing, revenue, disclosures received, and cumulative licenses. Our team of professionals is focused on specific schools and academic departments.

Last year alone, Case’s spinouts attracted more than $100M in venture capital.

From a regional perspective, over the last three years Northeast Ohio has attracted more than $500M in venture capital, and is well on its way to its goal of $1.2B over the next five years.
Let’s return to the formula I mentioned at the beginning. Any successful high-tech economic development strategy must address three factors – people, technology and capital – and academia, government, and industry have a role to play in all of them.

The university’s core mission must be to build centers of excellence that will attract top researchers, scholars and students, who will in turn develop the new technologies that can generate the necessary capital to make technical transfer possible.


To allow this to happen as quickly as possible, government and academia must develop programs that accelerate the process of turning research concepts into practical products and services.

And that, of course, brings industry into the picture, creating the companies that will produce the jobs and spur the economic development of the marketplace of the future.
Our spinoffs have not only been developed from research at Case, but also as a result of our expanded, leveraged ties in the region. We call this our “Innovation Network”, and it has given us great flexibility in acquiring funding for start-ups.

An important part of this network is Case Technology Ventures, a pre-seed venture capital fund managed by our Tech Transfer Office that promotes promising start-up opportunities.

The network also includes two world-class hospitals that neighbor the university – University Hospitals Case Medical Center and the Cleveland Clinic Foundation. This strong medical presence is a central point of commercialization for the region.

Two other organizations round out our Innovation Network, and I’d like to tell you a little about each of them.
BioEnterprise is a business accelerator created to help emerging medical device, biotechnology and health care service firms attract venture capital, as well as attract bioscience companies to the region. It is a joint initiative by Case and the area’s leading hospitals and health care institutions, and it is funded by the State of Ohio and local foundations.

BioEnterprise has helped attract $585 million in capital to medically oriented companies in Northeast Ohio over the last four years. Total capital investment in such firms over that period was $860M, so you can see what an important role BioEnterprise plays. And according to a recent BioEnterprise analysis, Ohio has become the leading state between the East and West coasts – and one of the top 5 in the nation – for hosting health care venture capital firms.
JumpStart, Inc. is a venture capital development organization created in North-east Ohio to accelerate the progress of high-growth, early-stage businesses. JumpStart is a relatively new addition to the Innovation Network, but this seed-funding entity is already one of the most active investors in the United States. It is, in fact, ranked in the Top 10 by Entrepreneur Magazine.

JumpStart is owned by CWRU and NorTech, which is the local high-tech chamber of commerce, and is funded by the State of Ohio and local foundations. JumpStart has invested in several of Case’s spinout companies.

Government also must play a role in research commercialization, and I’d like to speak to you about several state programs in Ohio that contribute to our technology transfer success.

**OHIO THIRD FRONTIER PROJECT**

- Research Commercialization Program (RCP)
  - Grants advance major research initiatives to impact Ohio’s economic development and provide long-term improvements in the State’s technology base
  - Now a 10-year, $1.6B initiative to:
    - Build world-class research capacity
    - Support early stage capital formation and the development of new products
    - Finance advanced manufacturing technologies to help existing industries become more productive

Fig. 13: Ohio Third Frontier Project

The Research Commercialization Program, or RCP, is part of Ohio Third Frontier, a voter-approved initiative to increase investment in research and technology. The RCP was enacted by legislation in 2003.

The purpose of the program is to award grants to advance major research initiatives that have the potential to increase economic development and provide long-term improvements to the state’s technology base.

Originally supported by funds received by the state as part of a settlement in lawsuits against the tobacco industry, the RCP has grown to become a 10-year, $1.6B initiative to build a world-class research capacity in the State of Ohio. The RCP supports early-stage capital formation and the development of new products, as well as financing advanced manufacturing technologies to increase the productivity of existing companies.

The list of RCP and other Third Frontier success stories is a rapidly growing one. Some of these include:
The Third Frontier Program aims to take Ohio’s technological strengths and maximize their economic development potential. The focus areas zero in on the things Ohio does best – biomedicine, alternative energy, Instruments-Controls-Electronics, advanced materials and advanced propulsion. Nearly $50M has been set aside to fund research projects, with average awards of $2 to $5M.

Projects are collaborations among Ohio higher education institutions, non-profit research organizations, and Ohio companies. To receive an award, the plan must demonstrate collaboration among the partners, as well as commercialization potential. In addition, the partners must put up funds to match the state award. It is very important that a significant portion of the money be spent in Ohio, and the inclusion of a solid corporate partner is considered crucial.
The Ohio Capital Fund

Another program established by the state is the Ohio Capital Fund, a fund of funds professionally managed and designed to promote private investment in Ohio companies in the seed or early stage of business development. To date, the Ohio Capital Fund has obtained $150 million of commitments from private resources for investment in qualified venture capital funds. These venture capital funds commit to invest at least half of the Ohio Capital Fund monies in Ohio-based companies, corporations and individuals. The Ohio Capital Fund is actively making commitments to venture capital funds and through these commitments, the Ohio Capital Fund acts as a catalyst to promote venture capital investment in promising Ohio companies.

TECHNOLOGY TRANSFER AND COMMERCIALIZATION

CWRU-FUNDED START-UPS

Cardiovascular

Medical Devices

Fig. 15: The Ohio Capital Fund

Fig. 16: Technology Transfer and Commercialization
These are some of the start-ups that have emerged at Case. I’ll talk about a few of them in a moment, but first, I wanted to say a few words about university-based startups in general.

No one could question the impact universities have on the development of many of our most successful, forward-thinking companies. Hewlett-Packard, Cirrus Logic, Genentech, Google and Lycos are just some of the world-renowned companies born as a result of technological inventions by faculty, students and staff at American universities.

And these are only the most high-profile examples. There are many, many more university spin-offs enjoying success, with new ones being created all the time.

University spin-offs share a number of common factors. Typically, they are high-performing companies, and they are much more likely to go public than the average new firm.

According to one estimate, the percentage of American university spin-offs that have gone public exceeds 8%, a figure 114 times the average for a new company in the United States.

Spin-offs are also much more likely to receive funds from venture capitalists and business angels than the average start-up.

In addition, university spin-offs are less likely than the average start-up to fail. Of 6,300 start-up companies founded since 1980 in the United States, over 60% remain operational today, which is considerably higher than the average survival rate for new companies in the U.S.

Finally, university spin-offs are more profitable, on average, than the typical high-technology start-up. So by almost any measure, the value of spin-offs is unquestionable.
To give you an example of what we’ve been doing at Case, I’d like to tell you about one of our spin-offs, CardioInsight Technologies, Inc.

The technology behind the company was more than 20 years in the making. It involves the use of a vest with more than 200 electrodes, embedded along with a propriety software algorithm to precisely measure the surface potential of the heart. It is a quantum leap over current technology – the EKG – and displaces more invasive technology involving a catheter-based probe and CAT or MRI scanning.

In short, it is considerably less invasive, much less costly, and more precise than any other existing technology.

Although it is a biomedical application, the principal intellectual property is the software that interprets the data from the vest’s electrodes in real time.

This and the following slides provide a timeline for the steps that led to the commercialization of this trailblazing technology and the creation of CardioInsight. As you can see, the initial steps occurred in 1994, which we call Dimension 1, involved what could be described as the basics: finding office and lab space, acquiring the necessary equipment and taking the required legal steps, such as incorporation and retention of legal counsel.

**CardioInsight, Inc.**

- Dimension 1
  - Space
  - Equipment
  - Legalities

- Dimension 2
  - Business Plan
  - Revenue Plan
  - Locate Providers
  - Make Investment

Fig. 18: CardioInsight, Inc.
The original researcher in the development of the new technology left Case to go to Washington University, but two of his students were very enthusiastic about the technology and wanted to form a company to commercialize it.

So they turned to us, and Case agreed to provide seed capital and help formulate a plan.

As it turned out, neither of the founder researchers was appropriate to lead a start-up company, so Case found an “interim CEO” and project manager around which to form the company.

This team led the company through the Dimension 2 steps in its development. A business plan, including a revenue plan, was drafted and re-drafted.

**CARDIOINSIGHT, INC.**

- **Dimension 1**
  - Space
  - Equipment
  - Legalities

- **Dimension 2**
  - Business Plan
  - Revenue Plan
  - Locate Providers
  - Make Investment

- **Dimension 3**
  - Find Capital
  - Coach Leaders
  - Recruit Players
  - Help Form Board

Fig. 19: CardioInsight, Inc.

Venture capital was acquired from several sources, including JumpStart and Case Technology Ventures. Company leaders are receiving coaching from experts at BioEnterprise and our own Technology Transfer Office, and top researchers and doctors are being retained as advisors and consultants. A board is also being formed, on which the Technology Transfer Office has a seat.

In addition to providing start-up capital, Case helped to find first round financing from other sources, specifically, the previously mentioned JumpStart and Draper Triangle Ventures. Each party invested $250,000, for a total of $750,000 to launch the company.
These funds allowed for the development of an experimental prototype and the testing of the device on humans.

Today, CardioInsight stands on the verge of great success. Tests conducted with the clinical prototype proved so successful that the company attracted a $5M “A” round financing. It is currently raising the round of $5M, with $4M of venture capital committed to date.

This seed funding allows for chronic animal studies to take place, the first human trials, expansion of IP protections, and a raise of Series A investment.

For Case Technology Ventures, a $5M pre-seed fund at Case Western Reserve University, CardioInsight is our prototype of a successful university spinoff.
The fledgling company is still evolving, but it is well on its way to establishing itself in the cardiovascular diagnosis market. CardioInsight is an outstanding example of a technology originating in university research and gaining commercial success.

The success of the clinical prototype has helped the company to attract a $5M “A” round financing.
Another emerging business that began in our school’s research labs is Neuros Medical, Inc., which is attempting to commercialize neurostimulation technology developed by two researchers at the Case Department of Biomedical Engineering.

This technology, known as “Nerve Block,” delivers high-frequency stimulation to sensory nerves in the peripheral nervous system to block chronic pain. Because it operates at a much higher frequency than conventional neurostimulation devices, the Nerve Block technology is able to block pain completely, as opposed to simply masking it.

The company will target it toward patients with chronic pain, especially those with residual limb pain, a common occurrence after amputation. The technology also has potential applications for cancer pain, diabetic neuropathy, cerebral palsy, multiple sclerosis, and stroke.

Case has acquired a patent for this unique high-frequency application and has an additional two patents pending. Case put up seed money, BioEnterprise helped with the business, and an organization called North Coast Angels committed to $500,000 to $600,000 in capital.

All this happened amazingly quickly. The company went from inception to launch in less than a year, and successful clinical tests helped the company to attract a round financing of $5M.

Neuros Medical is well on its way to becoming the latest of our successes at Case. It, as well as CardioInsight and the other spin-offs we’ve been involved with at Case, demonstrate what can happen when you bring those three essential ingredients together: **People, Technology** and **Capital**.
As you can see from this overview, those three keys apply to us and apply to you. I know I’ve taken every bit of my allotted time so I’ll close here, but I look forward to taking any questions you might have.

I want to thank you once again for inviting me to speak with you today about the efforts we are making at Case Western in the area of research commercialization. I am especially grateful to have had the opportunity to visit your beautiful city and country. Back home, I enjoy going to Little Italy. Believe me, I like Big Italy even better.

On the screen is our website and the mailing address of the Technology Transfer Office at Case Western University. Please contact us if you would like to learn more about our programs.

Again, thank you for your attention.