

Math in
Business

Brittany
Degnan

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Mathematical Entrepreneurship

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Main Objectives

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The main objectives of this research were to find out three important things among the data I was trying to collect. Those were to:

- Communicate with Mathematical Entrepreneurs
- Research how such entrepreneurs use mathematics to start their businesses
- Understand how these entrepreneurs used the world of mathematics to become successful

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- What is NTRU, Inc.?

It is a provider of embedded security solutions. Founded in 1996 by Jeffery Hoffstein, Jill Pipher and colleagues, all mathematicians from Brown University. In 2009, the company was acquired by Security Innovation.

- What type of mathematics is used in creating this business?

Jill Pipher, Jeffery Hoffstein, and their colleagues at NTRU, Inc. used Public Key Cryptography to start and continue to use it to run their business.

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- What is Cryptography?

It is concerned with making communication secure from anyone other than the sender and receiver.

- What is Public Key Cryptography?

Public Key is a cryptographic algorithm that requires two separate “keys”, one which is private and the other which is public. The Public Key is used to encrypt plaintext, whereas the private is used to decrypt the cipher text.

Founder's Background

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The educational background of the founder's of NTRU, Inc. and other businesses plays a key role in the fact that it tells us that it doesn't take a genius to build an enterprise using mathematics.

Jill Pipher's Background:

Jill was a mathematics major in college, trying to build a sufficiently strong resume in mathematics to get into grad school. She was very focused on mathematics. She also had the benefit of having a education in liberal arts and because of that, both poetry and philosophy are now important parts of her life.

Founder's Background Cont.

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Jeffery Hoffstein's Background: Jeffery was trained as a number theorist, and has a mathematics degree from Brown University. He got into more applied mathematics around 1992.

“In 1994, I heard a talk by Dorian Goldfeld that connected a previous result of ours to cryptography. I realized that if these ideas could be used to create a public key cryptosystem, the resulting system would be far more efficient and lightweight than public key cryptosystems, based on factoring large integers or the discrete log program.” JH

Importance

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- Why is this important?
This is important because the founders of NTRU, Inc. used something they learned in school and used it to create their business, which now uses this cryptography to send private information, such as credit card numbers, over the internet on secure channels.
This information is also important because it gives us the knowledge of what it would take for one to start their own business using just their knowledge of mathematics.

Steps

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Steps to Building an idea for a Business

- 1 Place your idea.
- 2 Present to an investor.
- 3 Present a talk.
- 4 Incorporate.

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- The idea for NTRU, was placed around 1995, then Jeffery and others went to Bell Labs in 1996 and presented the idea to Andrew Odlyzko.
- Later that you they presented the talk in a "rump session" (2-6 min) at Crypto 1996.
- Then once they got their idea on solid ground, they filed for a provisional patent, hired a CEO and raised investor capital and grew their company.
- In 2000, they had only 2 employees (other than themselves) and by 2001 they had over 20.

Public Key Cryptography

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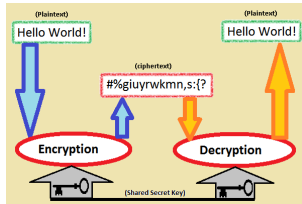
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Public Key Steps:

- 1 Create Message
- 2 Encrypt Message using your personal 'key'
- 3 Send encrypted Message
- 4 Receiver decrypts encrypted message using their 'key'
- 5 Receiver gets message.

How it's used

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NTRU, Inc. used public key cryptography to encrypt data that is sent across the internet. They would encrypt information such as names, credit card numbers, and other important information, while the website receiving the information would be able to get the correct information through the encryption. Their company, now owned by Security Innovation, uses public key cryptography, to protect others so that we don't get our identities stolen.

Advice

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In an interview with Jeffery Hoffstein, he gave some advice to everybody whom wants to go about what you will need to do to go about starting their own business.

- 1 Find the right problem to attack with what you already know.
- 2 Scale your financial expectations
- 3 Trust your gut instincts; know when to take professional advice (and when not to).
- 4 Be alert for business pressures that drive "solutions" that are not ready.
- 5 Networks are vital.

Methods of Research

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Communication

Communicated with the founders Jeffery Hoffstein and Jill Pipher of NTRU, Inc.

Understanding

Understood the process and mathematics they used to start their business.

Interpretation

Interpreted what they told me into a way of formatting it for my research.

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Looking into the way that some mathematicians from Brown University started a business, using just their knowledge of mathematics. I have researched, to the best of my ability at this point in time, how the founders of businesses used mathematics to start and continue to use mathematics to run their business. I have not been very successful as this research requires data from the founders themselves, and I haven't had much luck getting into contact with such people. However, I got a good look at the way NTRU, Inc., used mathematics to start and run their business. I think the information Jill Pipher and Jeffery Hoffstein provided was very helpful.

Questions or Comments

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The End