

Washington University in St. Louis Engineering

Lessons Learned by an Academic Entrepreneur

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4 Companies



Hearing Emulations, LLC





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BECS Technology, Inc.



becs.com
10818 Midwest
Industrial Blvd.
St. Louis, MO

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BECS Technology, Inc.



- Graduate school startup (in late 1980s)
 - » Evolved out of consulting activities w/ college roommates
- Manufactures controls for industrial applications
 - » Water – Municipal Pools, Drinking Water, Waste Water
 - » Agriculture – Hog Barns, Chicken Houses, Grain Bins, etc.
- Technology from Undergraduate Education
 - » Combining Electrical Engineering and Computer Science
 - » No university owned intellectual property or involvement in the company

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BECS Technology, Inc.





- Recently moved to new 47,000 sq.ft. facility

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Recent Connection to Research Agenda

- Security for IoT
 - » "Layered Security and Ease of Installation for Devices on the Internet of Things," in *Proc. of IoTDI*, 2016.
 - » "Devices can be Secure and Easy to Install on the Internet of Things," in *Interconnection, Integration, and Interoperability of IoT Systems*, 2018.
- IoT and the Cloud
 - » "Water in the Cloud: Remote Understanding of Water Chemistry," in *Proc. of IoTDI*, 2017.
- Automated Titration
 - » "Automated Titration in a Recirculating Water System," in *Proc. of CySWater*, 2018.

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Lessons Learned – BECS Technology

- Maintain appropriate separation from university
 - » Honor conflict of commitment rules
 - » Don't expect its success to help tenure case
- Growing a company is a lot of work
 - » Someone has to be very dedicated – I had partners
 - » Think hard about doing this while full-time faculty
- And it can be very rewarding!
 - » Much more tangible than typical academic pursuits

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Hearing Emulations, LLC

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Hearing Emulations, LLC

- More of a classic university startup
 - » Initial funding via SBIR grants through NIH
- Excellent technology
 - » Make hearing aids act like human cochlea
 - » Demonstrated improved speech understanding in noisy environments – Important hearing problem
- Very difficult marketplace
 - » Going it alone is quite problematic
 - » Not-Invented-Here syndrome is common at big companies

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Published as We Went

- Hearing Benefits
 - » "Acoustic and Psychoacoustic Benefits of Adaptive Compression Thresholds in Hearing Aid Amplifiers that Mimic Cochlear Function," *J. Acoust. Soc. Am.* 2001.
- Novel Numerical Representations
 - » "Modeling the Power Consumption of Audio Signal Processing Computations Using Customized Numerical Representations," in *Proc. of Simulation Symp.*, 2003.
- Low-power Implementation
 - » "Implementation of Hearing Aid Signal Processing Algorithms on the TI DHP-100 Platform," in *Proc. of Asilomar Conf. on Signals, Systems and Computers*, 2003.

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Lessons Learned – Hearing Emulations

- Pick your market carefully
 - » The deck was stacked against us from the beginning
 - » Incremental improvement (even if real) isn't enough
- Leadership must not think/act like academics
 - » Someone has to be the business leader
 - » This task is NOT anything like an academic job
 - » Either transform or partner with someone

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Exegy, Inc.

exegy.com
 349 Marshall Ave.
 St. Louis, MO

*Extreme Speed.
 Extreme Insight.*

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Exegy, Inc.

- University technology
 - » Patents applied for in 2000, Exegy formed in 2003
 - » Local St. Louis (angel) investment to start
- I served as initial Director of Engineering
 - » On leave from the university
 - » My job included the task of hiring my replacement
- Computational acceleration
 - » Initially focused on approximate search applications
 - » Repositioned to financial market data in 2005

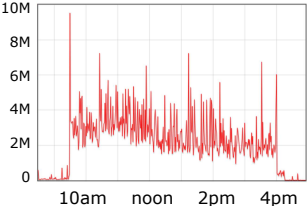
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Published as Technology Developed

- "The Mercury System: Exploiting Truly Fast Hardware for Data Search," in *Proc. of SNAPI*, 2003.
- "Massively Parallel Data Mining Using Reconfigurable Hardware: Approximate String Matching," in *Proc. of MPP*, 2004.
- "Biosequence Similarity Search on the Mercury System," in *Proc. of ASAP*, 2004.
- "An Architecture for Fast Processing of Large Unstructured Data Sets," in *Proc. of ICCD*, 2004.
- "Streaming Data from Disk Store to Application," in *Proc. Of SNAPI*, 2005.

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Exegy, Inc.



- marketdatapeaks.com
 - » Msgs per second through one Exegy ticker plant
- Exegy services \$1 trillion in trades per day

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Short Detour on Intellectual Property

- Three fundamental forms
 - » Copywrite
 - » Patent
 - » Trade secret
- Patent is most compatible with university culture
 - » Technology is published, not hidden
 - » Grants exclusive rights to manufacture, sell, use
 - » Valued in financial markets (e.g., venture capital)
- Exegy started with university-owned patent applications (now 21 patents + 1 pending)

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Lessons Learned – Exegy

- Be Flexible with Company Direction
 - » Again, great technology but hard-to-crack market
 - » Successful only once we focused on customer needs
- Focus, Focus, Focus
- Professional Leadership is Key
 - » Engineering
 - » Marketing
 - » Sales

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VelociData, Inc.

velocidata.com


10425 Old Olive St. Rd.
St. Louis, MO

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VelociData, Inc.



- Spinout from Exegy
 - » Return to initial product focus
 - » Process large volumes of enterprise and/or IoT data
- First cohort of cable industry startup accelerator



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Lessons Learned – VelociData

- Understand market needs
 - » Good technology is essential
 - » Must be paired with good market understanding
- Understand value proposition
 - » Good technology is *not* enough!
 - » Must make (or save) money for customers
- Startup accelerators can be very beneficial
 - » Access to the right people
 - » Network, network, network

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Summary

- Lots of fun!
 - » The personal sense of accomplishment is huge
 - » True “impact”, which is often difficult to gauge in academia
- Lots of work!
 - » Much (most) of the work is NOT engineering
 - » Either partner with people that have business skills or develop them yourself, but don't just assume they exist

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Thank you ...

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