

Designing and Launching an Embedded Product

Class 1: The Business of Product Development

November 18, 2019
Jacob Beningo

Course Overview

Topics:

- **The Business of Product Development**
- Success through Design and Development Processes
- Scalability, Architectures and the MVP
- Achieving Quality and Reasonable Time to Market
- Techniques for Accelerating Time to Market

The Lecturer – Jacob Beningo



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ARM Connected Community

Consulting

- Advising
- Coaching
- Content
- Consulting
- Training

www.beningo.com

Jacobs CEC Courses

CEC 2013 – 2015

Fundamentals of Embedded Software (2013)

Mastering the Software Design Cycle (2014)

Python for Embedded Systems(2014)

Software Architecture Design (2014)

Baremetal C (2015)

Mastering the ARM Cortex-M Processor (2015)

Writing Portable and Robust Firmware in C (2015)

Design Patterns and the Internet (2015)

CEC 2016 - 2017

Bootloader Design for MCUs (2016)

Rapid Prototyping w/ Micro Python (2016)

Debugging (2016)

Professional Firmware (2016)

API's and HAL's February 2017

Baremetal to RTOS April 2017

Designing IoT Sensor Nodes July 2017

From C to C++ October 2017

CEC 2018

Connecting Edge Devices (March 2018)

Building an IoT Connected PLC (April 2018)

Securing IoT Devices using Arm TrustZone (Nov 2018)

Minimizing Defects (Dec 2018)

CEC 2019

Machine Learning for Embedded (April 2019)

Designing Embedded Systems using MicroPython

Launching a Product (Nov 2019)

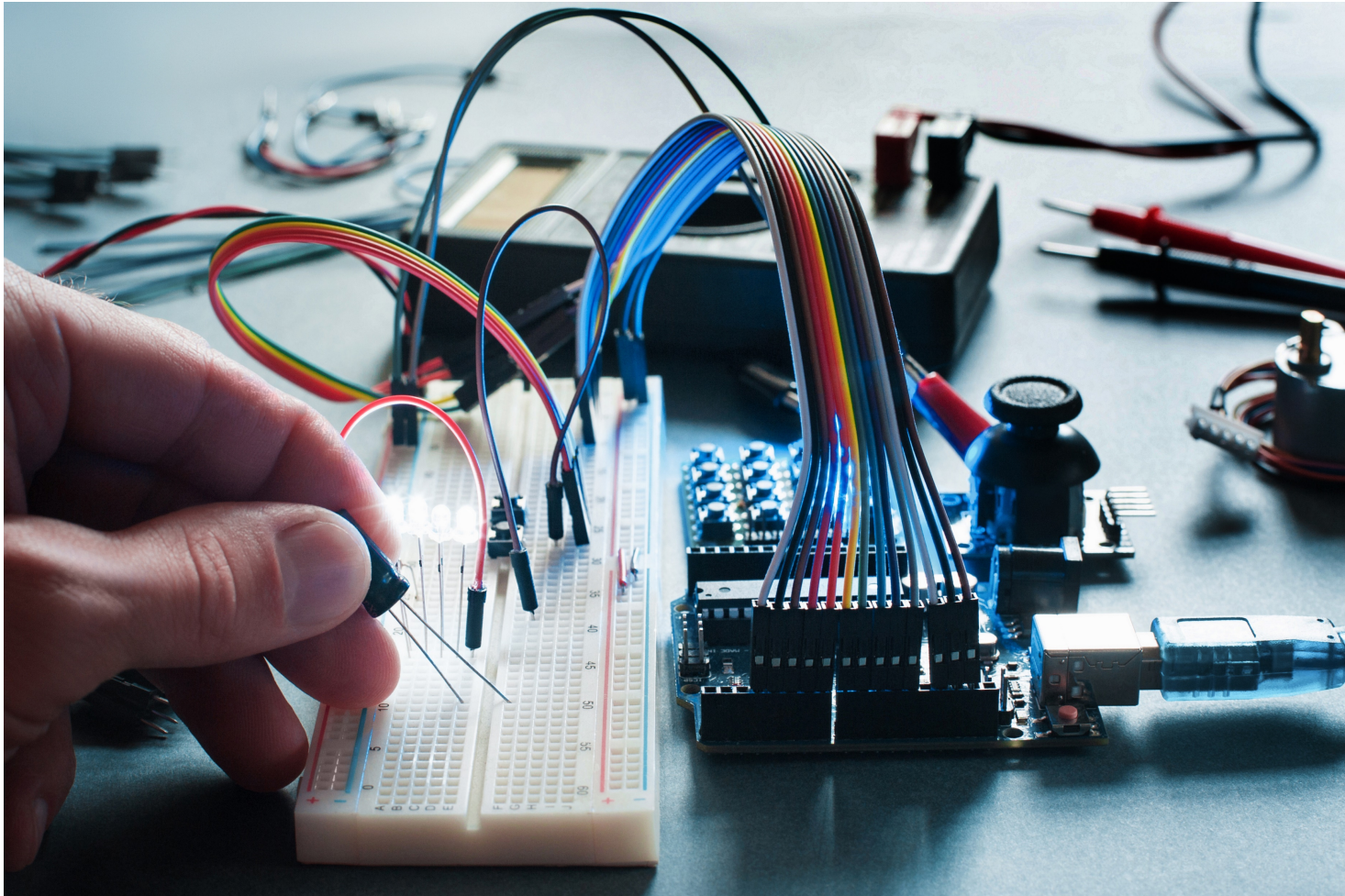
Session Overview

- Product Development
- Product / Marketing Paradox
- The Company Success Bias
- SWOT Analysis
- Development Costs



Presented by:

Product Development

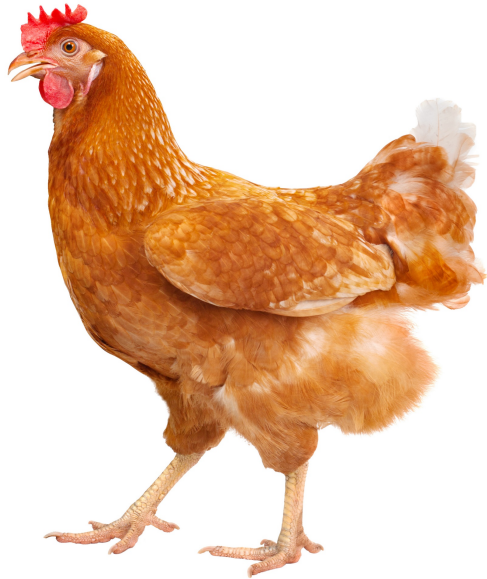


“If you build it, they will come”



The Field of Dreams, Dyersville, Iowa—
May 2006 (Source: Wikipedia)

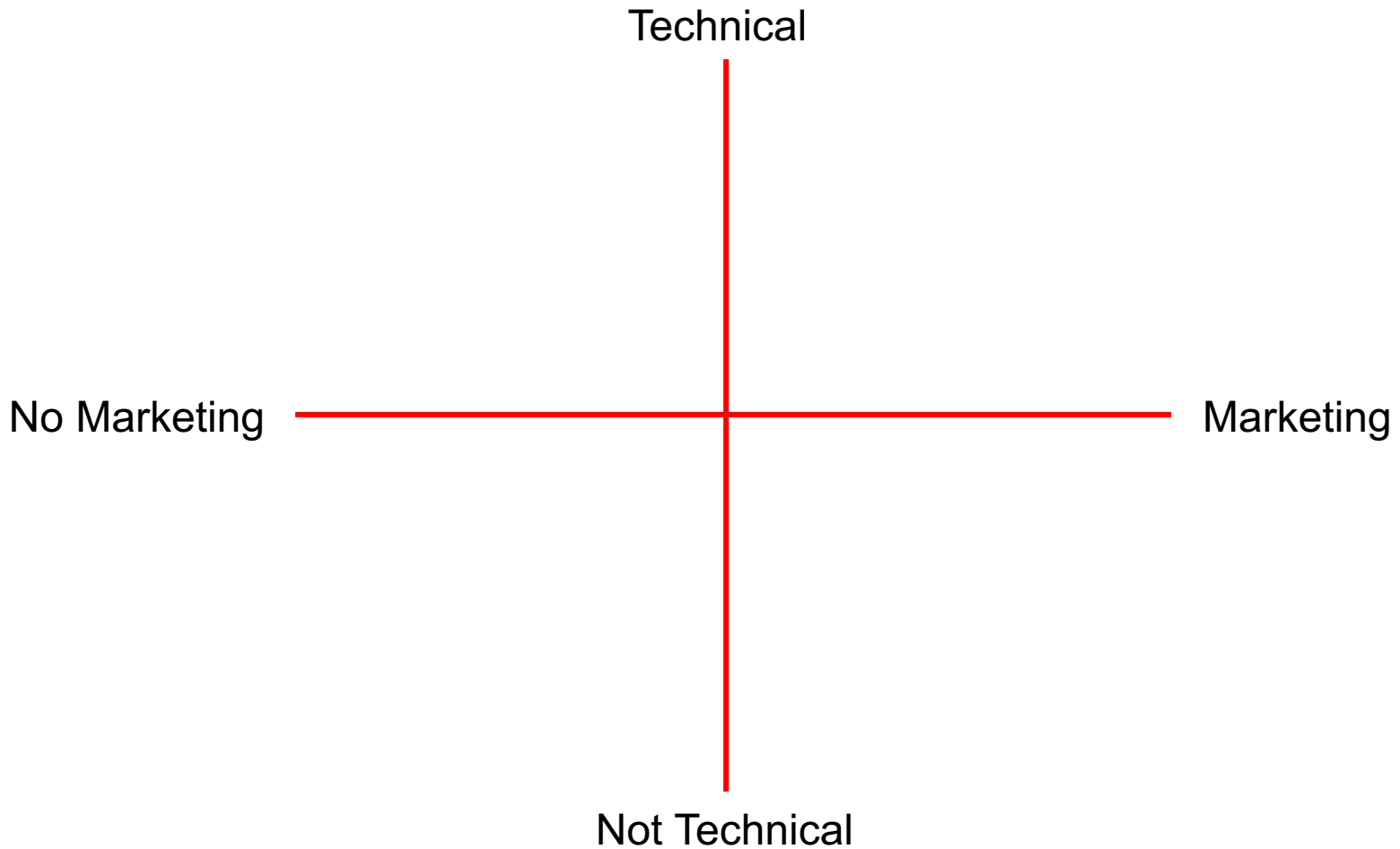
The Product / Marketing Paradox



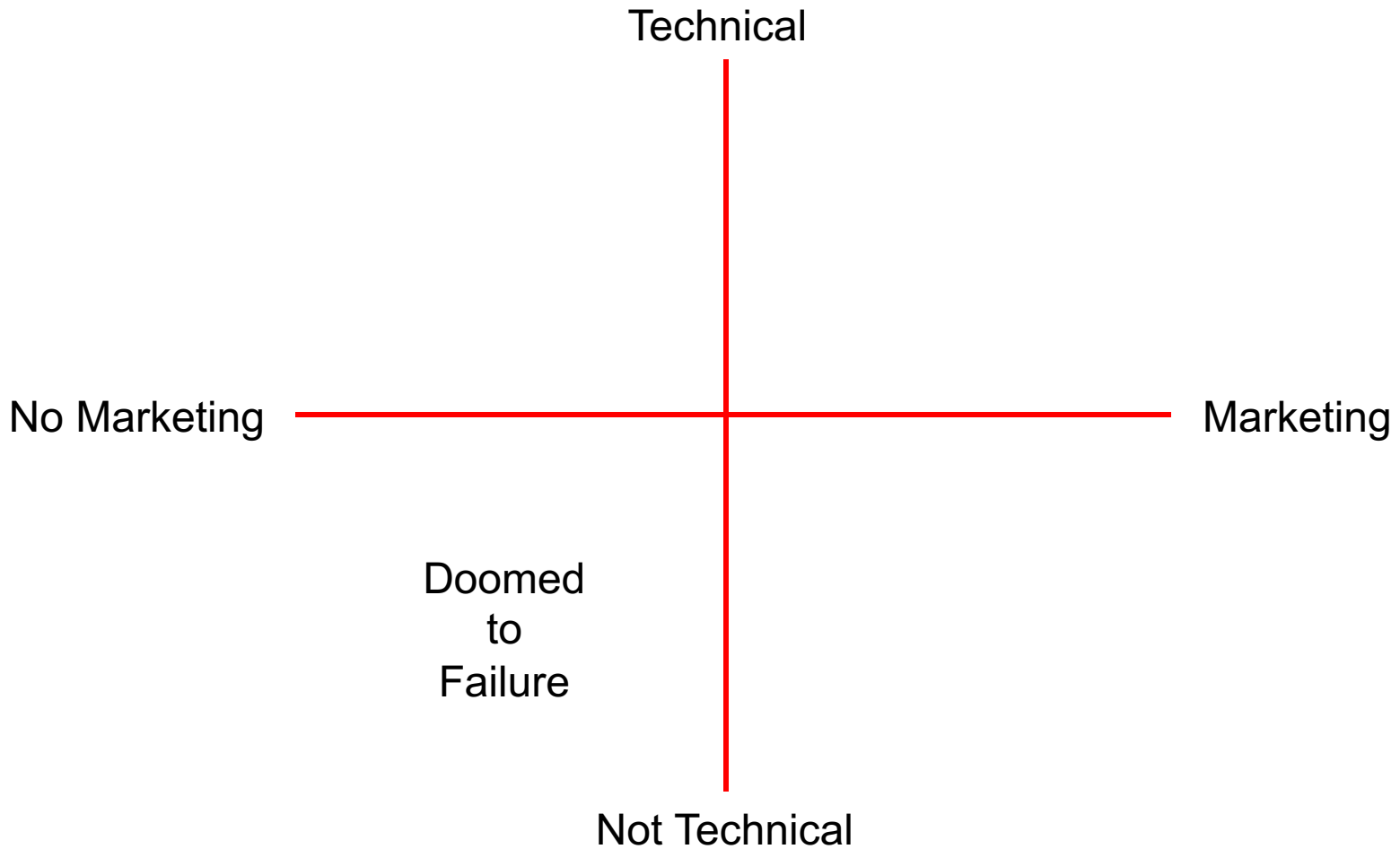
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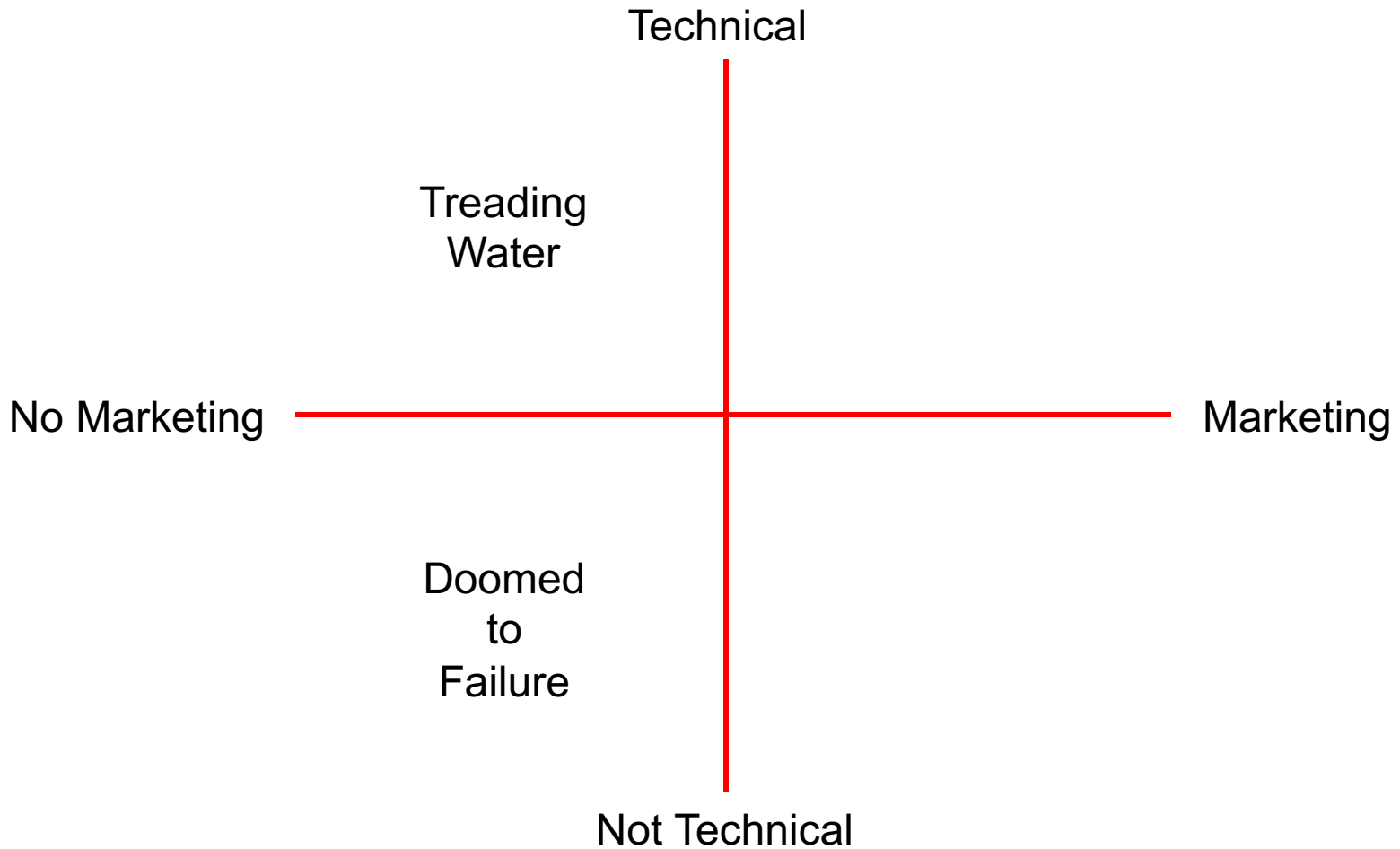
The Company Success Bias™



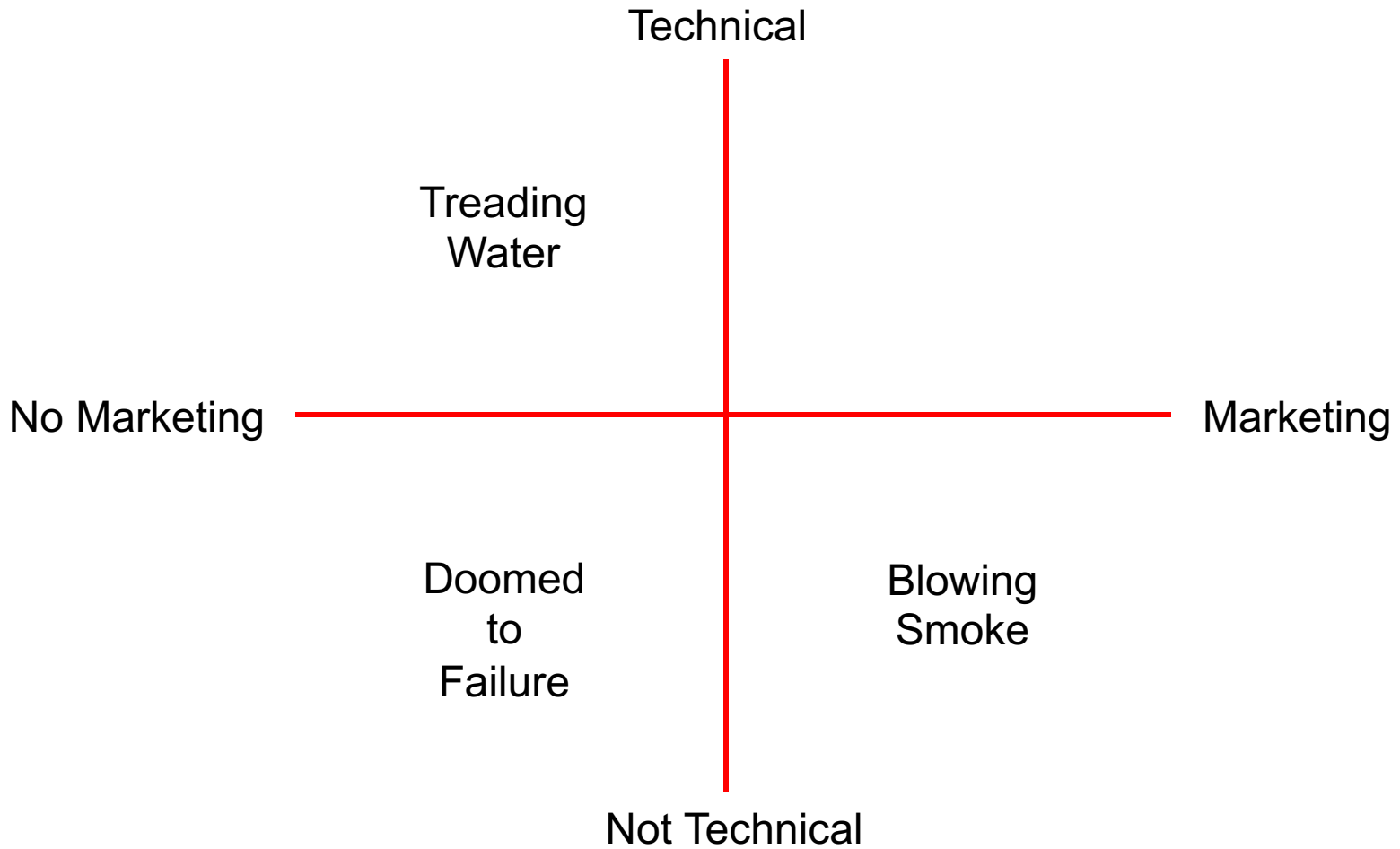
The Company Success Bias™



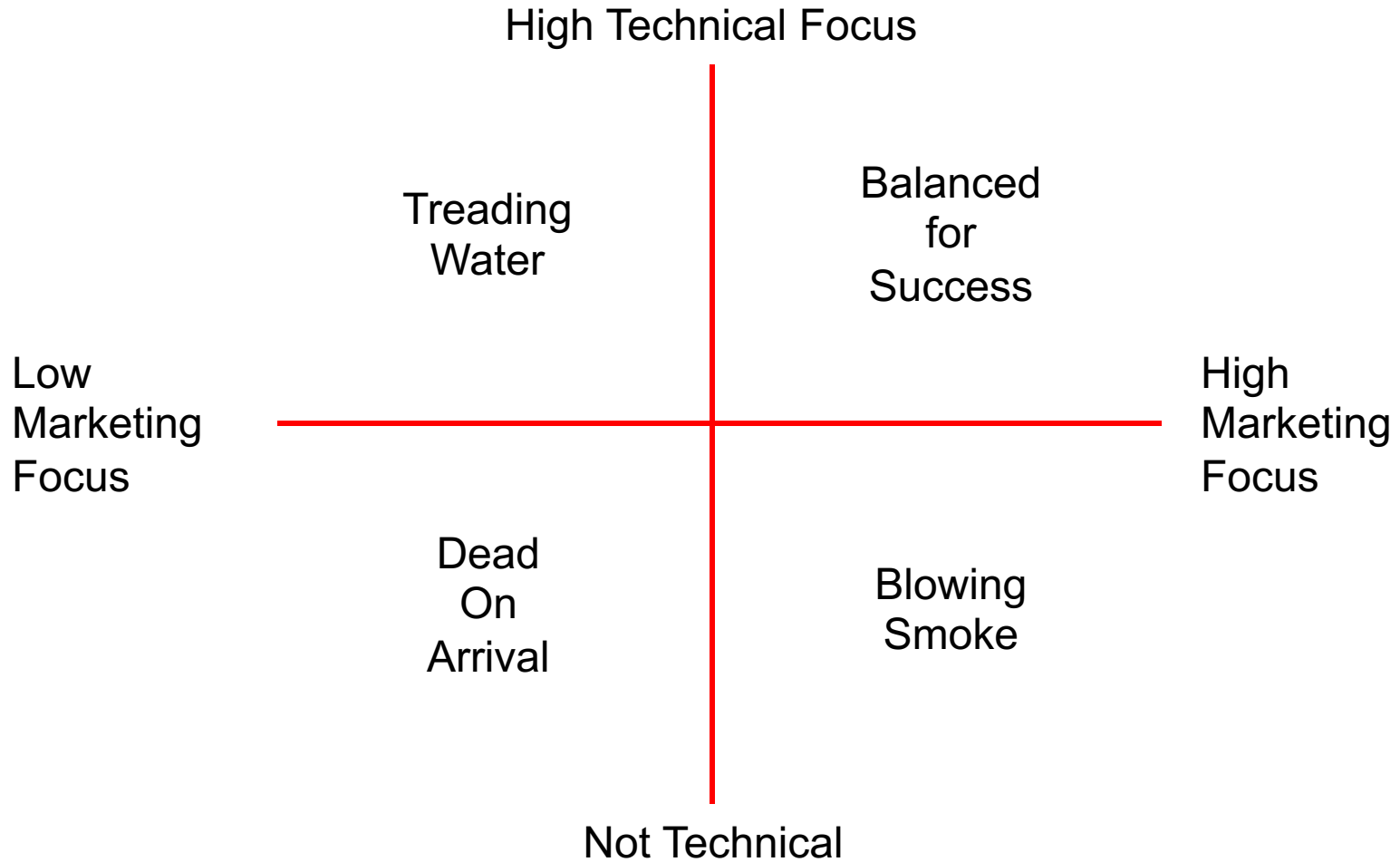
The Company Success Bias™



The Company Success Bias™



The Company Success Bias™



Success is not Guaranteed

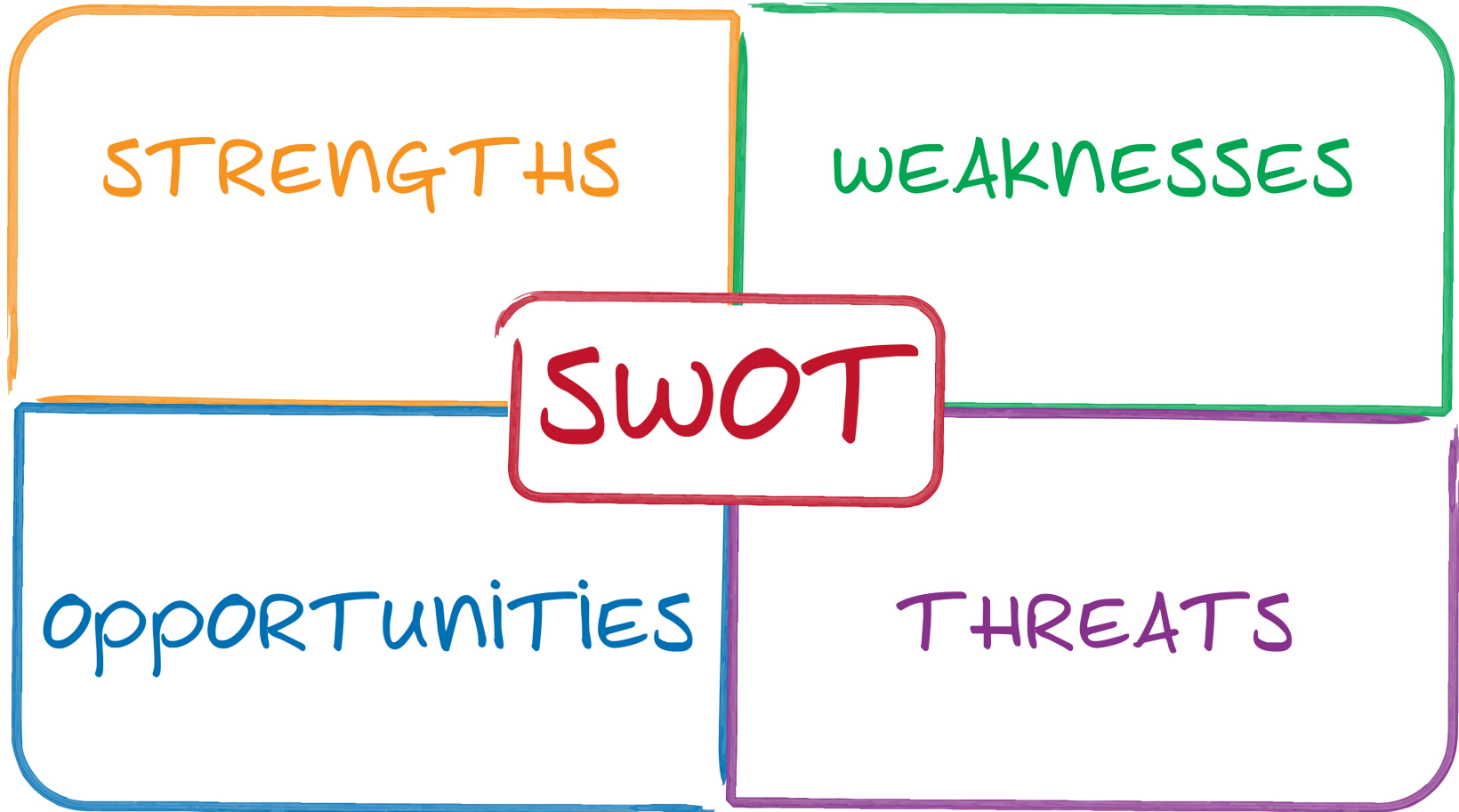
The SBA states

- 30% of new businesses fail during first 2 years
- 50% of new business fail during the first 5 years
- 66% of new business fail during the first 10 years

25% of businesses make it 15 years or more

<https://www.investopedia.com/financial-edge/1010/top-6-reasons-new-businesses-fail.aspx>

Perform a SWOT Analysis



Perform a SWOT Analysis

- Strong Technical Team
- Development Process
- Scalable Software Architecture
- Access to Jacob

- Marketing Team
- Development Speed
- Project Costs
- Not known in the market

SWOT

- New market
- More features
- Higher quality
- Global customer base

- Existing competitors
- Tariffs
- Loss of key personal
- Schedule delays

Perform a SWOT Analysis

- What resources do we have?
- What will it cost?
- When would we have to launch?
- Can we make this happen?
- Where is the competition? (beware marketing hype)

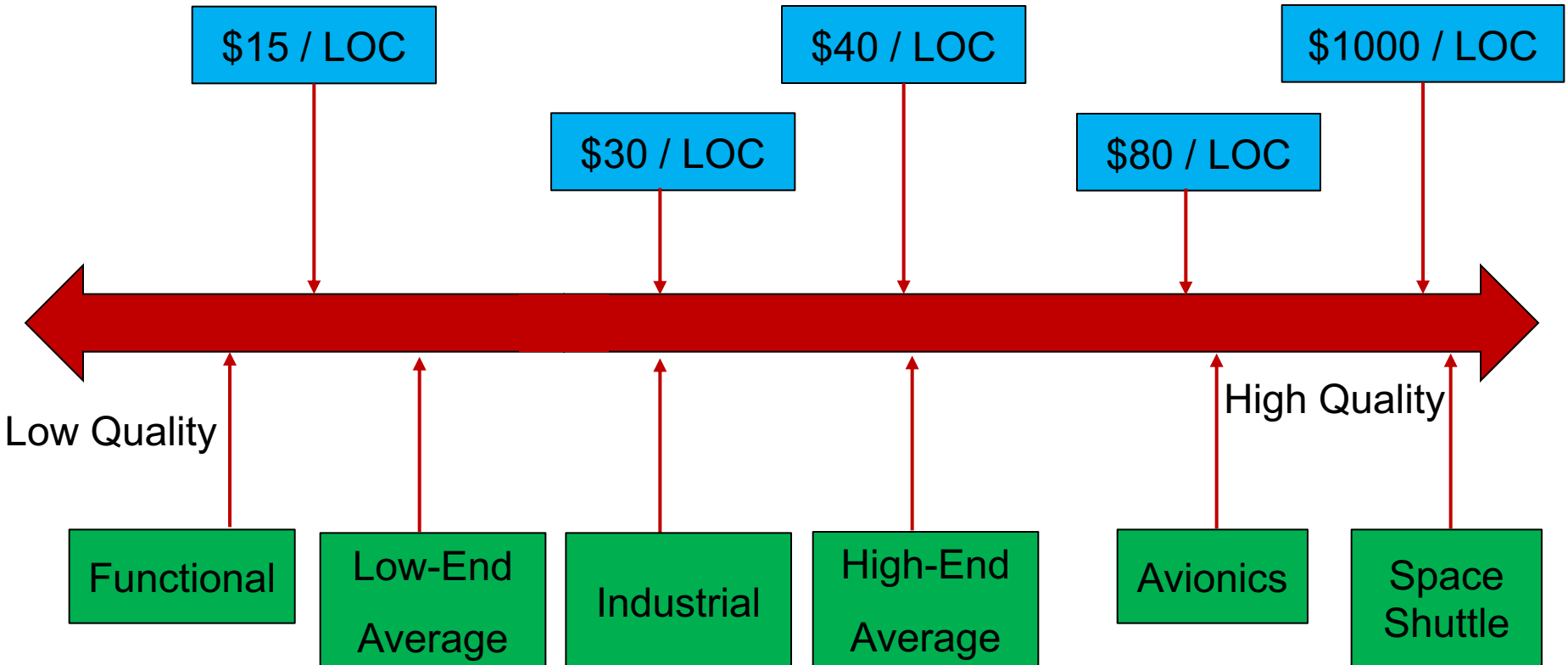
Typical Development Team

| Development Role | # of Engineers |
|-----------------------|----------------|
| Non-Firmware Software | 3.0 |
| Hardware | 2.5 |
| Firmware | 2.7 |
| QA / Test | 2.5 |
| Systems / Integrator | 1.6 |
| Other | 2.5 |
| Project Team Size | 14.8 |

* Aspencore Embedded Market Survey 2017

- 39% Dedicated to Software
- 28% Dedicated to Test and Integration
- 17% Dedicated to Hardware
- 17% Dedicated to Other

Software Development Costs



Software Development Costs

- Total Cost of Development (TCD)
 - Average number of software developers (SWE)
 - Time to Market (TTM in months)
 - Month months of effort - $MM = TTM * SWE$
 - Cost per developer CD = salary + overhead (\$150k average number)
 - $TCD = MM * CD$

Software Development Costs

Example based on industry survey results

1) $SWE = 3$

2) $TTM = 12.3$

3) $MM = 3 * 12.3 = 36.9\text{-man months}$

4) $CD = \$125,000$

5) $TCD = \$384,375$

The Minimum Viable Product (MVP)



Cost, Speed, Quality Triangle



