



Cross-Linking Research and Education and Entrepreneurship

MATLAB ACADEMIC CONFERENCE 2016

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Education Manager, Asia Pacific
MathWorks
@techcomputing



Innovation

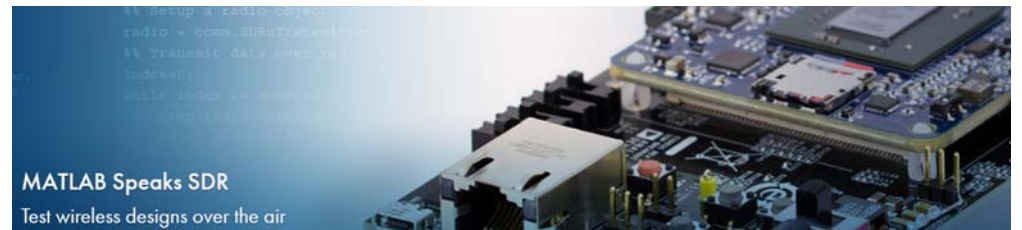
A pressing challenge

Exceptional research but commercialization struggles

- Insufficient STEM education
- inadequate collaboration
- 75% businesses without innovation culture

Disruptive technologies present opportunities

Education, research & business communities must align



Technology & Innovation – setting a direction

- Big Data
- **Machine Learning**
- **Modelling & Simulation**
- Robotics
- Biotechnology
- Sensors
- Nanotechnologies
- Energy technologies
- IOT

These two new general purpose technologies offer enormous social and economic opportunities for countries which facilitate and embrace their widespread development and adoption.



Technology & Innovation – setting a direction

Lead author, Bob Williamson says:

"Data analytics stands to be the next general purpose technology, and is surely a harbinger of the next technological revolution,"

"To me the really interesting thing is rather than say you have this privileged class of technology scientists and then you have all these other poor bunnies. But everyone is a technologist of sorts.

"When you consider every student at school now-what is it they need to learn to given that we are moving into an era when **data technology will be pervasive.**

"They don't need to necessarily build it but in the same way I don't need to know how to build a computer but I **do need to understand how to exploit it** and you are starting to see a lot of this."



Demand & opportunity

Employer's say..

*Our senior engineers with experience and integrated knowhow are **retiring and taking with them our core competencies.***

*The **new engineers have no multidisciplinary, integrating, systems experience.** Academia does not teach that! We are losing our competitive advantage!*

How can we capture that engineering expertise and enhance our engineering workforce to keep our competitive advantage?

Gaps Between What Academia Teaches and What Industry Needs

	Industry: Essential, Important, or Useful
Linear Models	96.4%
Control-Oriented Models for System Design	98.2%
Simulation Models for System Verification or Product Development	94.5%
Nonlinear Models	90.9%
Finite State Machine Models	82.9%
Real-Time Models for Hardware-in-the-Loop Verification or Training	94.4%

Nov. 2009 Controls Curriculum Survey:
 An IEEE Control Systems Society Outreach Task Force Report
www.ieeecss.org/publications/miscellaneous.html

Education is the key for new Industries

- New industries bring more variations & **Complexity** in development and production.
- Requires **more capable employees** in both the works and the development
 - The worker needs to understand how to influence production plant that is reconfiguring itself.
 - The developer must plan for flexibility in the production systems
- **Modelling and simulation is an indispensable tool.**
- **Responsibility for quality and implementation lies with companies and universities**

Innovating the Engineering Education Model

– Supply & Demand

Supply side

Research universities

Engineering schools

- Teaching
- Research

Technology transfer office

Technology

Engineers

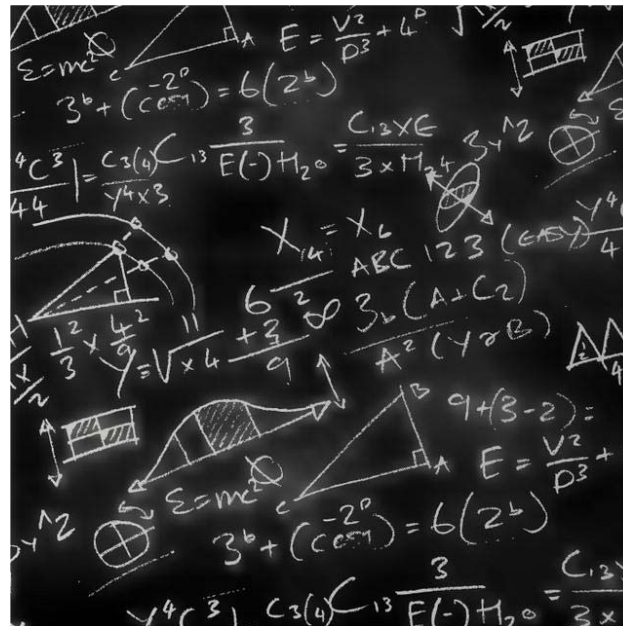
Demand side

Dynamic changes

- Service innovation
- Partner collaboration
- Globalization
- **Exponential technology**
- **Disruptive innovations creating new industries**
- **New startups**

It's Math that Drives Things

More math in your system → bigger benefit from MATLAB & Simulink



Aeronautics



Automotive



Retail



Finance



Internet



Logistics



Healthcare Management



Medical Devices



Clean Energy



Oil & Gas



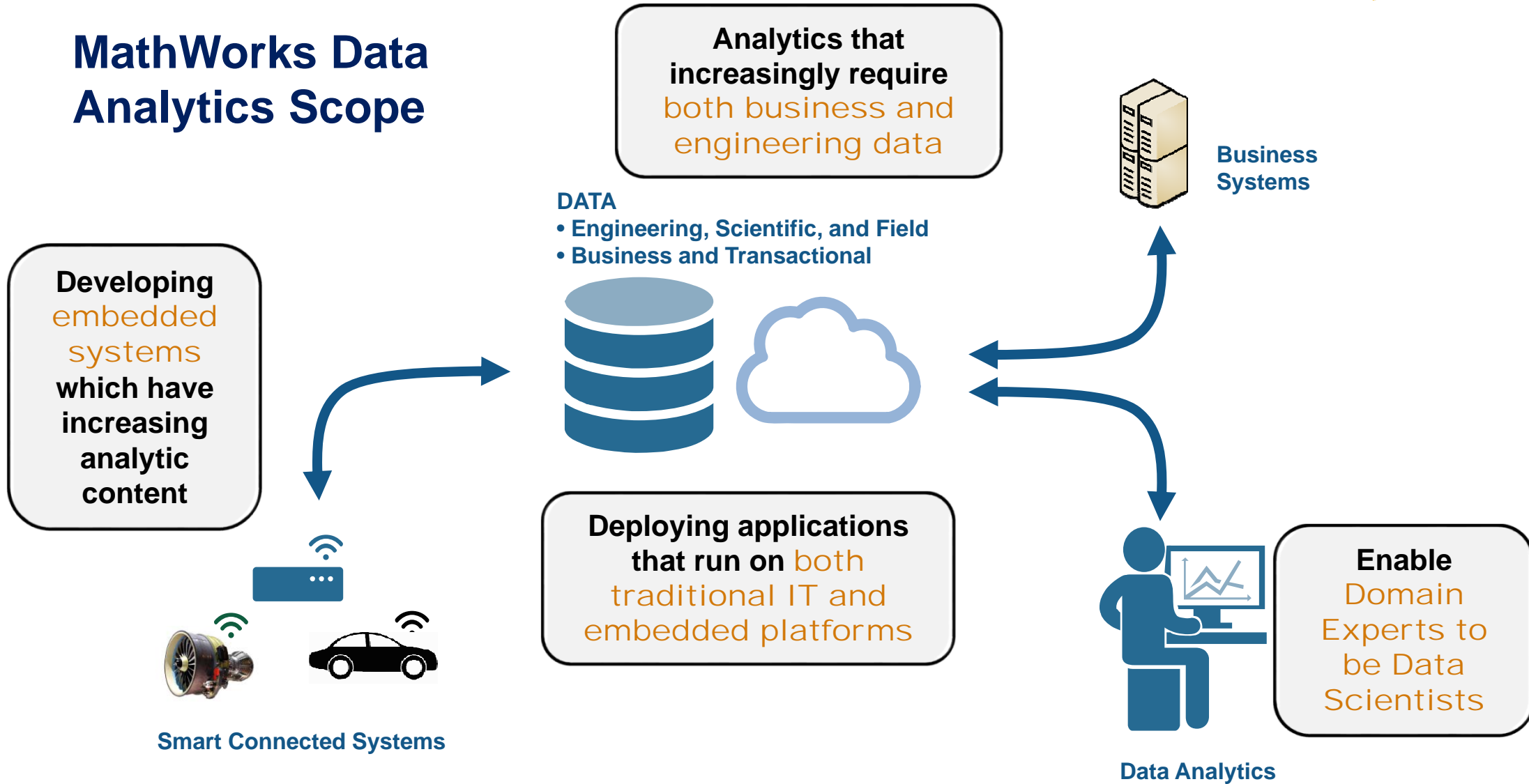
Industrial Automation



Off-highway vehicles



MathWorks Data Analytics Scope



MATLAB Enabled Campus

“Everyone, Anytime, Anywhere” Access

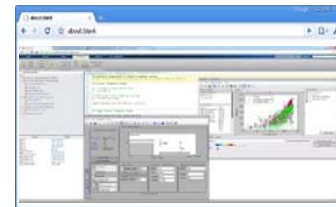
Unified Computational Ecosystem



MATLAB ON
PCs
Clusters
Cloud



MATLAB Mobile



MATLAB Online



Scalable Computing Infrastructure

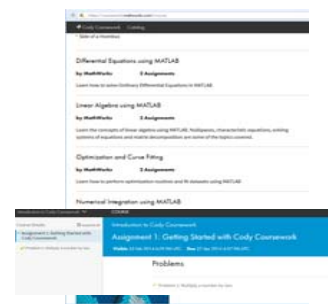
Resource Framework



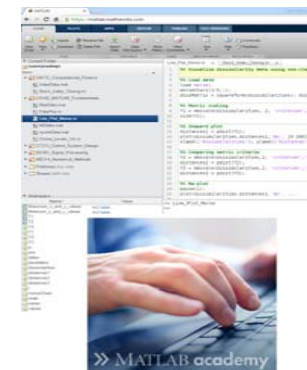
Curricula Materials and Projects



Hands-on learning with hardware & sensors



Online auto grading of assignments



Online self-paced learning

Over 5000 universities use MATLAB

650 provide **MATLAB-enabled** campuses



Australia & New Zealand: 28 out of 48 universities are **MATLAB Enabled Campuses**



University of South Australia



Michigan State Integrates MATLAB into Engineering Curricula to Foster Student Proficiency in Problem-Solving Using Computational Tools

Challenge

Help engineering students build confidence in their ability to apply computational tools and better prepare them for industry and postgraduate study

Solution

Integrate MATLAB and Simulink throughout the engineering curricula, enabling students to consistently build upon their previous experiences

Results

- Students better prepared to meet industry demands
- Program outcomes and student skills improved
- Teaching accelerated in higher-level courses

[Link to user story](#)

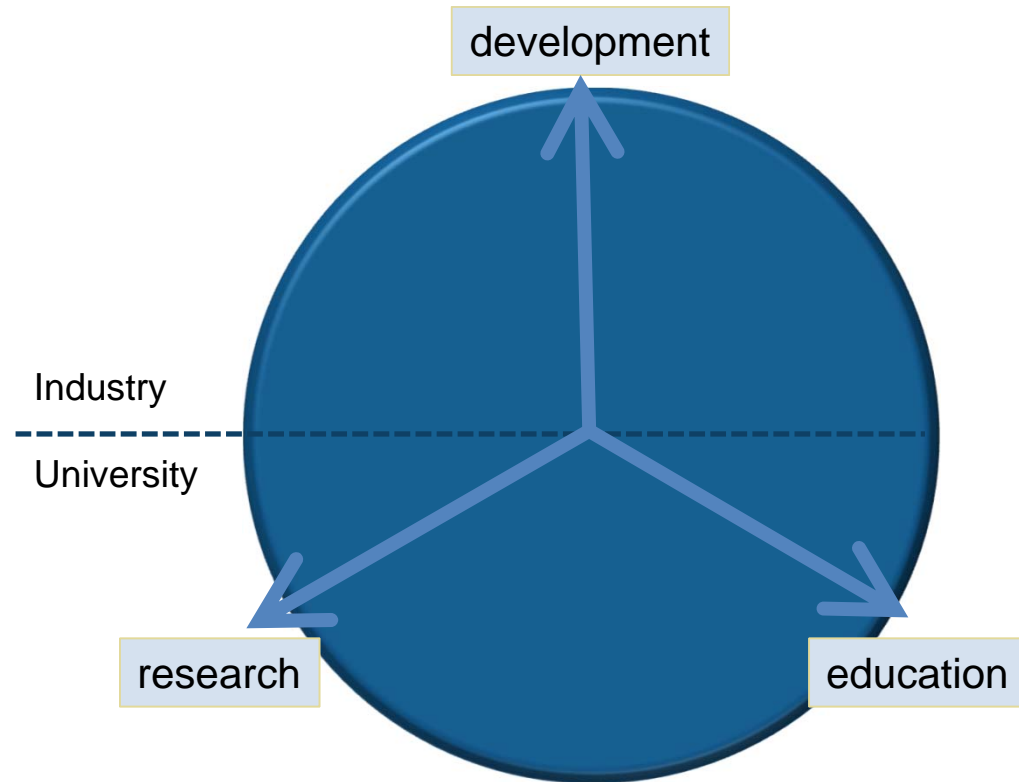


Dr. Daina Briedis with a student in the lab.

“Our environment of choice for problem-solving at the undergraduate level is MATLAB. We selected MATLAB because it is suitable for a broad range of problems and because it is becoming the de facto standard in many university engineering programs, reflecting the increasing use of MATLAB in industry.”

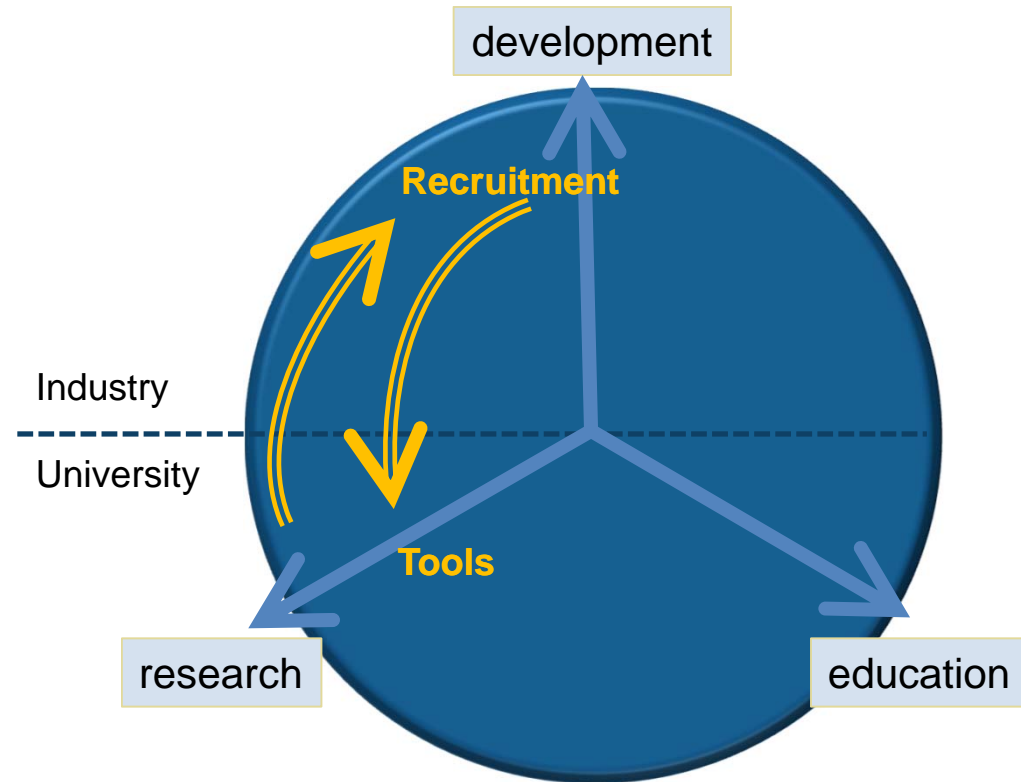
**Dr. Jon Sticklen
Michigan State University**

Supporting Research Programmes



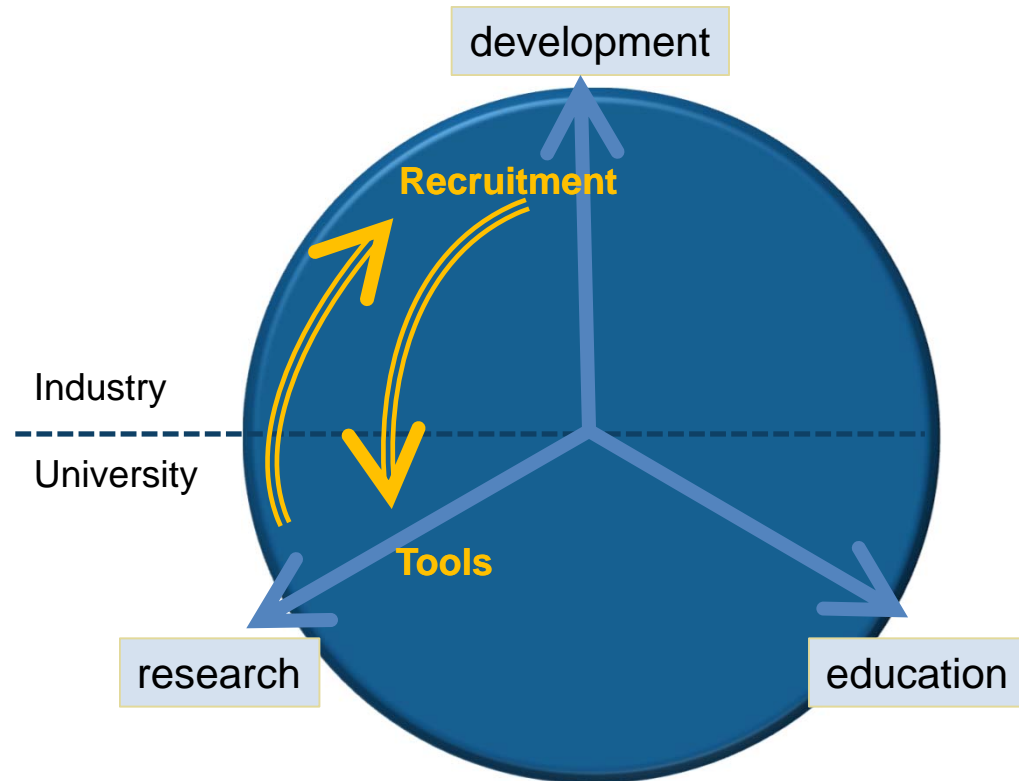
A Challenge for All of Us

- Universities need to revise curricula to attract and retain students, reflect research interests of faculty, and give students practical knowledge and skills



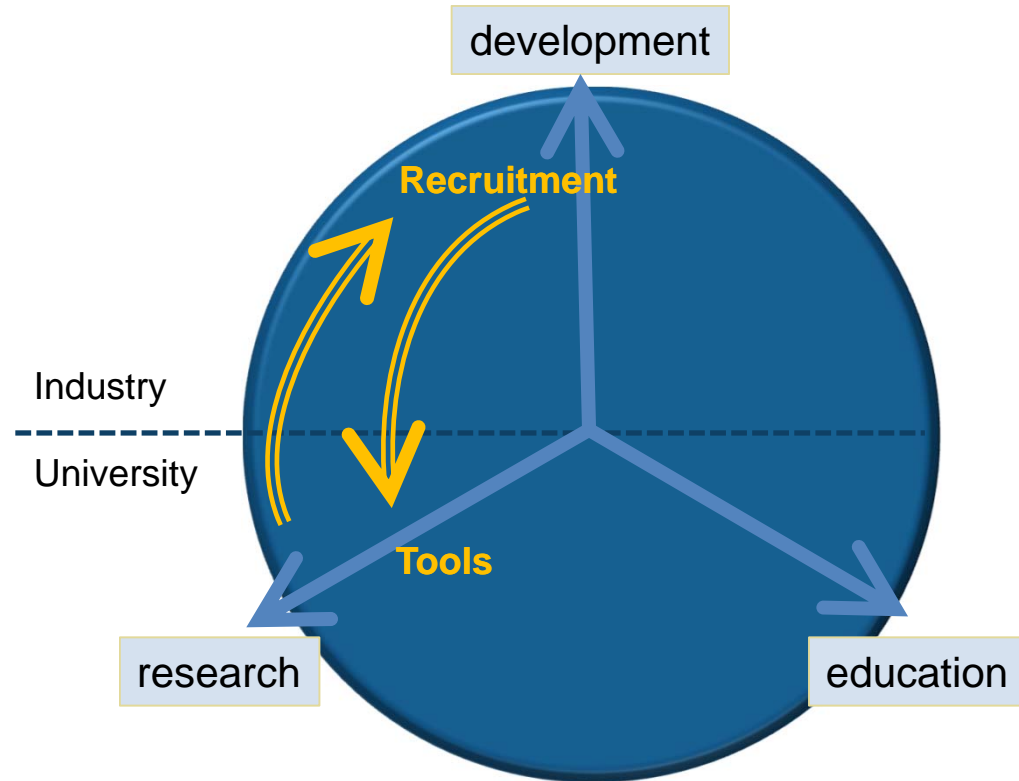
A Challenge for All of Us

- **Companies** need innovative techniques to solve their own real-world problems
- **Universities** have researchers in search of real-world problems to drive and anchor their research work



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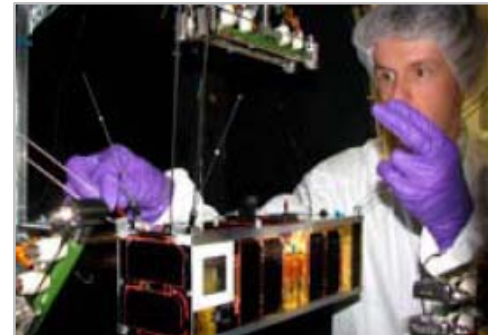


Industry-University Research Collaborations

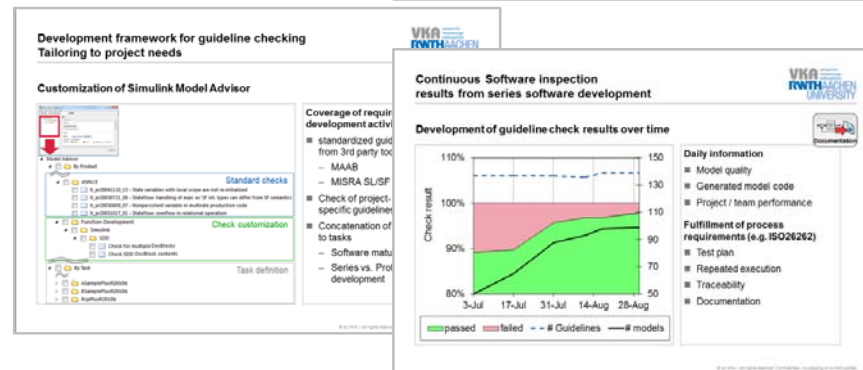
Ricardo and Fraunhofer Institute
Model-Based Design of a
Piezoelectric-Actuated Hydraulic Pump



University of Toronto and Space Flight Laboratory
Design of Nanosatellite Control Systems

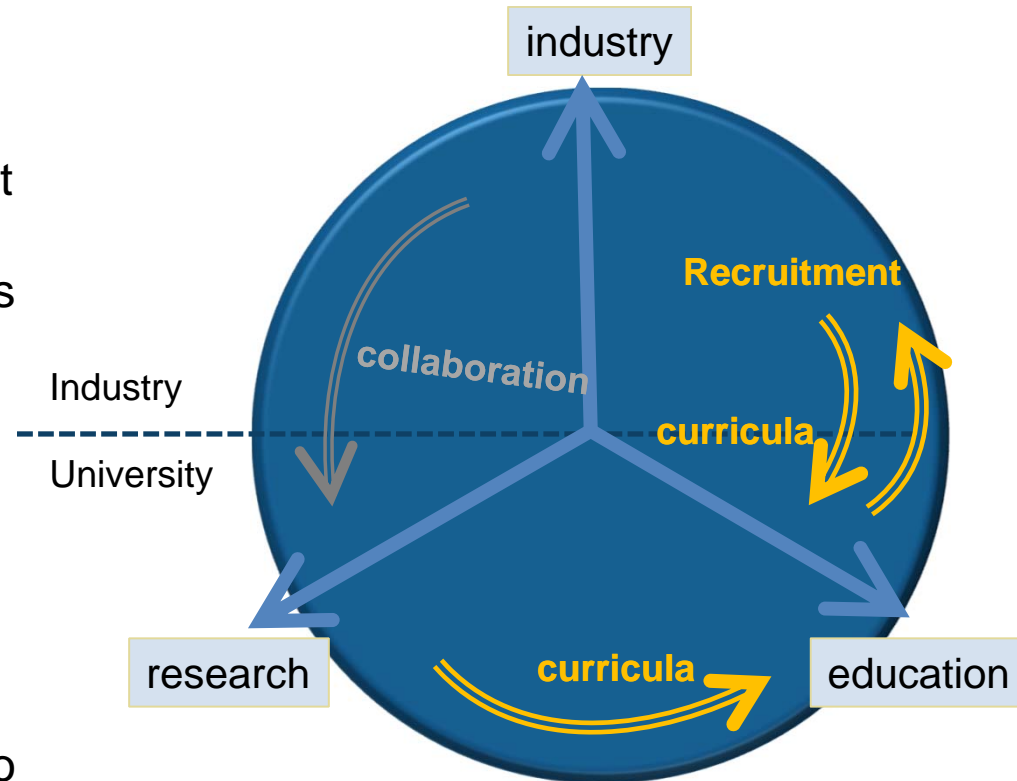


FEV and RWTH Aachen
New Model-Based Design
Techniques for Automotive
Software Development

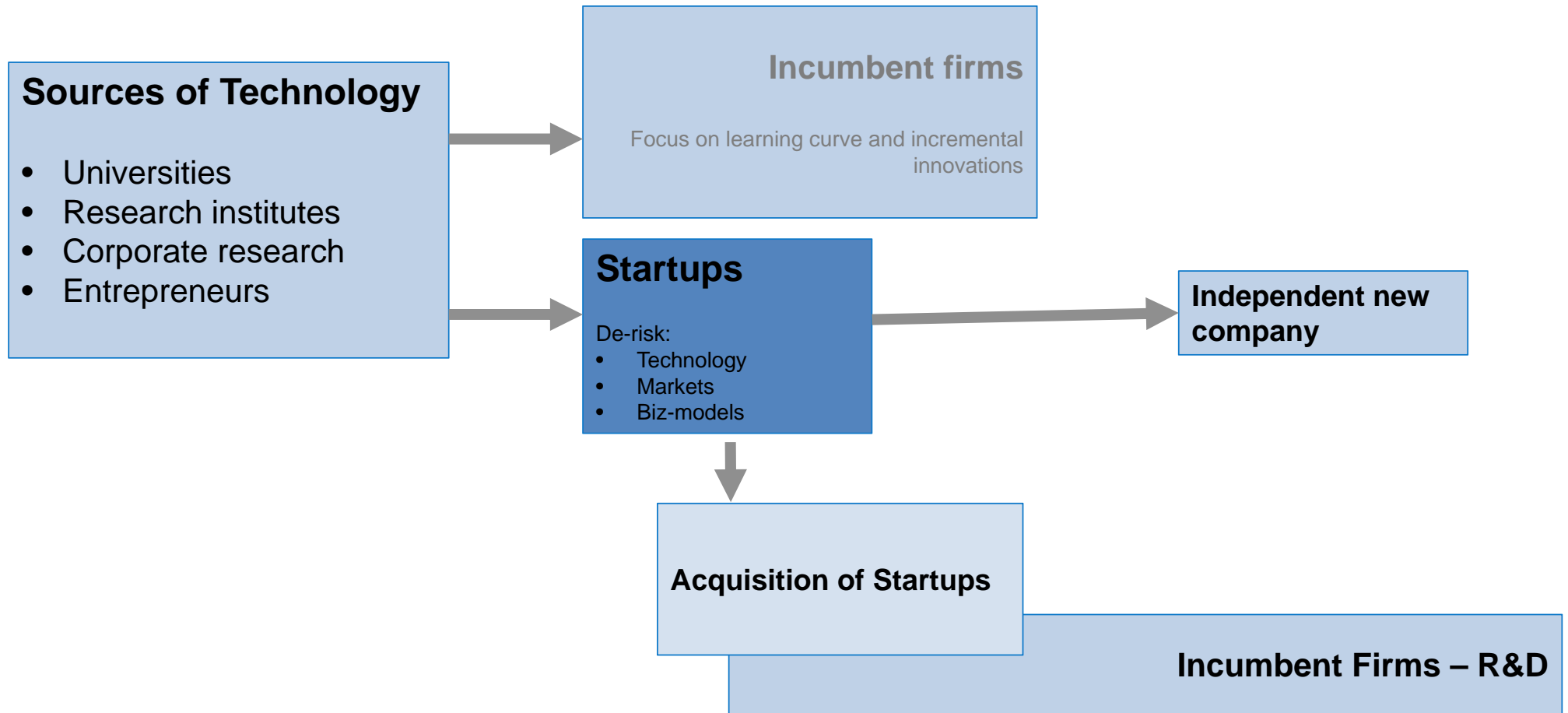


A Challenge for All

- **Universities** need to revise curricula to attract and retain students, reflect research interests of faculty, and give students practical knowledge and skills
- **Companies** push the state-of-the-art in development methods, and need engineers who can contribute



Innovation Transition



MathWorks Startup & Accelerator Program



MathWorks supports more than 100 **startup accelerators and incubators** worldwide.

Startups rely on MATLAB and Simulink to

- reduce technical risk
- do more with limited resources.
- focus on competitive differentiation and reach early-stage milestones.

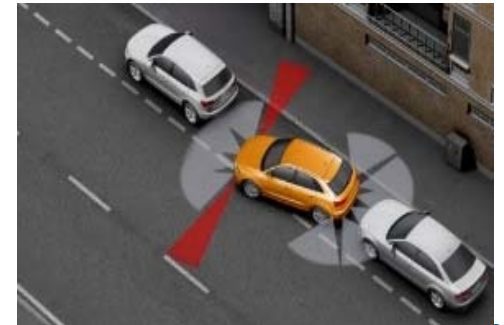
Australia & New Zealand

6 Accelerators & >15 Startups supported

Bridging Innovation from Academia to Industry

How will your teaching, research or learning enable you to collaborate in innovative teams and companies?

Are you providing yourself with the competency and tools to deliver innovative products and systems?



Accelerating the pace of discovery,
innovation, development, and
learning in engineering and
science.

