#### University Industry Collaboration -A Case Study in the Automotive Industry

Stellenbosch





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#### History

# Fraunhofer / CIRP / TUM Connections

- Fraunhofer: Trustworthy Connections
  - Fraunhofer has been involved at Stellenbosch Engineering for over 20 years
  - Current President of Fraunhofer, Prof Dr Ing Reimund Neugebauer, received an honorary degree from Stellenbosch in 2013
- CIRP network
  - The International Academy For Production Engineering (CIRP)
  - Partner at Technical University of München (TUM), also part of the Fraunhofer network.
- A PhD collaboration was started around 2008, where TUM PhDs visit for 3-6 month, to complete their PhD studies.
  - One such PhD student joined us in 2016...
  - Once he completed his PhD, he joined a leading global automotive manufacturer BMW in Munich
  - Maintained a strong connection with South Africa



**TECHNISCHE** 

UNIVERSITÄT MÜNCHEN







#### History

**BMW Group South Africa** 

- A strong manufacturing base in South Africa, for 50 years the first plant outside of Germany for the company
  - Local market
  - Export market
- The BMW IT Hub forms part of BMW Group South Africa
- The BMW IT Hub:
  - Is the fastest growing business unit within the BMW Group
  - Has core competence in mainstream development languages and platforms such as SAP, JAVA, C#, Python, AWS, Azure and others
  - Develops and maintains IT Solutions for the BMW Group globally
  - https://www.bmwithub.co.za









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#### Requirement

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#### Why Engineering at Stellenbosch?

#### Key Resource Requirements

- Historically SAP, but moving on towards the newer DEVOPS based development, using technologies such as Amazon Web Services, Oracle, Microsoft Azure, TensorFlow, Python, PyTorch etc.
- Applied on production processes, but also newer expectations such as EV production. Circular Economy, Digital twins etc.

#### Strategic Risk Reduction

- Geographically source talent from not only Gauteng but elsewhere in South Africa
- Western Cape is positioning itself to become very focused on IT based solutions – eg AWS now basing a strong development hub in the Western Cape
- Stellenbosch Engineering, Computer Science etc, became strategic options.

#### Thus 2 Main Requirements:

- Talent Pipeline
- Innovative Solutions for operational challenges

### **Collaboration Goal**

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#### • Talent Development:

- Becoming a preferred supplier of talent
- Expose students to the culture and way of work
- Evaluate the student for suitability

#### • Knowledge Creation:

- Participate in joint research projects to build new software solutions for the future
- Operational challenge focus
- Commercial sensitivity and Intellectual Property challenge
- Contributing to the Economy

### Shapes And Forms Of University / Industry Partnerships

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	Undergraduate	Graduate	Graduate + Staff
	A: Undergraduate bursaries	B: Master's bursaries C: Engagement model	D: Research partnership
Description	<ul> <li>Offer bursaries to academically strong deserving students for undergraduate studies</li> </ul>	<ul> <li>Masters bursary scheme for top performers – Industrial Engineering and Engineering management</li> <li>Arms-length relationship with student but guide formulation of topics</li> <li>Masters bursary scheme + immersing student in Industry projects</li> <li>Project in partnership with Industry (direction; context, data, management through Industry project champion)</li> </ul>	<ul> <li>Research/skills development programmes in partnership with university staff and students</li> <li>A range of engagement models exist - from innovation platforms / hubs to research on project basis</li> </ul>
Commit- ment	• R80-R100k per student per year	<ul> <li>R100k-R140k per student per year</li> <li>R100k-R140k per student per year</li> <li>Field work support</li> <li>Management: Supervision and management costs</li> </ul>	<ul> <li>Funding on contractual basis and may contain elements of supervision, management and engagement</li> </ul>
	Human pipeline		
fit	Work-back commitment	<ul> <li>Possible Work-back commitment</li> <li>Knowledge development in more objective form (outside Industry context but on relevant topics)</li> <li>Possible Work-back commitment</li> <li>Onsite nature of project allows for evaluation of compatibility of candidates to culture of Industry</li> <li>Alignment / shaping of the skill-se in Industry context</li> </ul>	<ul> <li>May include elements of options A, B and C</li> <li>University staff move closer to Industry</li> <li>May include Industry staff capacity development e.g. short courses</li> </ul>
Bene	Knowledge development and knowledge	transfer to Industry	6
		<ul> <li>Arms-length relationship allows for fresh and "out-of-the-box" thinking in safe environment</li> <li>Outcomes however may be disconnected from Partner context – lead to limited direct utility of research</li> <li>Research takes place in Industry context</li> <li>Knowledge transfer pathway set up through engagement model and employment of candidates</li> </ul>	<ul> <li>Potentially setting up of more permanent structures in University (Hub)</li> <li>Create entry point to expertise in staff in the university</li> </ul>

# Selected Partnership Model for the Case Study

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	Undergraduate	Grad	uate	Graduate + Staff
	A: Undergraduate bursaries	B: Master's bursaries	C: Engagement model	D: Research partnership
Description	<ul> <li>Offer bursaries to academically strong deserving students for undergraduate studies</li> </ul>	<ul> <li>Masters bursary scheme for top performers – Industrial</li> <li>Engineering and Engineering management</li> <li>Arms-length relationship with student but guide formulation of topics</li> </ul>	<ul> <li>Masters bursary scheme + immersing student in Industry projects</li> <li>Project in partnership with Industry (direction; context, data, management through Industry project champion)</li> </ul>	<ul> <li>Research/skills development programmes in partnership with university staff and students</li> <li>A range of engagement models exist - from innovation platforms / hubs to research on project basis</li> </ul>
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#### Talent Development & Knowledge Creation

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Tech

and

Knowledge

Development

Contracted Research	<ul> <li>Develop new technology / IP, where staff are also contracted</li> </ul>	
PhD Program	<ul> <li>Identify strong talent that we want to base new technology on</li> <li>Develop the technology and the talent</li> </ul>	
Research Masters Program	<ul> <li>Use Industry Projects to expose good students</li> <li>Allow Students and supervisors to propose new solutions not previously considered</li> </ul>	pment
Structured Masters Programs	<ul> <li>Examples: Data Science, or Engineering Management</li> <li>Participate in projects – typical 60 credits</li> </ul>	Develo
Educate Existing Engineers	<ul> <li>Short Courses</li> <li>Amend with other relevant topics (ie Digital Twin based models)</li> </ul>	Talent
Target Undergraduate Engineers	<ul> <li>Awareness of Industry Options</li> <li>Marketing</li> <li>Bursary Program</li> </ul>	

#### Talent Development & Knowledge Creation

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Development

	Contracted Research	<ul> <li>Develop new technology / IP, where staff are also contracted</li> </ul>		Tech
22-2025	PhD Program	<ul> <li>Identify strong talent that we want to base new technology on</li> <li>Develop the technology and the talent</li> </ul>		ge and <sup>-</sup>
	Research Masters Program	<ul> <li>Use Industry Projects to expose good students</li> <li>Allow Students and supervisors to propose new solutions not previously considered</li> </ul>	pment	nowled
A Knowledge Pyramid	Structured Masters Programs	<ul> <li>Examples: Data Science, or Engineering Management</li> <li>Participate in projects – typical 60 credits</li> </ul>	Develo	×
<ol> <li>Establish foundation in Research Masters Projects.</li> <li>Upgrade worthy projects to PhD.</li> </ol>	Educate Existing Engineers	<ul> <li>Current Short Course proposal</li> <li>Amend with other relevant topics (ie Digital Twin based models)</li> </ul>	Talent	
3. Identify Contract Research opportunities as expertise and confidence is built.	Target Undergraduate Engineers	<ul> <li>Awareness of Industry Options</li> <li>Marketing</li> <li>Bursary Program</li> </ul>		

#### **Collaboration Across Skill Sets**

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## Intellectual Property and the IPR Act

- By Default, as per the IPR Act and University Policy:
  - University owns IP
    - Created by staff in the scope of their employment
    - Created by students in the scope of their academic work towards a qualification
  - Staff and students disclose IP creation to InnovUS (University Commercialization Entity)
    - University protects IP
    - InnovUS commercialises IP
    - Shares income with Inventor and SU
- But, we have the Knowledge Creation Requirement, where the IP must be with Industry in order to make it useful and provide them with a return on investment.



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## Full Economic Costing in the IPR Act

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# Section 15(4)(a):

Any research and development undertaken at an institution and funded by a private entity or organisation on a **full cost basis** shall not be deemed to be publicly financed research and development and the provisions of this Act shall not apply thereto.

# Section 15(4)(b):

"full cost" means the full cost of undertaking research and development as determined in accordance with international financial reporting standards, and includes all applicable direct and indirect cost as may be prescribed.

### **Components of the Full Cost Budget**

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Direct Cost	Personnel Cost (minimum basic remuneration level)
Direct Cost	Equipment
Direct Cost	Running Cost
Direct Cost	Audit Cost
Direct Cost	Travel cost, conferences, workshops, seminars
Direct Cost	Any other direct cost related to the project
Indirect Cost	Indirect Cost of the University (ICRR = 22% of income)
Price: IP Transfer	IP Transfer (InnovUS) Note: IP Transfer Price exempted from ICRR
VAT	VAT
Direct Cost	Bursaries

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# Intellectual Property and Full Cost

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- Principles Applied
  - If funder paid full cost (+ reasonable IP transfer fee) University may assign the IP to the funder or grant exclusive licenses without National Intellectual Property Management Office ("NIPMO") approval.
  - If funder paid less than full cost, then no IP assignment is possible without NIPMO approval and funders rights (licenses) to IP are restricted

#### **Contractual Framework**

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#### Framework Agreement with Addendums

- Non-Disclosure Agreement
  - Standard NDA between Automotive Partner and Stellenbosch
  - Each Stellenbosch participant also sign an individual NDA before they can participate
- Umbrella Framework Agreement :
  - 5 year term
  - Full-cost agreement with an IP Transfer fee arrangement the implication is that the Automotive partner owns all the Intellectual Property
  - Each year is defined by projects and a full cost budget, as annexures to the umbrella agreement

#### BMW and Stellenbosch University entered into a partnership



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#### Framework Agreement signed November 2021 at Lanzerac

The Faculty of Engineering at Stellenbosch University recently joined forces with BMW Group South Africa, specifically the BMW IT Hub, to develop a homegrown IT talent pipeline for the company. The initiative aims to promote skills in artificial intelligence and data analysis, ultimately creating a pool of talented students that will support BMW in growing and maintaining software in the scope of their IT business.



## **Operational Model**



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#### Active Industry Involvement

- Student Onboarding Exercise –similar than employees/contractors of the partner
  - 1 week process
  - Exposure to culture, and operations, as well as social events to build the team.
- Progress:
  - Integrated in teams, with regular updates virtual
    - Agile Teams, with weekly Q&A sessions
    - Regular Sprint Reviews
    - Student Progress Presentations
  - Dedicated space in Stellenbosch a BMW sponsored collaboration hub
  - Regular colloquiums where groups meet physically as well
  - Soft skill enhancement selling their ideas to business







Description	2021	2022	2023	2024
Contract				
2022 Intake		10 Masters Stu	Idents	PhD Upgrade?
Recruit Onboard 1 <sup>st</sup> Colloquium 2 <sup>nd</sup> Colloquium 3 <sup>rd</sup> Colloquium		<ul> <li></li> <li></li> <li></li> </ul>		,
2023 Intake			8 Masters Stu 1 PhD Studen	dents t
Recruit Onboard 1 <sup>st</sup> Colloquium			* *	

### Meet the BMW Project!

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#### • Currently:

- 18 Masters and 1 PhD student
- 9 Supervisors (Industrial Engineering, Mechatronic Engineering, Computer Science and Applied Mathematics)
- 5 Business Units in BMW involved widen the footprint
- 2022 intake has job offers











- Direct Industry Involvement is paramount for success.
- The Post-Covid environment makes the operation of internationally dispersed virtual teams a reality.
- Full Cost Contracts where the industry owns the IP fully are currently rare and needs special consideration.
- IP Sensitivity and Confidentiality need to be continuously managed.
- Research Masters are less known in Europe, and some in the Industry partner needed to be convinced of the benefits.
- The Industry Partner is not only getting solutions for real business problems, but is building a pipeline of potential young engineers and scientists who can join their worldclass operations.



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# Thank you Enkosi Dankie