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**IDEAS THAT WORK**

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**Collaborative engineering for  
complex products**

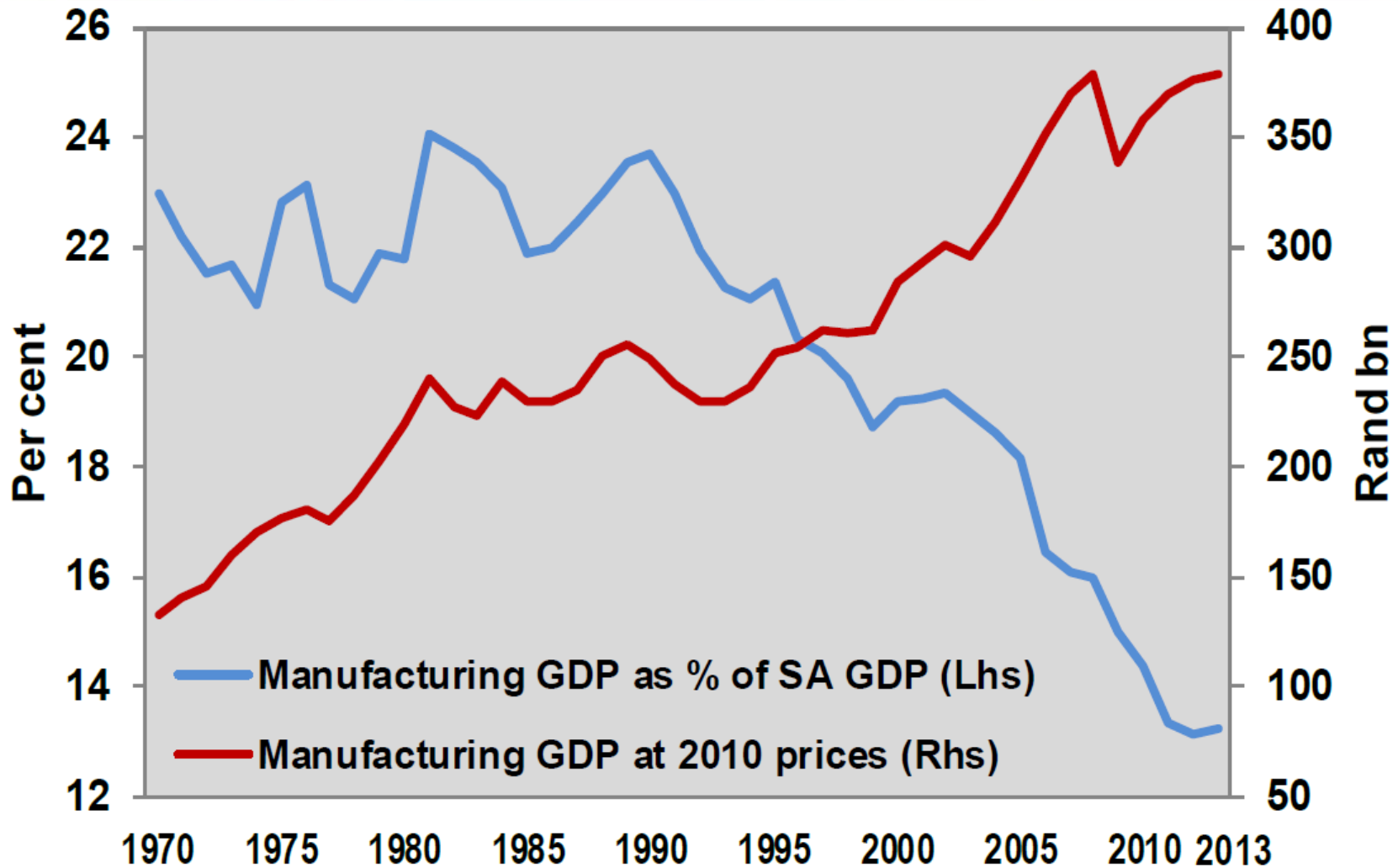
Jonnro Erasmus Pr. Eng.

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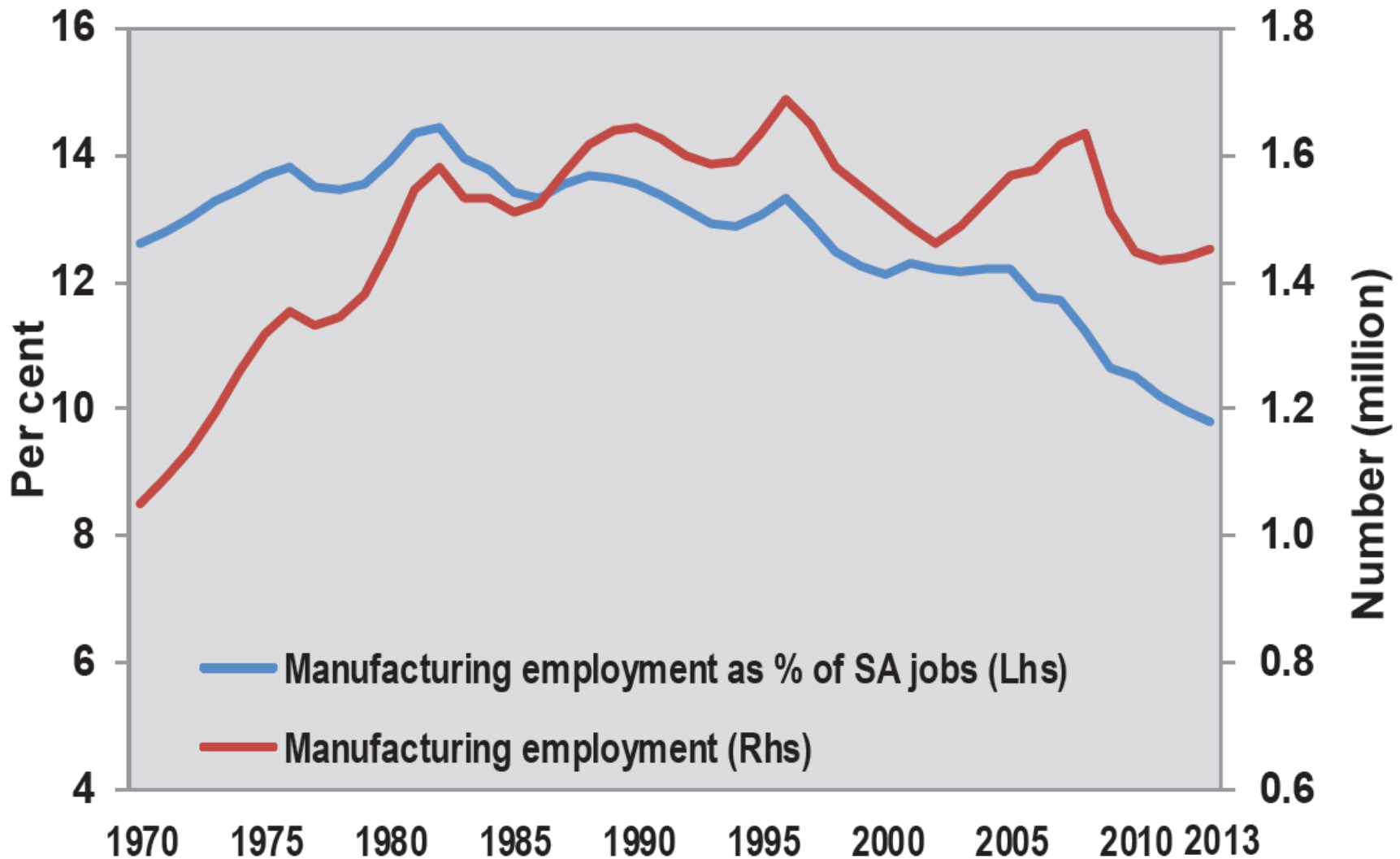
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**70** Years  
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# Contribution of manufacturing

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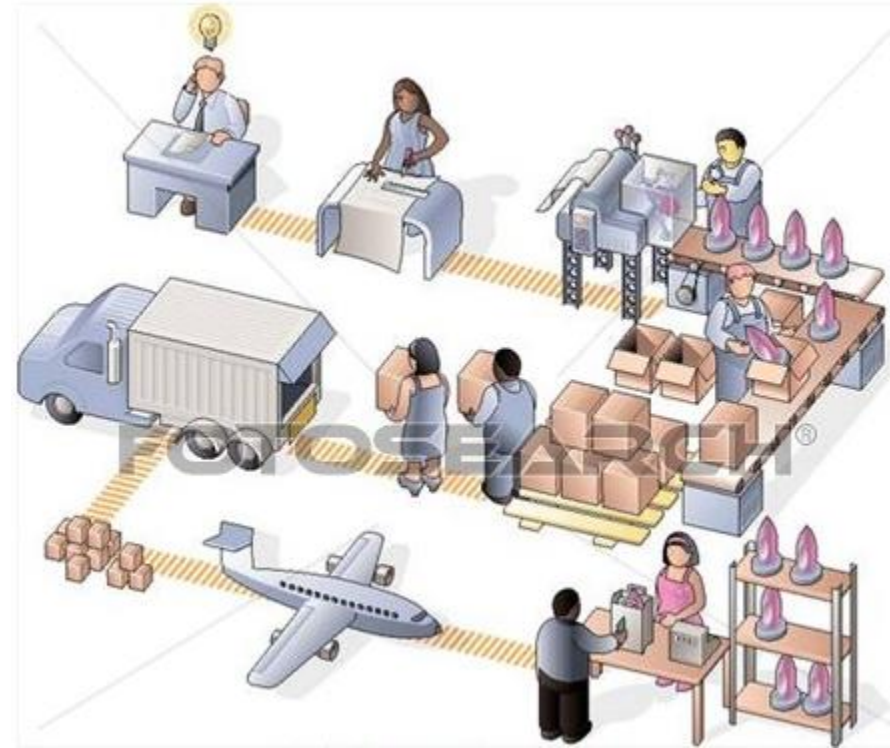
# Manufacturing employment



# Manufacturing in SA

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- Employs around 1.7 million people
- R1 invested → R1.13 of value
- Among the top three multiplier sectors in terms
  - value addition
  - job creation
  - export earnings and
  - revenue generation
- Base load and scale for key national infrastructure
- Only viable means of beneficiating natural resources in SA



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# Current situation

Competitiveness of manufacturing in SA has dramatically decreased [1]

NIPF: Manufacturing drives employment and growth in the economy [2]

IPAP: 16 industry sectors to be targeted for governmental support in an attempt to increase local production [3]

Most products are becoming more complex, calling for more sophisticated and advanced ways to design, manufacture and support [4]

[1] Pillay, K., 2013. Deloitte Manufacturing Competitiveness Report. Deloitte Touche Tohmatsu Limited

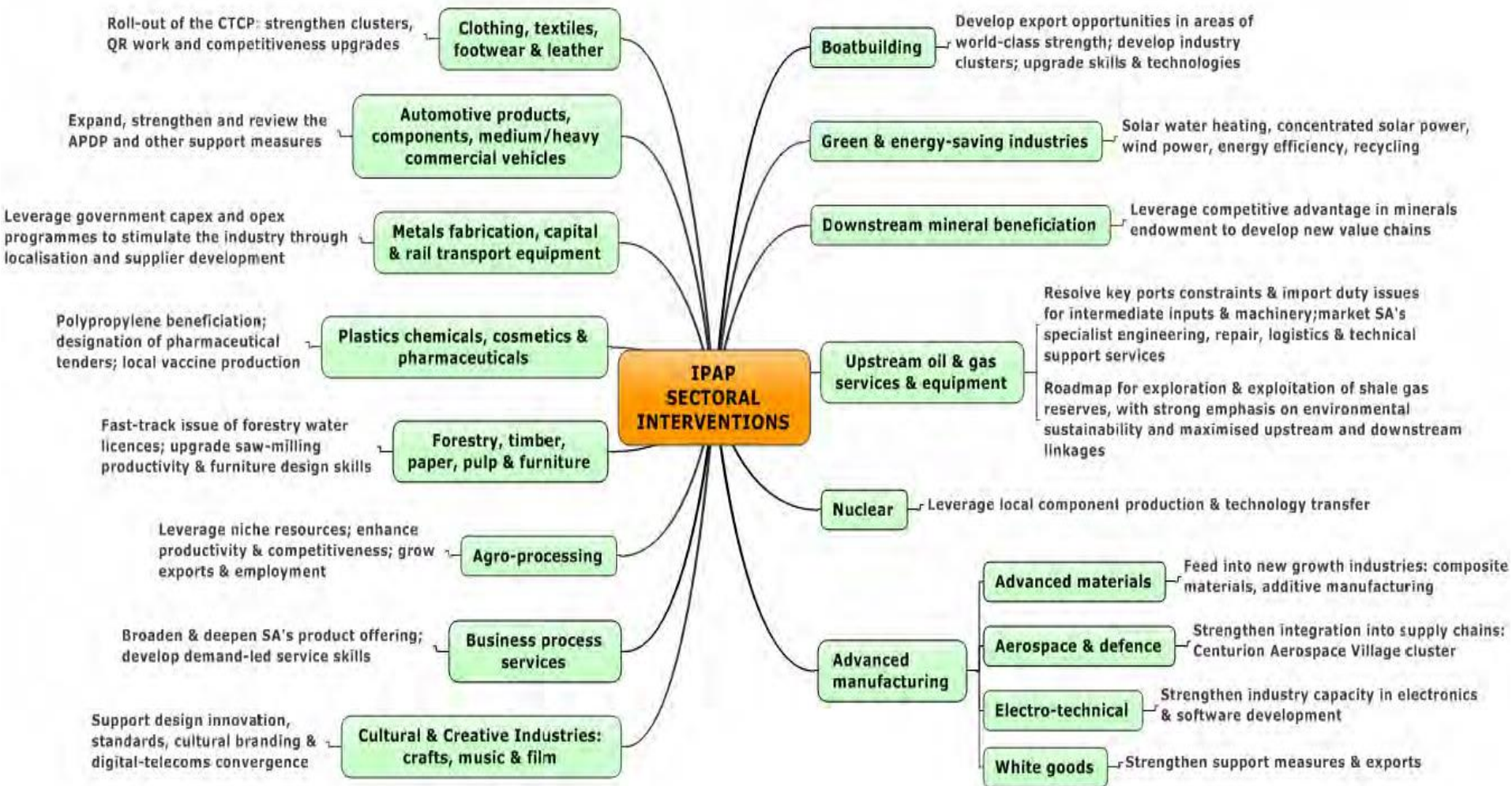
[2] Department of Trade and Industry, 2007. National industrial policy framework. Pretoria.

[3] Department of Trade and Industry, 2015. Industrial policy action plan 2015. Pretoria.

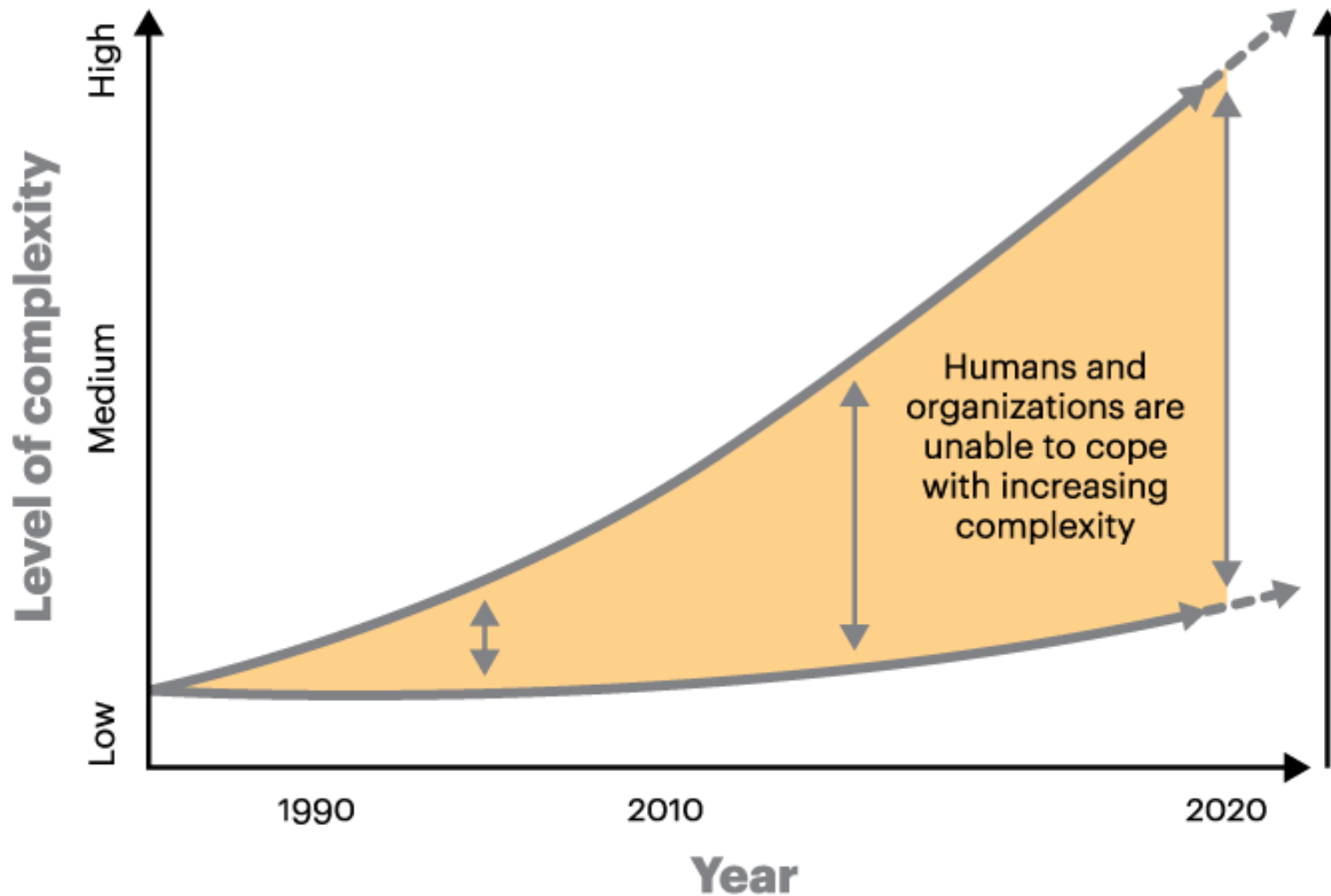
[4] Vermaas, P.E., Kroes, P, Light, A, Moore, S (Eds.), 2009. Philosophy and design: from engineering to architecture. Springer, Dordrecht.

# Industrial Policy Action Plan

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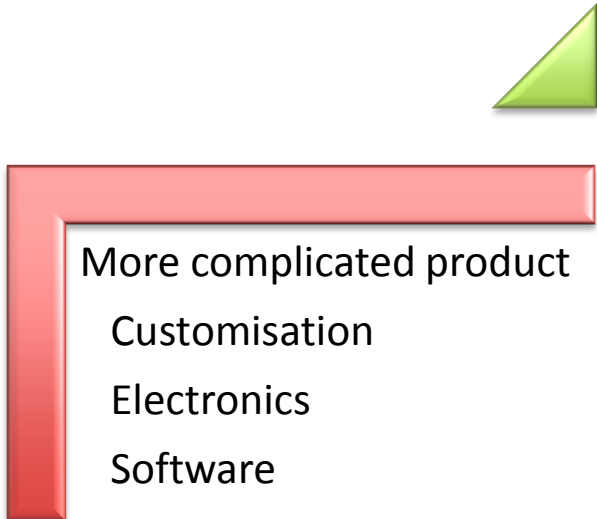


# Increased complexity

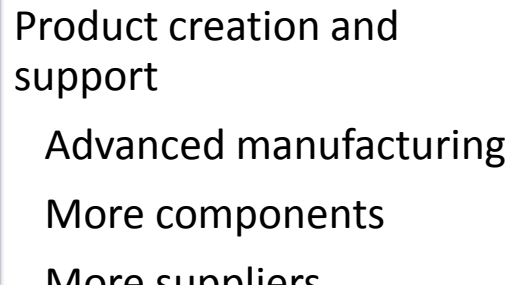


# Contributors to complexity

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More complicated product  
Customisation  
Electronics  
Software  
Servitisation



Product creation and support  
Advanced manufacturing  
More components  
More suppliers  
More complicated supply chain



Business environment  
Stricter regulations  
Globalisation  
More competition and potential customers  
Industrial symbiosis and circular economy

Vermaas, P.E., Kroes, P., Light, A., Moore, S., 2009. Philosophy and design: from engineering to architecture. Springer, Dordrecht.

Erasmus, J., Jacob, M., Erasmus, L.D., 2015. The need for PLM in South Africa, in: Proceedings of the 11th INCOSE SA Conference, Pretoria, South Africa.

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# The AUTOSAR example

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- Modern luxury vehicle contains 50+ electronic control units
- Code bases of more than 100 million lines
- 40% of market value and 80% of innovation
  
- Responded with collaboration and cooperation
- Now they compete on implementation (application) instead of standards (infrastructure)

Reyes, V., 2014. Dealing with automotive software complexity with virtual prototyping – Part 1: Virtual HIL development basics (accessed 9.30.14).

Daehyun Kum, Park, G.-M., Seonghun Lee, Wooyoung Jung, 2008. AUTOSAR migration from existing automotive software, in: Proceedings of ICCAS 2008. IEEE, Seoul, pp. 558–562.

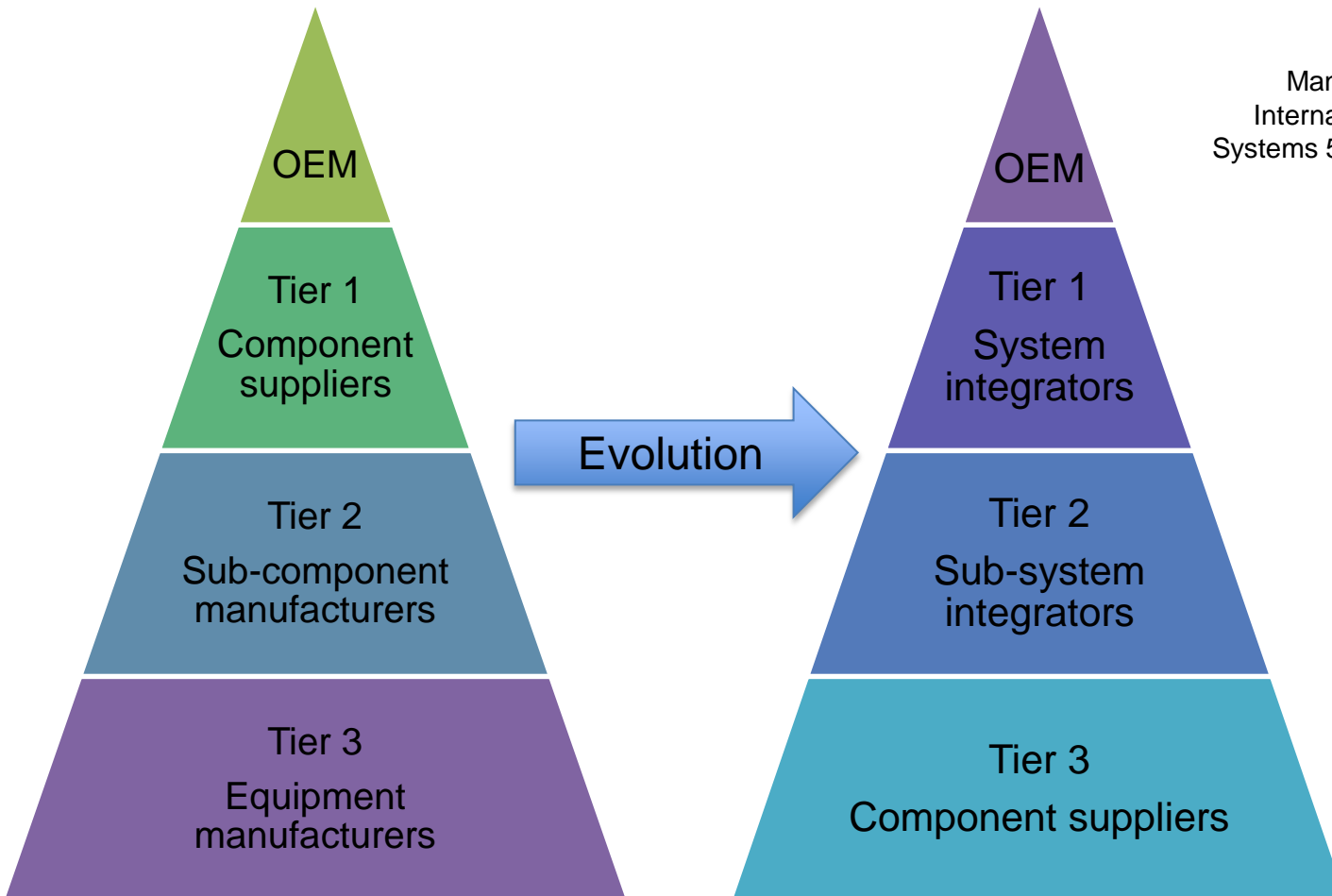
doi:10.1109/ICCAS.2008.4694565

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# Changes in industry

OEMs have become assemblers, from multiple tier 1 and 2 suppliers



Gandhi, P., 2013. Product Lifecycle Management Importance and Approach. International Journal of Applied Information Systems 5, 28–30. doi:10.5120/ijais13-450930

# Problem statement

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Deliver into global  
supply chains

Create our own OEMs

Compliance to  
regulations

Be globally  
competitive

IP  
management

Supplier development  
and localisation

Supply chain integration



**OEM**

**SMME**

# Disconnected industry

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I NEED THIS  
COMPONENT...



OEM

I CAN  
MAKE THAT!



SMME

# Connecting industry

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I NEED THIS  
COMPONENT...



I CAN  
MAKE THAT!



OEM

SMME

# Connective technology

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I NEED THIS  
COMPONENT...



I CAN  
MAKE THAT!



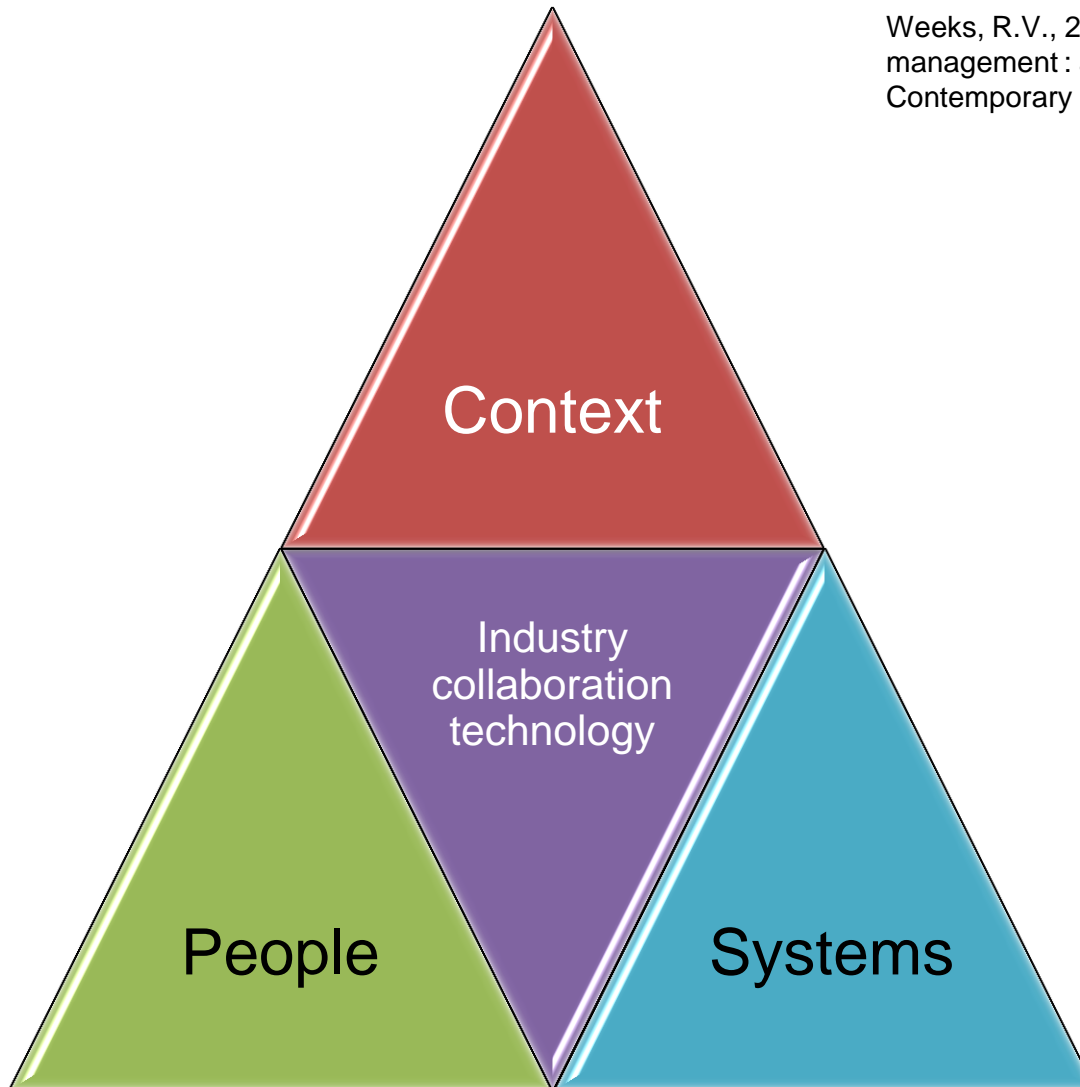
Industry  
collaboration  
technology

OEM

SMME

# Enterprise technology defined

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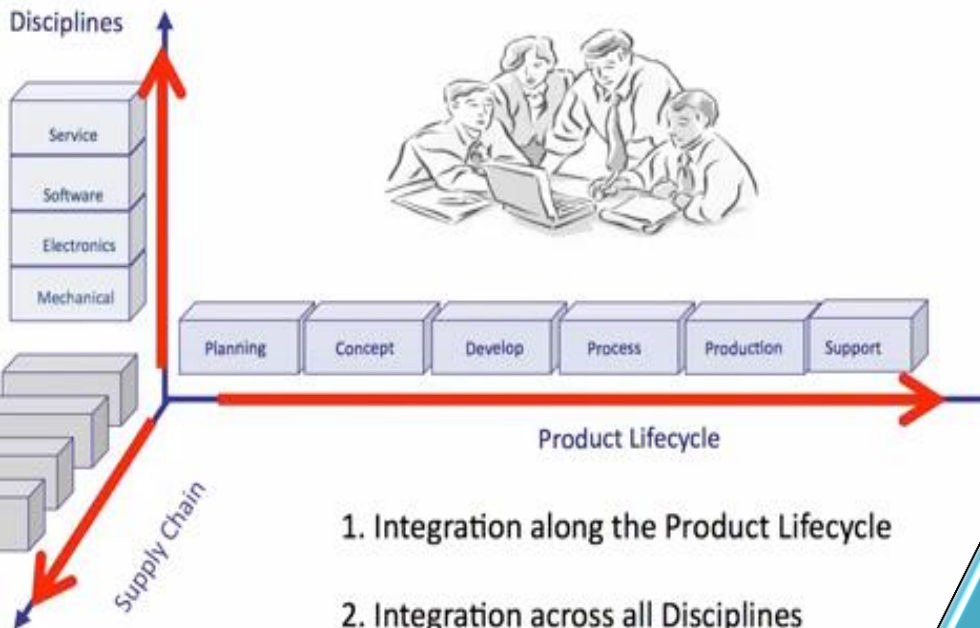
Weeks, R.V., 2012. Healthcare services management : a systems perspective. Journal of Contemporary Management 9, 382–401.

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# Systems

## Product Lifecycle Management



1. Integration along the Product Lifecycle
2. Integration across all Disciplines
3. Integration along the Supply Chain

### Integrating tools

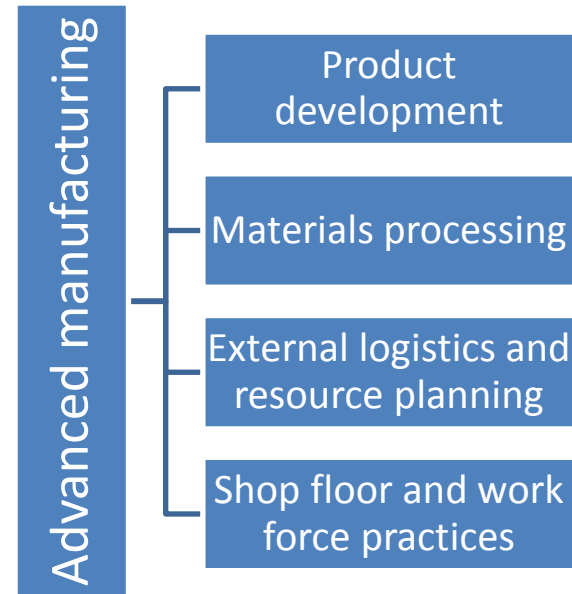
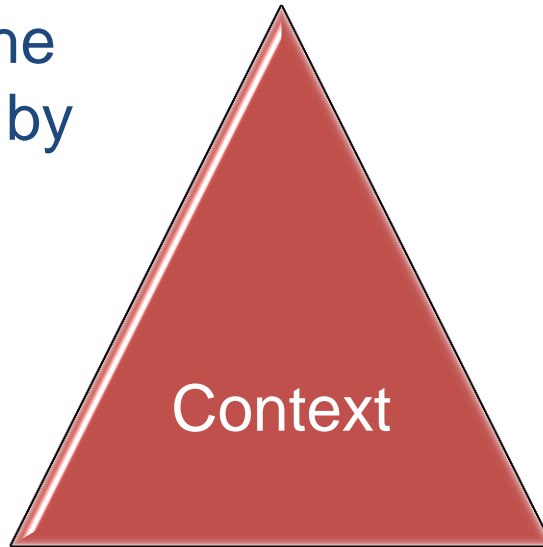
- Computer aided design
- Software engineering
- Analysis and simulation
- And more...

Systems



# Context

Can support 14 of the  
16 sectors targeted by  
IPAP



# People

## Our focus

Small, Medium and  
Micro Enterprises



Large South African  
Enterprises



Large Global  
Enterprises



People

# The vision

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## YOUR BUSINESS



## OUR SUPPORT

Small, Medium and  
Micro Enterprises



Large South African  
Enterprises



Large Global  
Enterprises



Product Lifecycle Management

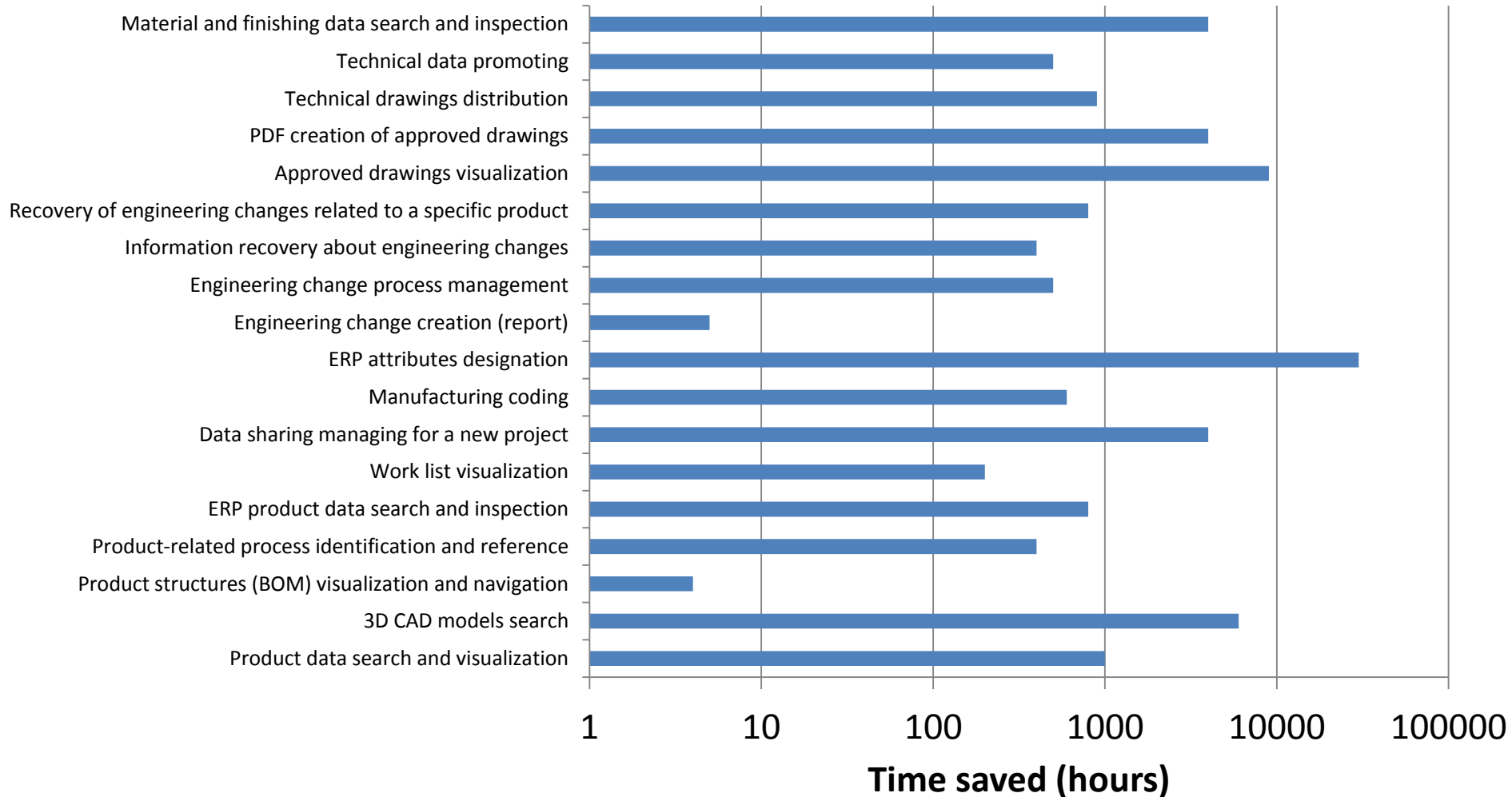
**Connecting SA industry to global  
supply chains**

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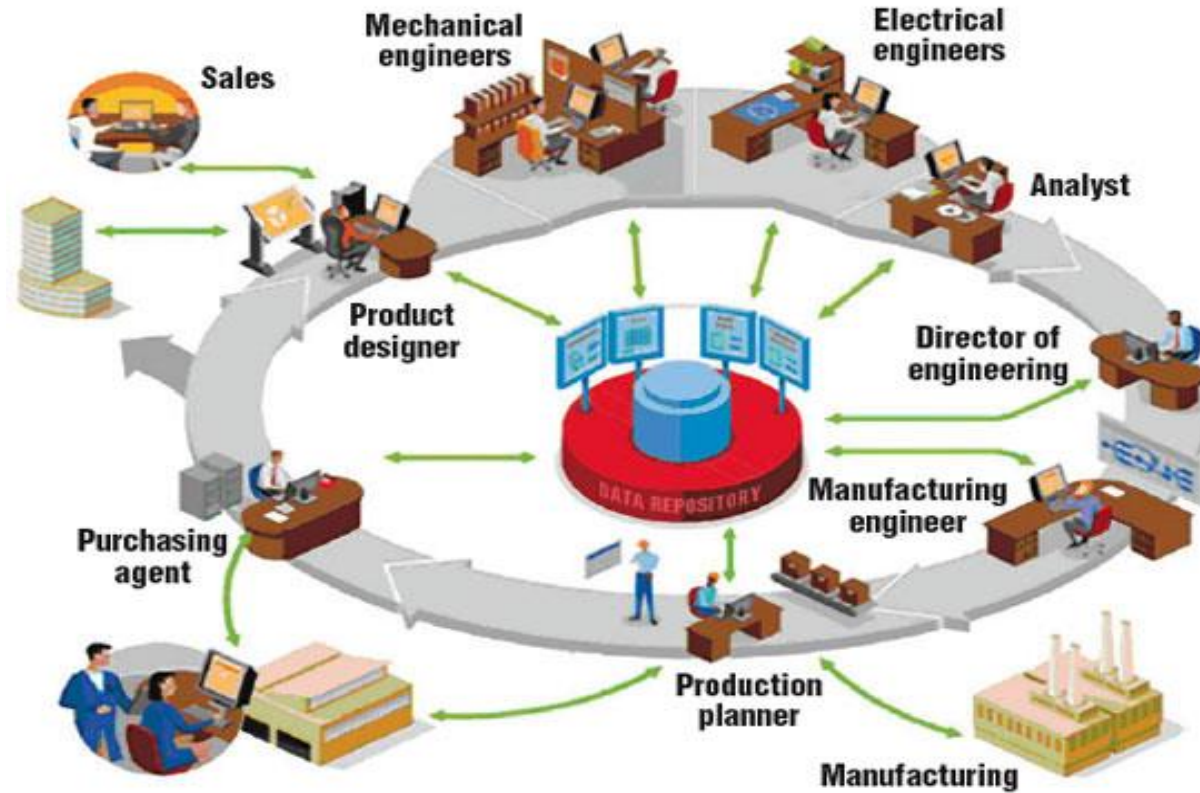
# Benefits to networked SMMEs

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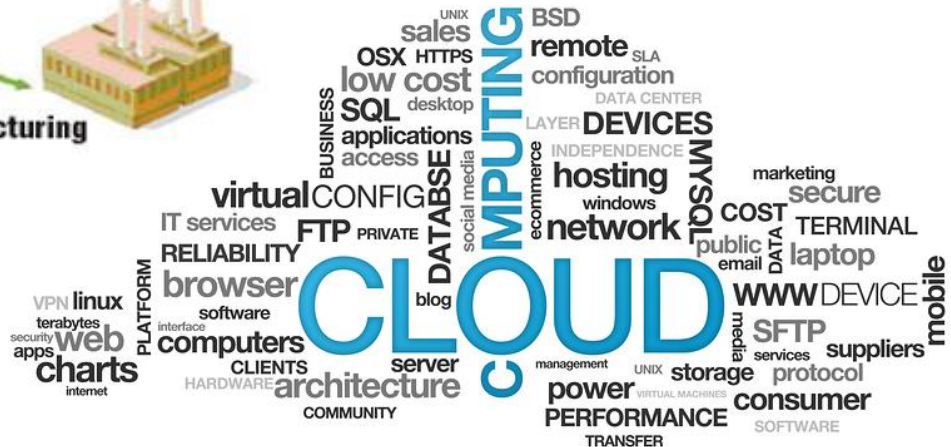
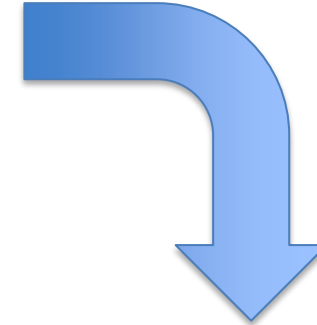


Peruzzini, M., Mengoni, M., Germani, M., 2011. PLM benefits for networked SMEs, in: Proceedings of PLM11. Presented at the 8th International Conference on Product Lifecycle Management, IFIP Working Group 5.1, Eindhoven, The Netherlands.

# What is it actually?



PLM in the cloud  
for South African  
industry



Industry specific starter packs to accelerate industrialisation

# Local knowledge centres

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PLM facilities for co-creation

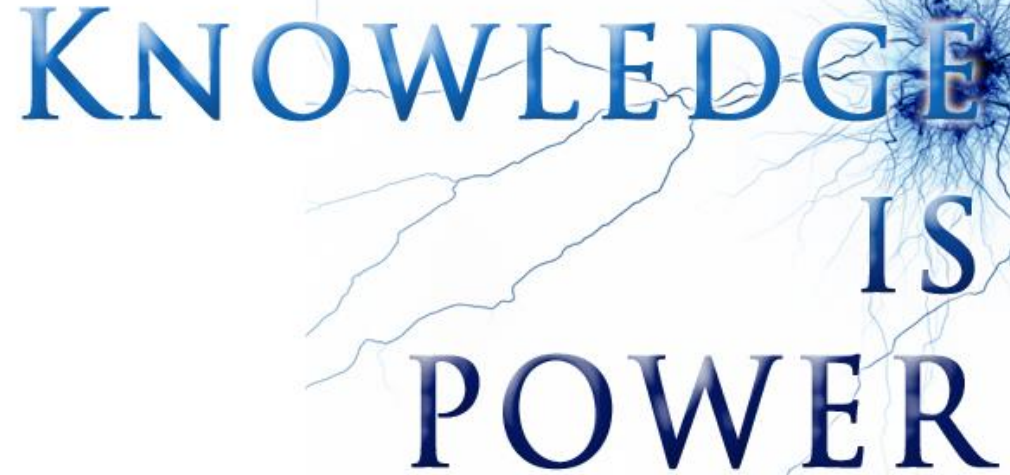
Classroom and hands-on training

Professional services

- Advanced simulations
- Rapid prototyping and 3D printing
- Technical and scientific problem solving

# The future

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KNOWLEDGE  
IS  
POWER

Industry analysis and research to identify further opportunities

Procurement, tendering and contract management in the cloud

Brokering and facilitation of professional services

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Thank you

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