WP6: The role of competence building in firms in the emergence and evolution of GINs: *case studies from the South African automotive sector*

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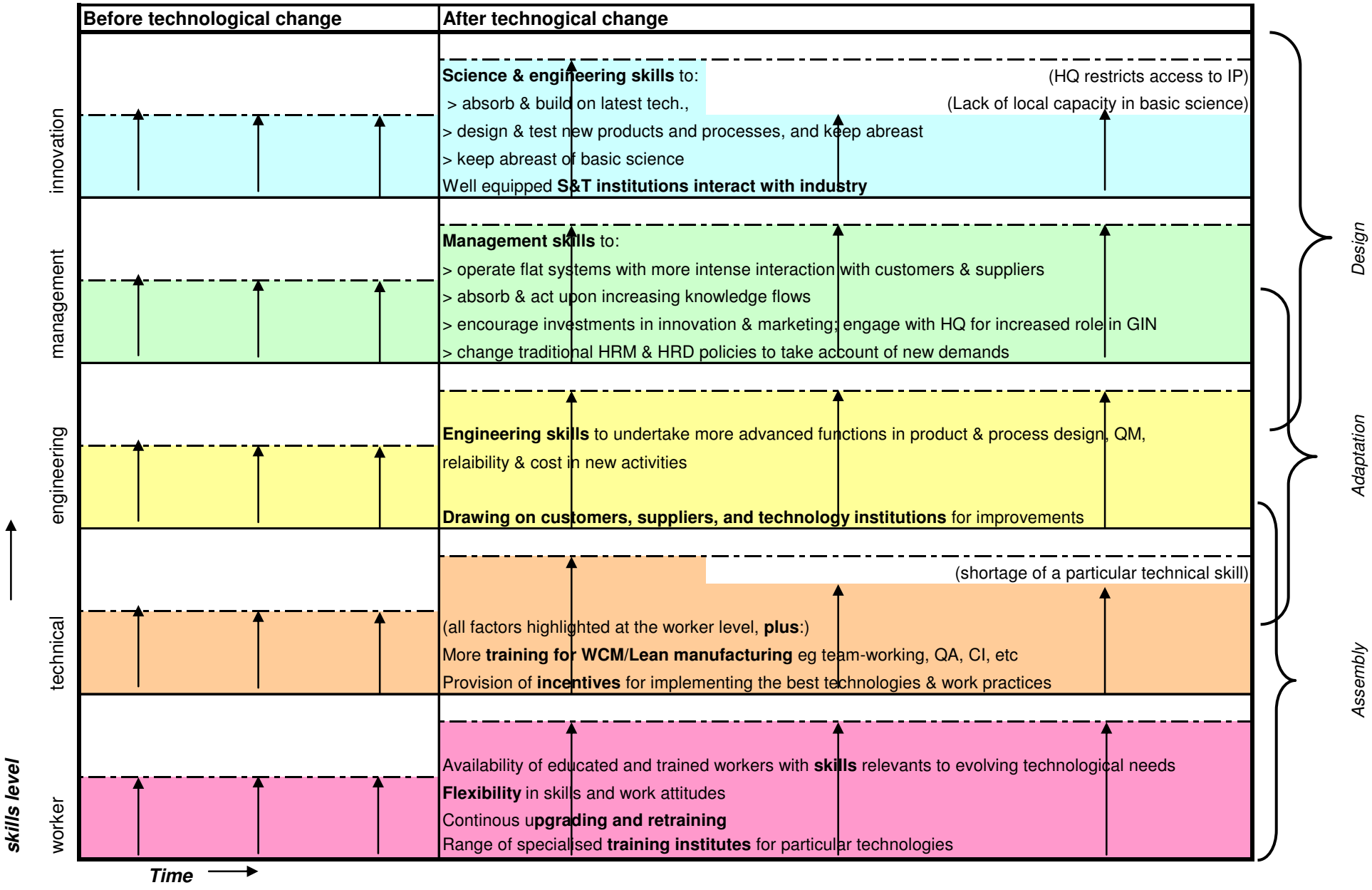
Research questions

- **Q:** How do skills and competences within the firm facilitate or inhibit technological upgrading, innovation, and GIN formation?
- **Q:** How does the relationship between FDI and skills affect the evolution of GINs?
- ***Hypothesis 1:*** knowledge workers are a necessary but not a sufficient condition for the emergence of GINs
- ***Hypothesis 2:*** differences in training systems and capabilities across countries will lead to different manifestations of GINs, GiNs, gINs, etc
- ***Hypothesis 3:*** the relationship between FDI and local human capital is two-way

Capabilities approach

- Firms are the unit of analysis, but also look at national level [HRD & FDI]
- **Key elements of firm-level learning:** (Lall, 2001)
  - The learning process is **technology specific** (e.g. tacit/codified/embodied, breadth of skills, time needed to absorb, etc)
  - Different technologies depend to different degrees on **external knowledge sources**
  - Relevant human capital **includes all employees** from shop-floor to CEO
  - Successful tech trajectories/catch-up strategies require 'know how', but also **'know why'.**
  - Technological learning involves **externalities and linkages**
  - The **circulation of knowledge workers** is a key factor in successful technological learning
  - **Links between MNCs and local human capital**: Internalised vs externalised transfers of technology (> effects on transfer of know-how & tacit knowledge)

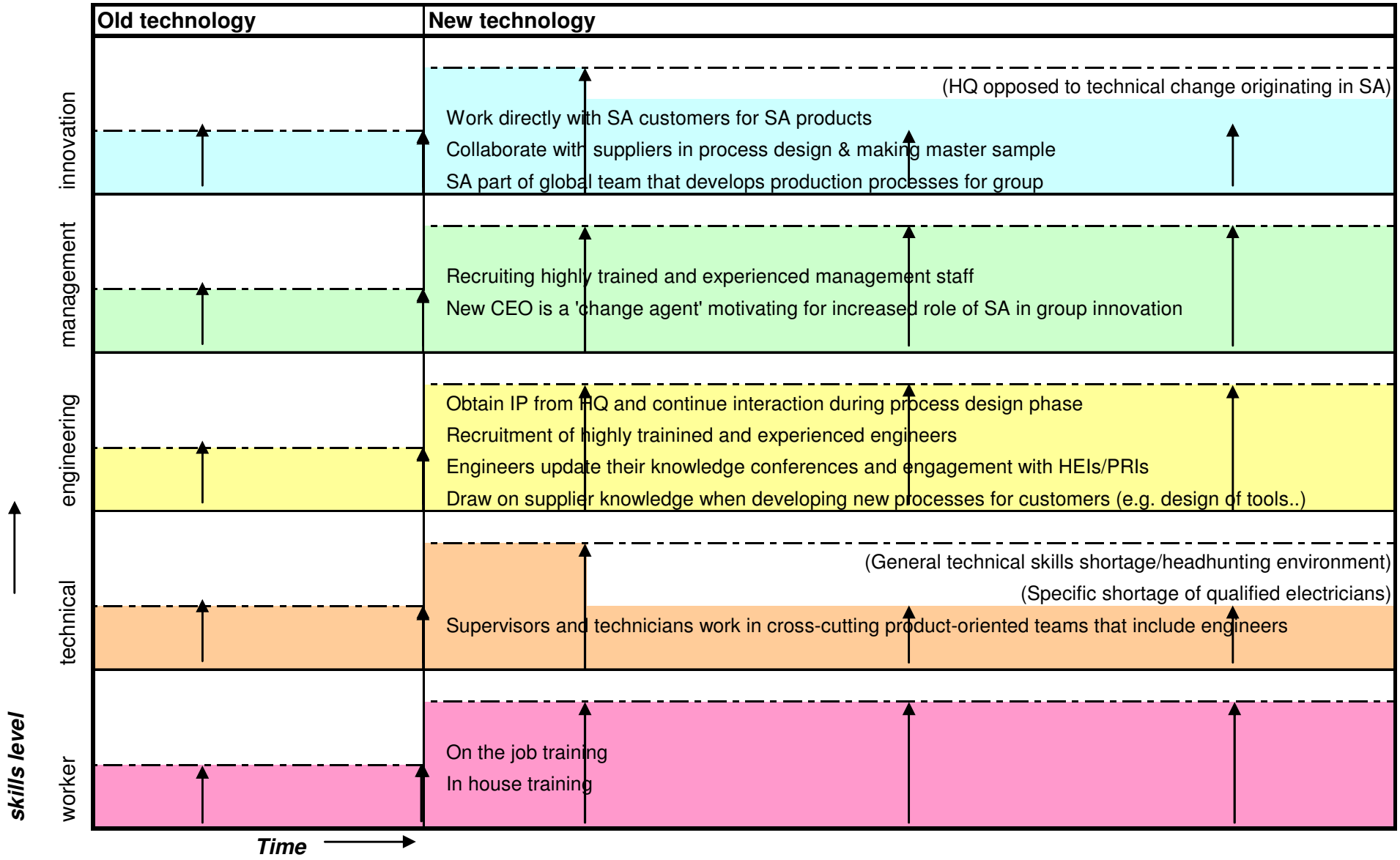

Before technological change
After technogical change
innovation
management
engineering
technical
worker
skills level
Time
Science & engineering skills to:
(HQ restricts access to IP)
> absorb & build on latest tech.,
(Lack of local capacity in basic science)
> design & test new products and processes, and keep abreast
> keep abreast of basic science
Well equipped S&T institutions interact with industry
Management skills to:
> operate flat systems with more intense interaction with customers & suppliers
> absorb & act upon increasing knowledge flows
> encourage investments in innovation & marketing; engage with HQ for increased role in GIN
> change traditional HRM & HRD policies to take account of new demands
Engineering skills to undertake more advanced functions in product & process design, QM,
relaibility & cost in new activities
Drawing on customers, suppliers, and technology institutions for improvements
(shortage of a particular technical skill)
(all factors highlighted at the worker level, plus:)
More training for WCM/Lean manufacturing eg team-working, QA, CI, etc
Provision of incentives for implementing the best technologies & work practices
Availability of educated and trained workers with skills relevants to evolving technological needs
Flexibility in skills and work attitudes
Continous upgrading and retraining
Range of specialised training institutes for particular technologies
Design
Adaptation
Assembly

Car component manufacturer 1

- **Global MNC**, with 5,200 employees in more than 20 countries
- Founded in 1865 with HQ in Esslingen am Neckar
- Focus on exhaust technology (catalytic converters, particulate filters, silencers) as well as heaters.
- 4th largest supplier of exhausts worldwide
- 2009 Sales revenues €1.3 billion
- 2009 R&D expenditure €79 million
- **R&D** in the group takes place in Germany, where the R&D centre employs 200 staff.

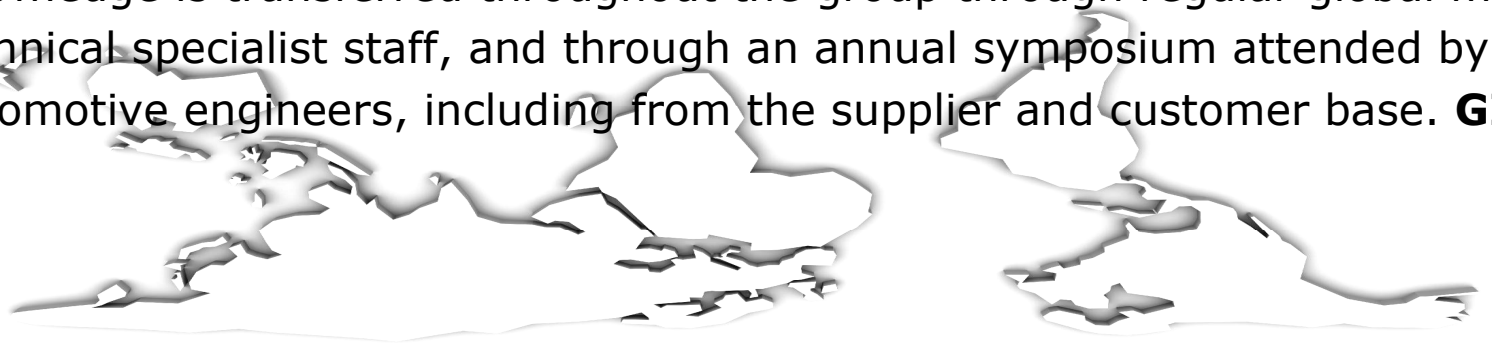
Car component manufacturer 1

- Largest producer of catalytic converter exhaust systems in SA
- Main driver of investment and growth is domestic **policy** incentive, although the availability of local **skills** facilitates this.
- Plays a very small part in **process innovation**, connected to a **weak network** that includes other firms in the group, customers and suppliers. **(Gin)**
- This role might increase – CEO engaging with HQ to facilitate, on basis that SA originated process improvements could benefit group.
- 98% of production is for export, so little innovation for adaptation to local conditions.
- Long pipeline to overseas customers provides incentive to innovate for quality assurance
  - *e.g. improved canning process, exported new canning process to group, modified canning equipment developed with local suppliers for export to Indian subsidiary*


Old technology
New technology
innovation
(HQ opposed to technical change originating in SA)
Work directly with SA customers for SA products
Collaborate with suppliers in process design & making master sample
SA part of global team that develops production processes for group
management
Recruiting highly trained and experienced management staff
New CEO is a 'change agent' motivating for increased role of SA in group innovation
engineering
Obtain IP from HQ and continue interaction during process design phase
Recruitment of highly trainined and experienced engineers
Engineers update their knowledge conferences and engagement with HEIs/PRIs
Draw on supplier knowledge when developing new processes for customers (e.g. design of tools..)
technical
(General technical skills shortage/headhunting environment)
(Specific shortage of qualified electricians)
Supervisors and technicians work in cross-cutting product-oriented teams that include engineers
worker
On the job training
In house training
skills level
Time

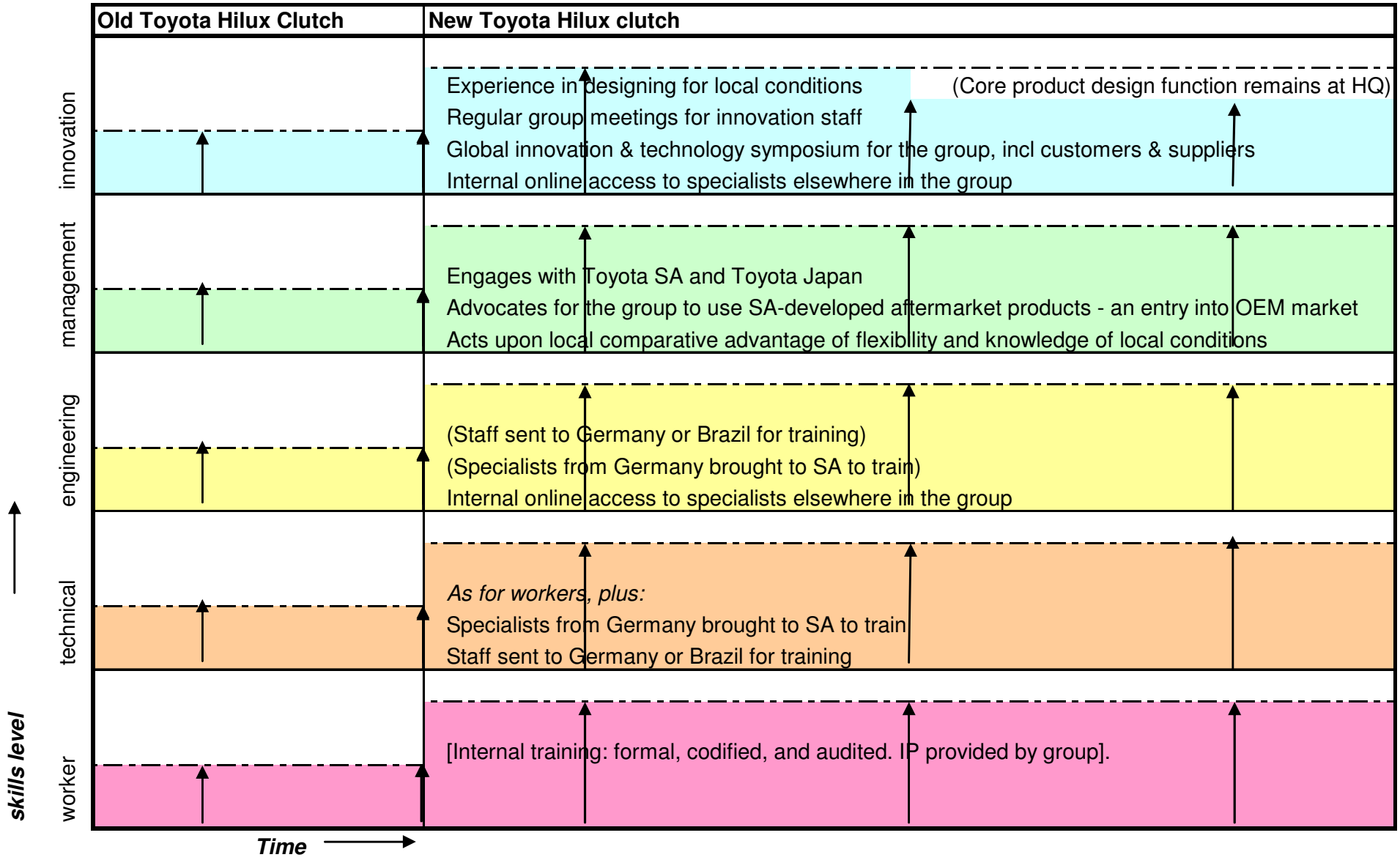
Car component manufacturer 2

- Global MNC with 61,000 employees in 180 locations in over 50 countries
- One of the largest family-owned industrial companies in Germany or Europe
- Produce brands and rolling bearings. Also industrial, aviation and aerospace divisions
- 2009 turnover of €7.3 billion
- **R&D:**
  - Group recently invested in new R&D centers in Asia and North America.
  - 4,800 employees in 32 R&D centers
  - Own rights to over 14,000 patents and patent applications
  - About 1,100 patent applications filed every year.
  - *The facility in China was established in part due to Chinese policy regarding design content.*
- Knowledge is transferred throughout the group through regular global meetings of technical specialist staff, and through an annual symposium attended by up to 800 automotive engineers, including from the supplier and customer base. **GIN.**



Car component manufacturer 2

- Employs 500 staff, including 300 workers, 80 technical staff, and 120 administrative and management
- **GiN:** part of a global internalised network that is integrated with an externalised network, including links with suppliers and customers.
- Engaged in product development because of 2 key drivers:
  - **Adaptation** for local conditions.
  - **Flexibility** (result of high labour intensity and diversity of the SA market), *e.g. aftermarket application engineering.*
- Skills are constantly transferred through the group. When necessary, staff from SA are sent to Germany for experience and/or training, and staff from Germany are sent to SA to assist in implementing new technologies.
- Access to skills elsewhere in the group is simple and horizontal – SA staff can have direct access to mathematicians or physicists in other countries.
- If new IP to assemble a new product is needed, the accompanying training is conducted internally from the shop-floor up, and is strictly codified, regulated and audited.


Old Toyota Hilux Clutch
New Toyota Hilux clutch
innovation
management
engineering
technical
worker
skills level
Experience in designing for local conditions
(Core product design function remains at HQ)
Regular group meetings for innovation staff
Global innovation & technology symposium for the group, incl customers & suppliers
Internal online access to specialists elsewhere in the group
Engages with Toyota SA and Toyota Japan
Advocates for the group to use SA-developed aftermarket products - an entry into OEM market
Acts upon local comparative advantage of flexibility and knowledge of local conditions
(Staff sent to Germany or Brazil for training)
(Specialists from Germany brought to SA to train)
Internal online access to specialists elsewhere in the group
As for workers, plus:
Specialists from Germany brought to SA to train
Staff sent to Germany or Brazil for training
[Internal training: formal, codified, and audited. IP provided by group].
Time

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