



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Graduate School of
Technology Management



TECHNOLOGY AND INNOVATION MANAGEMENT GROUP



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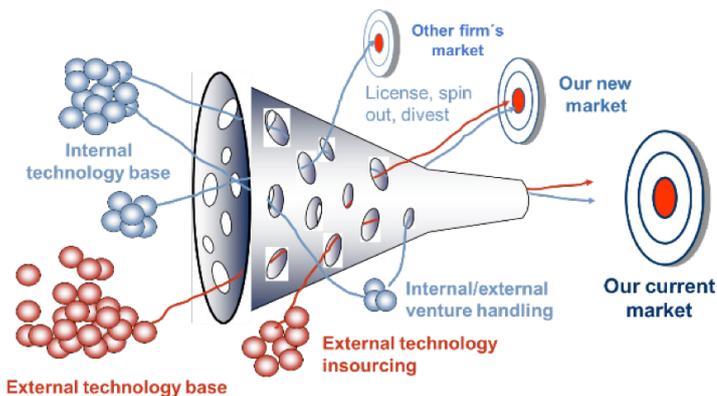


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BACKGROUND

Innovation in all its forms, encompassing the introduction of a new process, product, service or system to an organisation or into a company, is considered to be the key to long-term economic growth and improved quality of life. At firm level, innovation is generally essential to its competitiveness and sustainability; indeed, it is often stated that companies which fail to innovate will lose market share and disappear within a short period. The process of innovation is supported by the transfer or development of knowledge, and particularly knowledge on the choice and application of technology. The twin activities of innovation and technology management are therefore essential in order to ensure the optimal absorption and utilisation of new knowledge leading to the introduction of new products, processes or services.



Henry Chesbrough, *Open Innovation: Renewing Growth from Industrial R&D*, 10th Annual Innovation Convergence, Minneapolis Sept 27, 2004

Technology and Innovation Management focuses on the introduction of new products, processes, services or systems to an organisation, through the economic development and transfer of knowledge on the choice and application of technology and processes, in order to secure the organisation's growth, competitiveness and sustainability.

Education and Research Alignment

In the Masters programme on Technology and Innovation Management, the educational content focuses on the basics of innovation management, technology management, corporate entrepreneurship and strategic management, all of which support the long-term goals of building levels of innovation and productivity within an organisation.

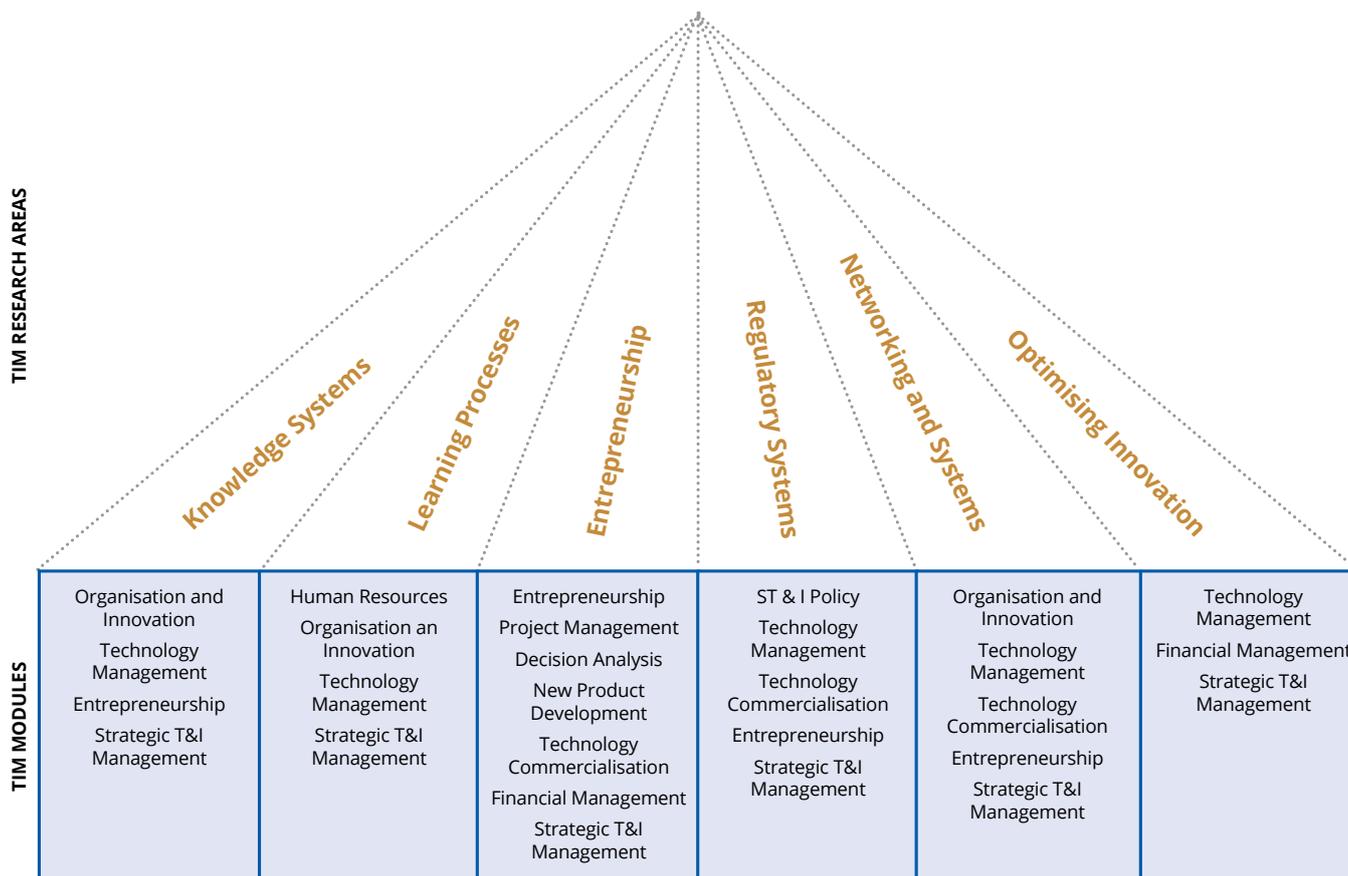
Students learn how to identify technology transfer and absorption processes, how to manage these processes, how to support firm-level innovation with in-house research and development, how to engage on open or inclusive innovation, how to use big data to support innovation processes and how to maximise the acquisition of new technology within the normal constraints of financial and human resources.

The alignment of the educational content of the programme with the research focus areas of the Technology and Innovation Management field is of great importance.

The research focus areas are Knowledge Systems, Learning Processes, Entrepreneurship, Regulatory Systems, Networking and Systems and Optimising Innovation.

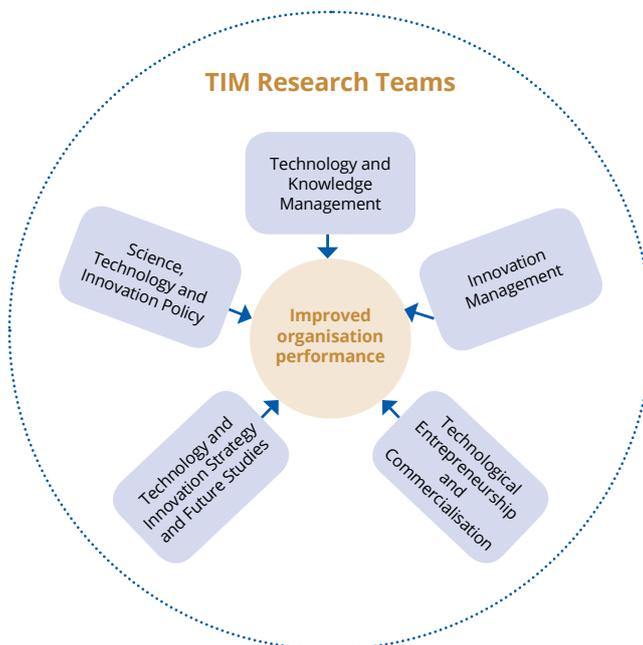
The diagramme below illustrates the alignment between the programme modules and the research focus areas. Education and research target the private industry (small, medium and large), government departments, state-owned enterprises and science councils. Application sectors include for example energy, manufacturing, pharmaceutical, bio-technology, ICT, mining and more.

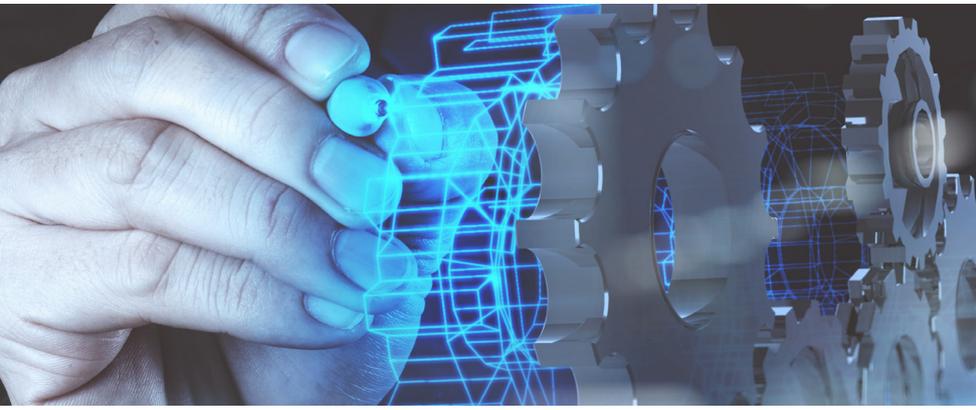
Technology and Innovation Management



Technology and Innovation Management Research Group

The Technology and Innovation Management Research Group has five Research Teams focusing on the areas of Technology and Knowledge Management, Innovation Management, Technological Entrepreneurship and Commercialisation, Technology & Innovation Strategy and Future Studies and Science, Technology and Innovation Policy. The main aim is to improve organisational performance through the integration of the different research areas.





RESEARCH AREAS AND STUDY LEADERS

Technology Management



Dr Petrus Letaba



Prof Tinus Pretorius



Prof Elma van der Lingen

Technology is often seen as the engine of economic growth. Michael Porter confirms this in his statement: “An upgrading economy demands a steadily rising level of technology. Technological change, in the broadest sense of the term, accounts for much of economic growth”.

The management of technology is therefore an important function within any organisation, whether it be as a core resource of technology-based companies or as a support resource in service organisations. Technology, in different formats and in many different applications, is present over the whole lifecycle of projects and its activities. Gregory (1995) identified the typical technology management activities as Identification, Selection, Acquisition, Exploitation and Protection.

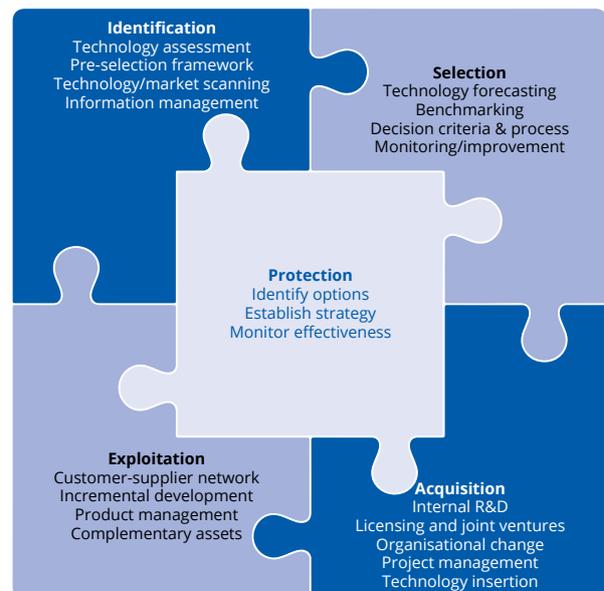
Many different methods and tools/frameworks were developed to assist organisations in the execution of their technology management activities and the search for new ones continues as the business environment keeps changing because of new emerging and disruptive technologies.

Therefore, the main research question of the theme is: How can technology shape the competitiveness of organisations?

Researchers thus ask questions such as:

- How can we assess current and emerging technologies?
- How can we forecast future technology landscapes?
- How can we select new technologies that will add value to the organisation?
- What processes do we need to acquire and transfer new technologies (including R&D)?
- How should we exploit and protect our technologies for optimal utilisation?
- And what methods and tools can we use to perform the various technology management functions?

Because of the nature of technology management, the interface with the field of knowledge management through technology and knowledge intelligence is obvious.



Source: Gregory (1995)

For a full list of publications, see:

[Dr Letaba](#)

[Prof Pretorius](#)

[Prof Elma van der Lingen](#)

Innovation Management



Prof Alice Chan



Prof Leon Oerlemans

It is widely known that innovation, both as a process and as an outcome, brings competitive advantage to organisations, regions and nations in this era of globalisation and increased speed in competition.

Organisations in emerging economies often face a range of obstacles, especially the lack of capabilities or limited resources that hinder them when innovating. Swan and Scarbrough (2005:914) stated that “innovation is actually more likely to occur at the interstices of collaborating groups and organisations”.

Establishing and maintaining relationships and networks with other actors inside and outside the organisation allows for collective learning as well as for gaining capabilities that in turn may enhance innovation performance. In the last decade, network analysis has gained a lot of attention, in particular the impact of networks on innovation processes and outcomes. The key (academic) research question for this theme is: What are

the relations between network and innovation at the individual/team/project/organisational levels and how are these levels intertwined?

This research group predominantly uses quantitative methodologies to study the relationships between networks and innovation at different levels of analysis.

For a full list of publications, see:

[Prof Chan](#)

[Prof Oerlemans](#)

Technology and data driven decision making



Dr Schalk Grobbelaar

We find ourselves in the fourth industrial revolution where the Internet of Things (IoT) drives data-driven decision making. Smartphones, intelligent sensors, edge computing, cloud computing and artificial intelligence has become part of our daily lives.

For organisations to remain competitive in this fast-paced environment, they need to be agile and competent in data science. From a technology and innovation management perspective, organisations need to prepare themselves to be competitive in this environment. This requires technical and management skills.

Research in this area studies the application of data science tools and the management of this technology and its innovations.

Typical research questions in this area include:

- What are the research patterns in a specific field of study, and where are there gaps that require more attention?
- How can data science be used to make better predictions of the future?

- How do organisations improve their data-driven decision-making capabilities?
- How do organisations integrate data-driven decision making into strategic decision making?
- How do organisations sustainably and ethically apply these technologies?
- How should society/organisations manage the potential risks of these technologies?

By researching these aspects, organisations/society will be enabled to sustainably and ethically use these technologies to improve competitiveness.

For full list of publications, see:

[Dr Grobbelaar \(1\)\(2\)](#)

Technological Entrepreneurship and Commercialisation



Prof Elma van der Lingen



Prof Joe Amadi-Echendu

Technological entrepreneurship and commercialisation can take various forms, such as self-commercialisation resulting from in-house research and development; creation of spin-outs or start-ups; joint ventures and alliances, and technology transfer via licensing of patents and know-how to third parties.

Technology entrepreneurs identify business opportunities in the scientific and engineering space and create value. Entrepreneurship is imperative to enhance SMME, corporate and national competitiveness.

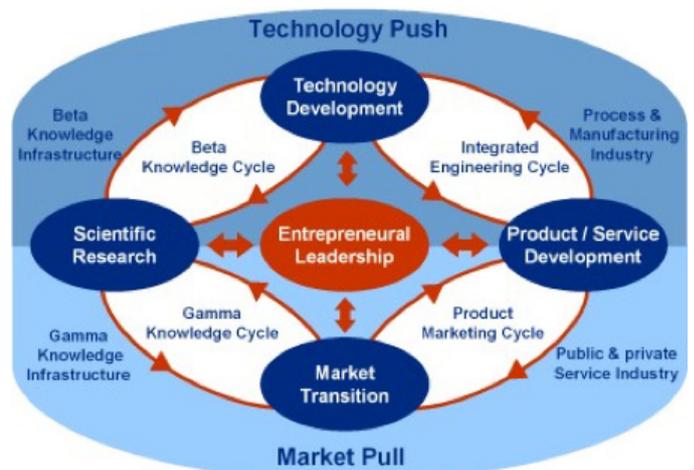
The focus of this research area will be to:

- Develop technology commercialisation and business models for technology driven organisations.
- Investigate the enabling and controlling mechanisms of Corporate Entrepreneurship.
- Uncover the key determinants affecting the outcome of corporate digitisation processes or the strategic pursuit of leveraging digital technologies to increase profitability.

For a full list of publications, see:

[Prof van der Lingen](#)

[Prof Amadi-Echendu \(1\)\(2\)\(3\)](#)



Source: TU Delft - Prof. Guus Berkhout, modified by Canevali BV

New Product Development

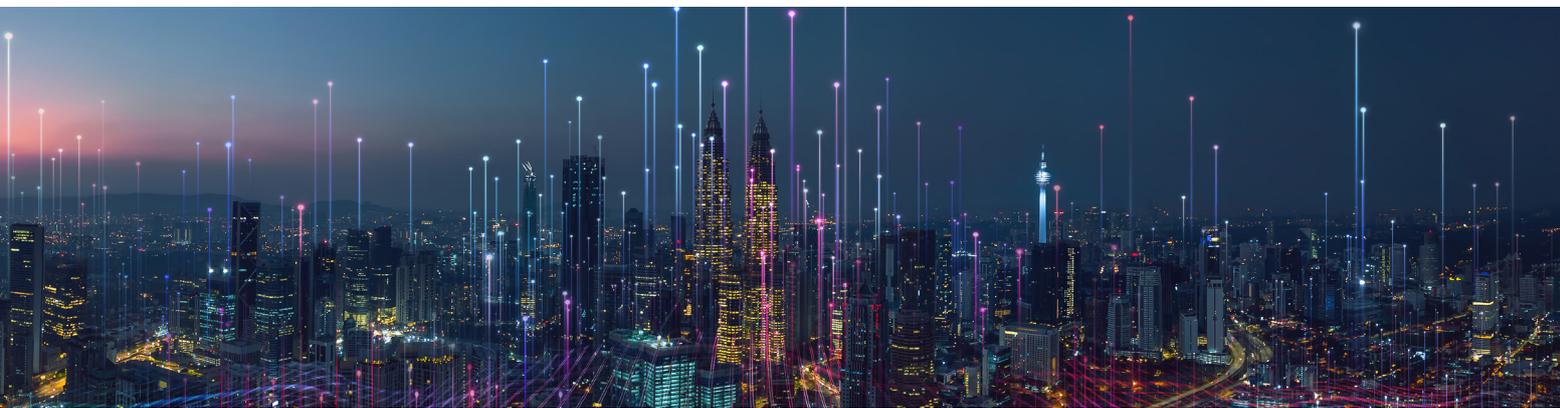


Prof Antonie de Klerk

Research regarding the development of new products and services in a technology-based organisation or environment.

With the unparalleled pace of introduction of new products in an ever-increasing competitive environment, the process and success rate of developing new products is an area of active research. Research is required into the management of a product development portfolio, optimum investment in new

products, selection of new product ideas, factors determining market success, impact of emerging technologies on product development, and the development processes applied in various environments.



Technology and Innovation Strategy and Future Studies



Prof Tinus Pretorius



Dr Anthon Botha

Technology and innovation driven organisations need new paradigms of strategic thinking in rapidly changing and competitive markets. To support the corporate strategy, a carefully developed technology and innovation strategy is required.

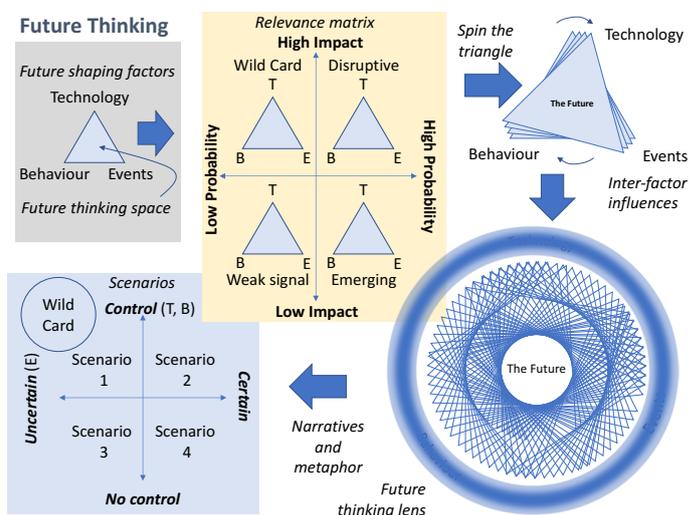
This strategy is very dependent on emerging and disruptive technologies, the behaviour of people in the marketplace and inside the organisation and events that influence future business. Strategic planning is undergoing a metamorphosis in the increasingly complex world where the rate of change is enormous and where decision making is based on emergence and sense making rather than analysis and complete understanding. Often, technology and innovation strategy is guided by business model innovation where value-adding has to be shaped and oriented to fast evolving areas of the market. Technology life cycles are becoming shorter and the requirements for innovative solutions drive value appreciation in the marketplace. Embedding knowledge deep into intelligent products have become the norm of a knowledge economy.

The main research question for the theme is: How can strategies for organisations and industries be developed in order to ensure optimal and sustainable organisational performance in the future?

Researchers thus ask questions such as:

- How should organisations think about the future and what should their visions be?
- What intelligence needs to be done to assess the internal and external environments?
- How should strategic selection and portfolio development be done?
- How should technology-, innovation- and business strategies be aligned?
- How should the paths to the future be mapped?
- What are the new business models that should be aligned with future strategies?
- What will the socio-economic impact of the strategies be?

- What new methods and tools should be developed to assist organisations in their strategy development and implementation processes?



Beyond strategy lies the future. The future is not predictable, but at the same time it is not predetermined. This research team uses future thinking to open the way for effective strategic planning. Future thinking encompasses many of the existing techniques and processes to estimate a future and develops new philosophies and executive outlook towards strategic thinking.

For a full list of publications, see:

[Prof Pretorius](#)
[Dr Botha \(1\)\(2\)](#)



SCIENCE, TECHNOLOGY AND INNOVATION POLICY

Research Management and Innovation Policy for Sustainability Transitions



Prof David Walwyn

New approaches to innovation management and policy are crucial to achieving the necessary, indeed vital, transitions in socio-technical systems from their present reliance on non-sustainable practices to more progressive systems which can ensure the achievement of global goals in respect of development, the environment and sustainable development goals (SDGs) are met.

The focus of this research area is to:

- Develop new frameworks for research and innovation management which link to active policy processes and assist in improving the social return on research expenditure, especially public expenditure
- Apply the approaches of technological innovation systems and the multi-level perspective in order to define new approaches to the development of sustainable innovation systems in South Africa, especially those systems pertaining to the hydrogen economy and renewable energy.

- Develop and use techno-economic models for energy systems in order to inform new innovation policies”.
- Apply the approach of technological innovation systems as a means of identifying critical barriers to the development of new innovation systems in South Africa, especially those systems pertaining to hydrogen fuel cells and solar energy.

For a full list of publications, see: [Prof Walwyn \(1\)\(2\)](#)

National Systems of Innovation and Innovation Policy Effectiveness in Africa



Prof John Mugabe-Ouma

Since the mid-1990s many African countries have adopted and are using the concept of National Systems of Innovation (NSI) in designing and governing their science, technology and innovation (STI) policy processes and frameworks.

The NSI concept which was initially developed and applied in industrialised economies, particularly in countries of the Organization Economic Cooperation and Development (OECD), is gaining currency in Africa in both academic research and public policy circles. However, its relevance and applicability in African contexts have not been adequately researched.

This research focus area aims at:

- Identifying and analysing factors that are influencing African countries' adoption and application of the NSI concept framework;

- Developing methodological tools and analytical frameworks for assessing the dynamism of African NSI and STI policy;
- Assessing the effectiveness of national STI policy frameworks and proposing specific measures to improve the quality of STI policy processes and related outcomes; and
- Studying drivers of and barriers to regional integration of African NSI in Southern African Development Community (SADC) and the East African Community (EAC);

For a full list of publications, see: [Prof Mugabe-Ouma](#)



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