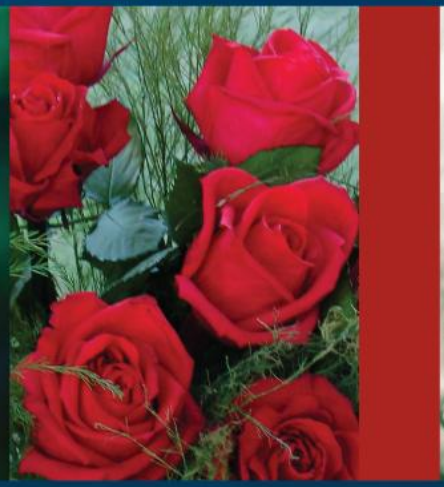
technology innovation AGENCY

InnoVenton

Nelson Mandela Metropolitan University

for tomorrow

InnoVenton: NMMU Institute for Chemical Technology



Engage to Exist

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Contents

1. Background to InnoVenton
2. Fit of Engagement into the business model
3. The nature of InnoVenton's Engagement activities
4. Example of Engagement activity
5. Benefits of Engagement activities
6. Lessons learnt
7. Acknowledgements

Background to InnoVenton

- Registered during 2005 following internal/external review process as InnoVenton: NMMU Institute of Chemical Technology
- Was awarded the status of a DST Technology Station in 2006 (and the wording “Downstream Chemicals Technology Station” added to the name)
- The purpose of the Institute as it appears in its founding documents includes:
  - Provision of training (career-focussed)
  - Provision of Technology Support
  - To perform contract R&D
  - To initiate and perform R&D in the area of chemical product and process development

How does “Engagement” fit?

The Board of InnoVenton adopted the following statement as long-term vision (Vision 2030) for InnoVenton:

By 2030 InnoVenton will play a key role in South Africa, the greater African continent, and the world by producing new innovations and new and competitive enterprises through world-class academic endeavours in Technological Science.
At its heart will be the people that participate and interact with InnoVenton and the ideas and technological solutions created by and through them that will give InnoVenton a unique place and identity in the technological/scientific community. In order to achieve this dream, people (staff and students) within, and connected to, InnoVenton will be equipped with the knowledge and skills to play a leading role on the world’s technological stage by enabling them to be the source of new ideas through excellent research and integrated disciplinary participation.

How does “Engagement” fit?

- From Vision 2030 it follows that:
  - InnoVenton operates in the field of Technological Science, and
  - Technological Science is by definition an “integrated disciplinary” knowledge field
- The integration of various disciplinary knowledge fields requires participation of:
  - The creators of new knowledge
  - The funders of the knowledge creation process,
  - The users of such new knowledge, and
  - The broader society
- “Engagement” is therefore built-in into the basis upon which InnoVenton has based its variety of R&D, T&L, and S&E activities

Nature of “Engagement” in InnoVenton

Objective of Engagement:

- To improve the sustainability of regional industries in the specific and allied industry sector, and
- To improve the quality of life of people using our scientific knowledge and capabilities

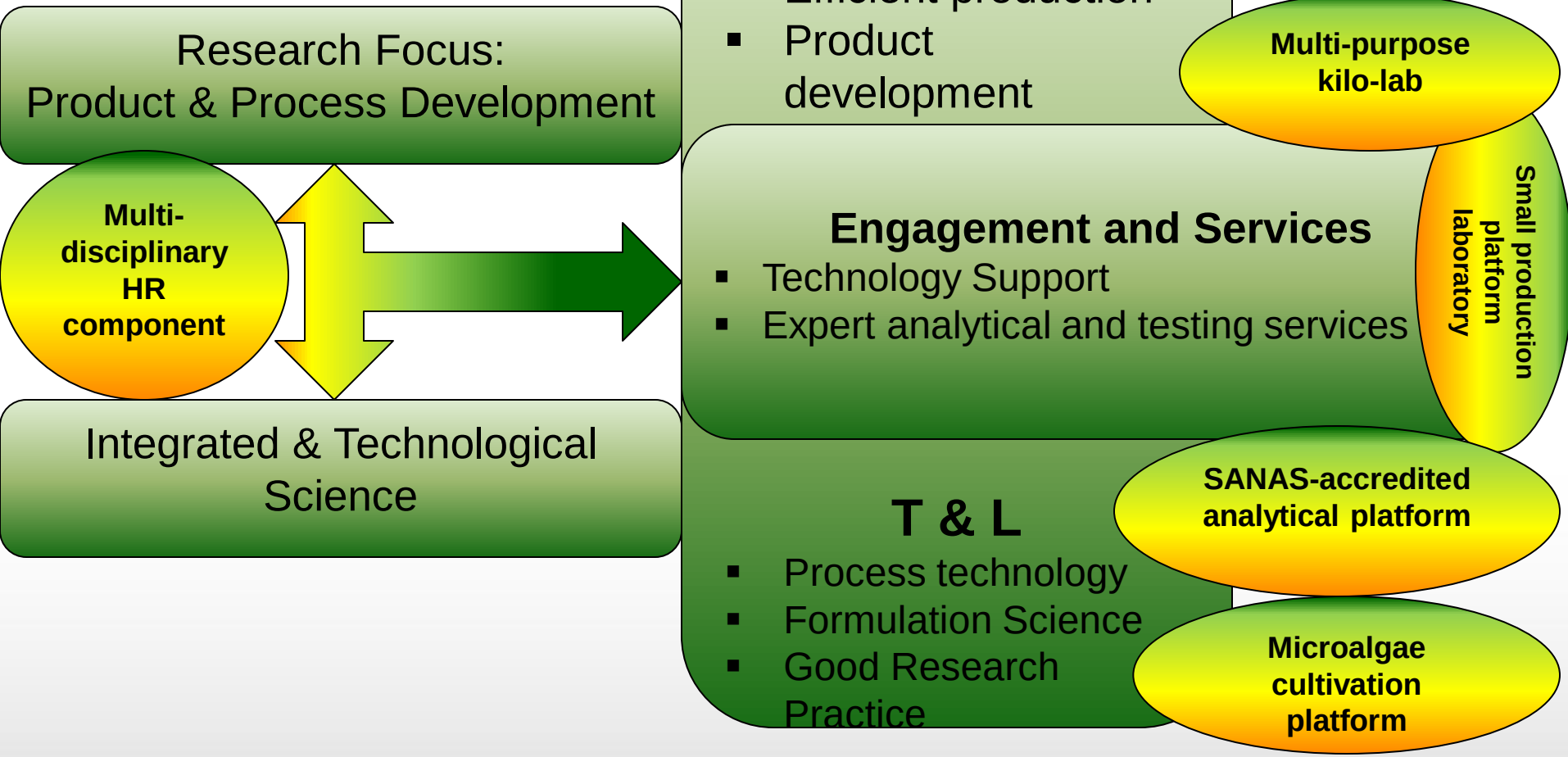
Stakeholders of Engagement:

- Regional and National Government,
- Industry, and
- The broader community

Components of Engagement

- Professional/Discipline-based Service Provision
- Outreach & Community Service
- Teaching and Learning, and
- Research and Scholarship

Nature of “Engagement” in InnoVenton



Examples of “Engagement” – MA2E

Title of Project:

- Microalgae to Energy (MA2E)

Main Problems to be Solved:

- South Africa has limited potential to generate sufficient biomass to meet renewable energy targets/CO_2 sequestration targets
- Current microalgae production technologies are to expensive to support large-scale renewable energy generation

Original Objectives of Project:

- To develop a technically and economically viable microalgae cultivation platform
- To convert microalgae biomass into various forms of biofuels
- To successfully commercialize a microalgae to energy-based business

Examples of “Engagement” – MA2E

Project Outputs to date:

- A unique RSA-developed microalgae cultivation system using closed photo-bioreactors
- Recovery and beneficiation of waste coal from the coal mining and processing industry
- Demonstrated production of various fuels containing a bio-component from microalgae and coal, including:
  - Fossil-biocrude oil (which can be refined to normal fuels)
  - Solid fuel briquettes (can be used for energy generation or conversion into fuel)
  - SNG (synthetic natural gas)

Project Status:

- Engineering design studies by international engineering company Hatch-Goba for (a) a 1 Ha technical demonstration facility and (b) a 100 Ha commercial facility neating completion (target date 17 November 2014)
- Proposal (R55 million capex, R12 million/year opex – for 5 years) approved for funding by DST – awaiting final decision
- Technical demonstration facility construction scheduled to start 2nd term 2015

Examples of “Engagement” – MA2E

Engagement partners:

- RSA Government (DST)
- Technology Innovation Agency
- Various Universities (NMMU, UCT, Wits, NWU, UFS, Rhodes)
- Eskom
- Coal mining companies (Muhango Mines, Exxaro, etc.)
- Engineering companies (Hatch-Goba, Roy-Mec, Tapflo, etc.)
- Petroleum companies (Sasol, Engen)
- Consulting companies (Infinergy)
- Local Governments (Witbank, Tswane, Musina, Graaf Reinette)

Examples of “Engagement” – MA2E

Potential Impacts:

- **Develop innovation capacity and contribute to socio-economic development**
  - Research, development and demonstration of technology-based solutions and promotion of the commercialization and use thereof
  - Grow and sustain niche high-potential capabilities for sustainable development and the greening of society and the economy
  - Facilitation of new industries with growth potential in chemicals and energy
- **Enhance South Africa’s knowledge-generation capacity in order to produce world-class research outputs and turn advanced findings into innovation products and processes**
  - Contribute to development of high-level human capital to purse locally relevant, globally-competitive research and innovation
  - Production of new knowledge and relevant training opportunities
  - Promotion of internationally competitive research, training opportunities and outputs in which South Africa has an advantage (e.g. sunlight, advanced coal industry, microalgae innovation)

Examples of “Engagement” – MA2E

Potential Impacts (Contd):

- **Develop appropriate human capital to meet the needs of society**
  - Contribute to development of high-level human capital to purse locally relevant, globally-competitive research and innovation
  - Facilitation of new industries with growth potential in chemicals and energy
  - Grow and sustain niche high-potential capabilities for sustainable development and the greening of society and the economy
- **Build world-class infrastructure to extend frontiers of knowledge, train next generation of researchers and enable technology development and transfer**
  - Ensure availability of and access to internationally comparable research and innovation infrastructure in order to generate new knowledge and train new researchers
  - Grow and sustain niche high-potential capabilities for sustainable development and the greening of society and the economy

Examples of “Engagement” – MA2E

Unintended Outcomes:

- **Production of clean water from non-potable water sources from the microalgae cultivation system**
- **Production of low-emission solid fuel for household use (16 – 18 million people in the RSA still use coal as the only source of energy in their homes)**
- **The production of bio-fertilizers and soil conditioners from microalgae biomass and other animal wastes**

Benefits of “Engagement”

- The ability to undertake complex problems through large networks that comprise various stakeholders and disciplinary knowledge fields – in this way risks are reduced and progress towards technically/socially robust solutions/knowledge are facilitated and managed through interaction with the users of, or stakeholders directly affected by such knowledge.
- The ability to use knowledge and skills used for the production of “reliable knowledge” (academic research) for the development of technically/socially robust knowledge – i.e. knowledge developed on a “consensus” basis with stakeholders to a level, and delivering outcomes expected by those stakeholders.

Lessons learnt from “Engagement”

- The creation of technically/socially robust knowledge occurs within a context of “application” and this context describes the total environment in which scientific problems arise, methodologies are developed, outcomes are disseminated, and uses are defined
- The creation of technically/socially robust knowledge is characterized by “integrated-disciplinarity” which may, or may not be derived from pre-existing disciplines

Lessons learnt from “Engagement”

- The creation of technically/socially robust knowledge integrates both academic role players from different unrelated disciplines and non-academic participants, such as government, commerce and industry, and the public. It is therefore a combination of “integration” with a “participatory approach”
- The creation of technically/socially robust knowledge requires novel forms of quality control, since “scientific peers” can no longer be readily identified as the knowledge creation process now comprise not only “producers” (of knowledge), but also “orchestrators”, “brokers”, “disseminators”, and “users”
- The creation of technically/socially robust knowledge involves a high degree of risk – people think they can exploit you – and they do.

Acknowledgements

- National Government departments (Department of Science and Technology, Department of Trade and Industry)
- Local Governments (Kamdebo municipality, Tswane municipality, Witbank municipality, NMB municipality)
- Funding Agencies (Technology Innovation agency, NRF, IDC, DBSA)
- Industry stakeholders (including Sasol, Eskom, Exxaro, and many more)
- Other Universities (UCT, Rhodes, Wits, NWU, UFS)
- Development partners (Infinergy, Hatch-Goba, Roy-Mec, etc.)
- The NMMU (especially the DVC:R&E and the Dean of the Faculty of Applied Science)
- The team and post-graduate students at InnoVenton