Report on the RALIS Exercise in the Foundry Industry
25 February – 07 March 2008
FINAL

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Content

1 Background

Currently the South African casting and foundry industry consists of about 200 companies that range from large internationally-competitive foundries to small independent family owned foundries. A consolidation process has reduced the number of foundries from more than 400 foundries twenty years ago to the current number. The industry is part of the broader metal industry and is considered to be important in the manufacturing sector as many other industries depends on components from this industry.

The Department of Science and Technology (DST), via the Tshumisano Trust, established a Metal Casting Technology Station (MCTS) at the University of Johannesburg. The purpose of the MCTS is to transfer technology into the metal casting and foundry sector, and to support the growth and improved performance of the sector. DST is also concerned with the growth of SMEs in the sector.

In general, the sector is performing reasonably well. Although tonnage in general is up, the sector is employing less workers. In one important sub-sector, Aluminium casting, tonnage is down from a few years ago, mostly due to the shut-down of a major plant that used to produce car wheels. There are several firms that are operating at world-class level, mainly because they are connected into OEM supply chains like the Automotive sector and have benefited from the Motor Industry Development Programme (MIDP). Several firms are also benefitting from the increased public spending in South Africa on the mining and construction sectors.

Overall, though, the industry is characterised by old equipment and below-par efficiencies, and many firms are struggling to compete with the producers from India and China. The equipment used in foundries is very expensive and capital intensive, and replacing old equipment requires an amount of capital investment that implies a long-term commitment of the owners to the company and the sector. Many firms are family-owned and have reached a natural point where the owners do not want to grow the firms any further, and a number of owners implied that they do not want to commit to the sector in the long term.

During 2007 it was decided that a RALIS exercise be conducted to identify opportunities for upgrading in the sector. The exercise was hosted by the Metal Casting Technology Station (MCTS) at the University of Johannesburg and supported by Tshumisano Trust and GTZ, as well as the South African Institute of Foundrymen (SAIF) and the Western Cape Institute of Foundrymen (WCIF).

2 Purpose and structure of the RALIS Exercise

The purpose of the RALIS Exercise was

- to diagnose the metal casting and foundry sector,
- to identify upgrading opportunities for companies in the sector,
- to identify possible interventions for the Metal Casting Technology Station and prioritise them.

The RALIS exercise was conducted from the 25^{th} of February to the 7^{th} of March 2008. The team consisted of:

- two technology station staff,
- one local industry expert,
- one representative of the SAIF,
- two facilitators (supported by a third expert for the Western Cape interviews), and;
- two representatives of the Tshumisano Trust (see Annex 1 for a detailed list of the team members).

In preparing for the RALIS the team identified a directory of about 55 key industry stakeholders that were considered to important stakeholders in the industry. These stakeholders were invited to various mini-workshops and interviews. Ultimately, 60 stakeholders were involved through five mini-workshops, 25 face-to-face interviews and 3 telephone interviews. The themes of the five mini-workshops were:

- Aluminium (permanent mould),
- Steel and Heavy engineering,
- Cast Iron,
- Suppliers of inputs and equipment, and;
- B.Tech and graduate students

The workshops were facilitated by experts that used structural methods that allowed for a discussion and analysis by the participants. Most of the workshops were structured around the Four Pillar Model, one of the main conceptual building blocks of RALIS (see below). The main venue was in the John Orr building at the UJ Doornfontein campus.

In most cases interviews were conducted by a pair of team members. During the interviews a structured guideline was used to guide the conversation. Interviews were not only conducted in Gauteng, but also in Mpumalange, Kwa-Zulu Natal and the Western Cape.

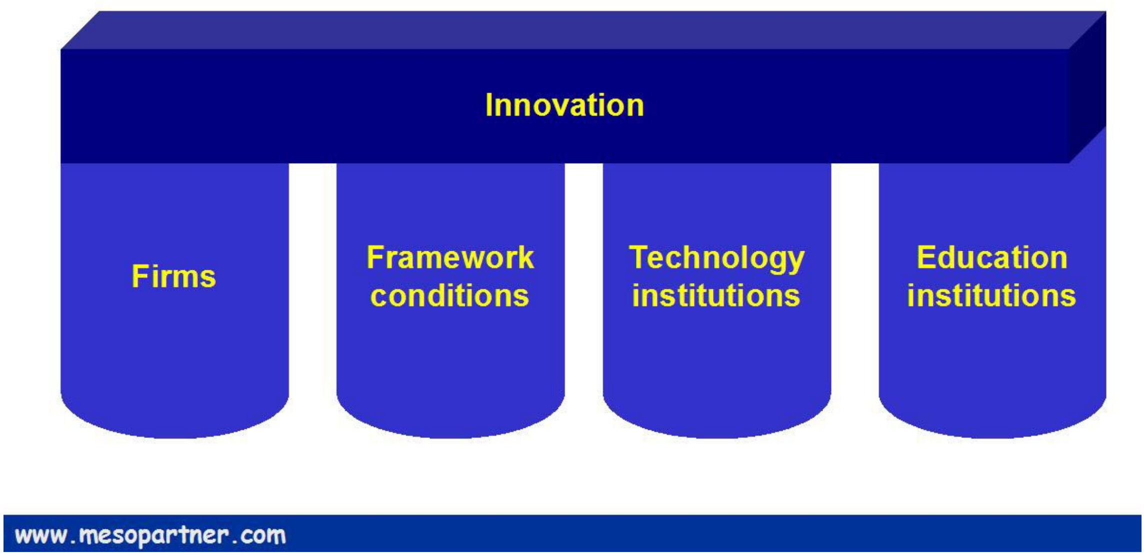
Towards the end of the RALIS an internal results workshop was conducted so reconcile all the findings and to develop proposals for action. Two industry representatives from the Western Cape Institute for Foundrymen also participated in the event. At the end of the day a Powerpoint presentation was prepared for the presentation event the following day.

A group of 25 stakeholders participated in the presentation event on 6 March 2008 where the findings and proposals were presented. The event was hostel at the Hotel School of the University of Johannesburg.

3 Findings

We organise the findings of this RALIS Exercise according to the four pillars of the RALIS innovation system model. This model summarises the research on the main factors of successful innovation systems that have come out of innovation research over the past two decades. The following figure summarises the model.

Figure 1: The Four Pillar Model of Innovation Systems

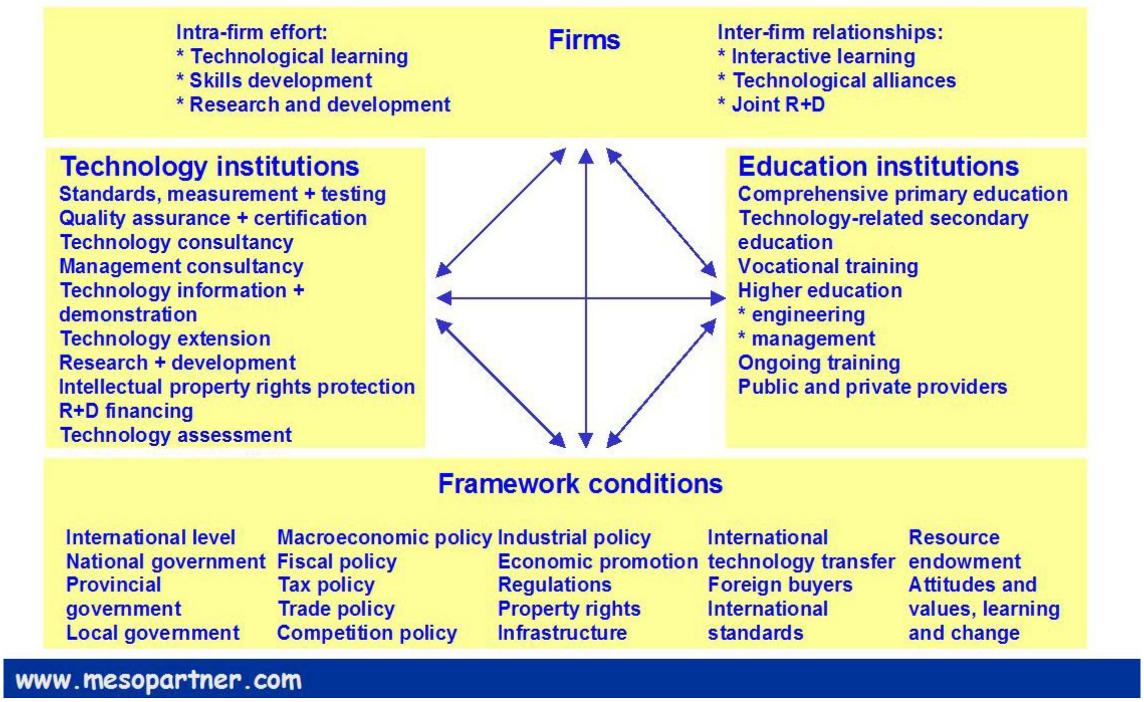


The key insights underlying this model are the following:

- Innovation is the main driver of innovation and thus of prosperity in a society. The main place where innovation happens in this regard are firms .
- The innovation behaviour of firms is, first and foremost, determined by framework conditions, i.e. the competitive pressure in markets and the economic policies that shape the evolution of the economy.
- In order to constantly innovate, companies rely on a variety of specialised technology institutions.
- Moreover, companies depend on effective education and training institutions that support life-long learning.

The following figure highlights the critical success factors related to each of the four pillars.

Figure 2: Critical Success Factors with respect to each of the Four Pillars



How does the South African foundry industry and the innovation system that it is part of fare?

3.1 Companies

There are several possible ways of explaining the structure of the foundry industry. One of them is according to the material used, i.e. ferrous vs non-ferrous. Many foundries involved in this research use both. Another option is to look at the process used, e.g. pressure- vs gravity casting and the type of form that is used. The most relevant distinction for the purpose of this analysis, though, is according to the criterion of competitiveness. In this regard, we found three types of companies:

1. Specialised and highly competitive firms, typically exporting a significant share of their production either directly or indirectly (e.g. as a component of a car made in SA),

2. Specialised firms that produce primarily for the domestic market and that operate at a lower level of efficiency and quality than leading export firms,

3. Jobbers who produce a variety of products, often using different processes and typically producing for a limited number of loyal customers.

The following table summarises, in a rather generalised way, typical features of the different types.

Table 1: Ideal types of companies in the SA foundry industry

Type 1 companies	Type 2 and Type 3 companies
• Medium- to large scale • Public companies or subsidiaries of multinational corporations • Technologically sophisticated processes • Relatively updated equipment	• Small to medium scale • Family-owned business • Reliance on experience / tacit knowledge and trial-and-error • Relatively outdated equipment

3.1.1 Current status of the industry

The most striking feature of the industry is the level of comfort that in particular Type 2 and Type 3 companies find themselves in. There was a consolidation process in the industry into the early 2000s, and the surviving foundries are benefiting from the strong performance of the SA economy, i.e. they are running with high capacity utilisation. Some of them could increase capacity easily, for instance by introducing a two shift system, yet prefer not to do so; many of the family-owned businesses can be classified as "satisfycers" rather than "maximisers", i.e. the company owners do not aspire significant growth of their business but rather try to stabilise it at the current level.

Type 1 companies, on the other hand, are under constant pressure to update, i.e. lower their cost, improve quality, reduce response times etc. They show a much more consistent effort in terms of process optimisation, quality management and other approaches to improve competitiveness than Type 2 and Type 3 companies. While all companies that operate primarily in the domestic market are not particularly threatened by foreign competitors, Type 1 companies are confident that they can match their Asian competitors in international markets.

3.1.2 Technology, innovation and competitiveness

A number of firms, in particular of Type 1, are upgrading equipment and processes, especially in the automotive parts sector. However, the majority of companies are not under a strong competitive pressure that would force them to constantly upgrade. In-house efforts around upgrading a limited, and systematic intra-company R&D is non-existent. Companies depend mainly on suppliers and some experts for technology transfer and innovation.

The majority of companies is experience-based (trial and error) rather than science-based. This is an important finding since it makes collaboration with technology institutions around problem solving or development of innovation complicated. Indeed, companies tend to state that technology institutions are weak or irrelevant to industry.

There is very little benchmarking in the industry, which is another indicator of the weak effort in terms of systematic upgrading.

3.1.3 Collective action

Only in some cases is there informal collaboration between very few companies on technical issues, i.e. occasionally two or three companies would interact, often based on personal friendship of owners or top managers.

The main body of the industry is the South African Institute of Foundrymen (SAIF). The SAIF is based exclusively on voluntary work, i.e. there is no paid staff. We found that the SAIF

- is not very effective beyond training and, to a limited extent, lobbying,
- runs successful social events, while technical seminars are poorly attended.

In fact, the Western Cape Institute of Foundrymen appears to be more effective that the SAIF, which predominantly involves companies from Gauteng.

3.1.4 Future perspectives of companies

Companies need to collaborate more to address shared issues, both in terms of effective collective action to address unfavourable framework conditions and in terms of learning from each other. Foundries in the Western Cape need to be involved in collective action.

Companies should be more concerned with medium- and long-term perspectives, and conduct long-term planning. The next downturn could become disastrous for the industry, in particular if a downturn in the domestic market coincides with a downturn in the international market and thus more foreign competitors would try to enter the SA market. In any case, there is a good chance that the foundry industry will consolidate to a critical mass of competitive companies, not the least since quite a few aging foundry owners would not mind to close their company down when they retire.

Among the three main drivers of the industry, mining and infrastructure look solid in the medium term, while automotive depends on headquarter decisions of OEMs and is thus unpredictable.

3.2 Framework conditions

The foundry industry is not a major addressee of government interventions. Some options for government support exist, but they are little known in the industry. The MIDP is highly relevant for automotive parts producers, i.e. an important segment of the foundry industry.

Government does not respond adequately to the export rush in the scrap sector. For several years now, there has been a shortage in the global scrap market, and SA scrap dealers have increasingly exported scrap, leading to significant price increases and a shortage on the domestic market. While other countries levy export taxes on scrap exports, no such thing happens in South Africa. As a consequence, competitors in other countries have access to scrap at a slightly lower price than companies in South Africa. This in particular affects SA companies that export or compete directly with imports.

The electricity crisis is a major issue for the industry. Several foundries had to reduce their production to comply with the 10 % reduction in electricity use that has been imposed by Eskom.

By and large, though, it must be noted that the framework conditions are not particularly unfavourable for foundries. Apart from the scrap and electricity issues, companies did not really complain about issues related to general framework conditions.

3.3 Education and skills

Things are different when it comes to specific framework conditions, in particular skills. This is the single most important concern of the foundry industry. The challenges that the foundry industry is facing go beyond the issues commonly connotated with the skills shortage problem that affects South Africa.

3.3.1 Skills issues in companies

Companies suffer from a shortage of skills at all levels, from shop floor to top management, and with the latter in particular with respect to succession when current managers retire in the near future. Moreover, there is a particular shortage of maintenance and non-foundry staff (e.g. electricians).

The industry has already addressed the skills issue in various ways. For instance, unit standards have been drawn up, but have been waiting for approval for more than two years now.

In order to upgrade skills, what is available are mostly generic courses that are not adapted to the needs of the foundry industry.

A deeper investigation of skills issues based on experience in companies in the Western Cape revealed the following issues:

- For companies, there may be a disincentive to upgrade the skills of its workers, since it is easier to poach skilled workers than to conduct in-house training. Also, many companies do not see shop-floor skills as an issue that is strategically so important that it would merit a major effort.

- For individual workers, the incentive to upgrade skills is small, since the direct financial rewards are very limited. Since currently courses are not recognised, indirect rewards through the accumulation of marketable skills are limited, too. Workers are less interested in training that is often conducted after work hours. Trade unions tend not to support skills development efforts.

- Apart from these intra-industry factors, the absence of a foundry-specific apprenticeship scheme and the weakness of training providers (e.g. FET colleges) is a problem.

3.3.2 Attracting talent to the foundry industry

Another issue is the attractiveness of the foundry industry for new talent. The foundry industry pays little attention to the attraction of new talent. The industry is competing for talent, and is probably losing. It is perceived as a dirty, declining industry, and it has not launched any activities to change this perception.

Moreover, the impact of increasing global recruitment in technical fields is not yet adequately understood in the industry or among policy makers. Other countries are actively poaching highly skilled and experienced staff.

3.3.3 Quality of students

In the industry, demand for students from higher education does exist, but the supply is very limited (at UJ: less than 20 graduates per year, many of whom had already been sponsored by future employers).

Students at tertiary level suffer from formal and life skills deficiencies. Their understanding of math is often not sufficient, and they tend to lack problem solving skills.

3.4 Technology institutions

This pillar is next to non-existent. Three technology institutions exist in South Africa that could be relevant to the foundry industry. The CSIR does not enjoy a good reputation in the industry. MINTEK is perceived as focusing on the mining industry only. This leaves the Metal Casting Technology Station (MCTS).

Few people in the industry are aware of the Technology Station. Those who know it, tend to see it as a training provider, not as a technology institution that focuses at R&D and technology transfer. There is a (wrong) perception that the TS targets primarily low-end, low-tech clients.

4 Myths

In our research, we encountered a number of myths. A myth is a statement of fact that is widely seen as true yet under close investigation turns out to be unfounded.

Myth No. 1: The foundries are by and large competitive, and can compete internationally even without TQM systems. Fact: Leading foundries in SA understand the enormous competitive pressure in the world market, the need to constantly upgrade, and to manage processes more consistently.

Myth No. 2: India and China are competitive because of low wages and mediocre quality, and they are particularly competitive on small high volume products. Fact: In India and China, a massive upgrading process is underway, and competitiveness is increasingly based on technology and other factors.

Myth No. 3: The foundry industry is a dirty and declining industry. Fact: The foundry industry in SA is growing in terms of output.

Myth No. 4: The skills shortage must be addressed by government / SETA, and formal education will solve the skills problem. Fact: The skills shortage must be addressed primarily by the industry. MERSETA will respond to robust proposals by industry. The foundry industry is an experience-based industry, and its future depends on its ability to transfer the tacit knowledge of experienced employees.

Myth No. 5: Government is standing in the way of a positive development of the foundry industry. Fact: The foundry industry is flying below the radar screen, for instance in terms of environmental issues. Certain government initiatives, like MIDP, are a boon for companies in the industry.

5 Recommendations

5.1 Recommendations for the Technology Station

Improve the focus of the Metals Casting Technology Station:

- Update the business plan to reflect findings of the RALIS, in particular the strong suggestion by industry that the TS should focus at key issues. In particular, three key issues in foundries were suggested:
  - metallurgy,
  - sand,
  - core making.
- Shift energy from one-on-one interaction towards one-on-many interventions: The TS should aim at interventions that benefit more than one company at a time, so that it extends its impact.
- Market the services and offerings of the MCTS better to industry: So far, the TS's marketing effort is limited. In order to market itself better, it should not only look at printed material, its website, and advertisements in industry magazines, but also and in particular at editorial content in industry magazines, especially success stories.

Recommendations for MCTS regarding practical training:

- Undergo MERSETA training on procedures and offerings
- Become a MERSETA accredited training provider
- Connect graduate students with industry for research project (dissertations, etc.). Several companies mentioned mentioned that in principle, or even at this moment, they look for student interns.

An excellent technology station:

- Technology station to provide its services to other provinces
- Requires additional funding and support from Tshumisano / Department of Science and Technology, UJ to increase its capacity
- The MCTS should become a centre of excellence in some specific foundry related areas
- MCTS should assist other specialised centres of excellence to be established elsewhere (with support from Tshumisano)

5.2 Recommendations for SAIF

Strengthen the capacity of the SAIF:

- Conduct a survey under members to understand poor turn-out at technical meetings
- Adapt events to address needs of members
- Closer co-operation between SAIF and WCIF
- SAIF should become a professional body with full-time executive and support
  - in order to better lobby on issues like scrap
  - to better represent the industry and its needs to financiers, investors, government and buyers

Improve practical training / apprenticeships – Tasks for SAIF:

- Several firms were identified during fieldwork that are already involved in skills development and that are willing to work with other firms and stakeholders
  - Better co-ordinate and share info on available training
  - Leverage existing goodwill and support further investment
- Arrange special training courses on specific topics like costing
- Work with firms to bring in international specialists for training (for instance, when one company flies in a leading international expert, that person might give a seminar to the industry, and the industry should cover part of his cost)
- Lobby for the development of a national skills development plan specific to the foundry industry
- Industry should lobby with MERSETA to have the unit standards finalised

5.3 Recommendations that involve collaboration between the Technology Station and SAIF

Improve practical training / apprenticeships – Tasks for SAIF and MCTS:

- Promote better uptake of learnerships and vouchers
- MCTS to engage with industry and MERSETA to organise groups for special training events

Promote benchmarking practices between firms:

- SAIF / MCTS should promote benchmarking between firms
- Technology station / Tshumisano to support benchmarking exercise by partially funding an expert
- Present the concept of a competitiveness club at the next SAIF technical meeting. The “competitiveness club” concept has been developed in South Africa, initially in the automotive components industry in KZN. It was subsequently, after a RALIS exercise, also introduced in the Western Cape textile industry, where it has generated excellent results. A representative from industry in the Western Cape should be invited to explain how to deal with issues like confidential information.

5.4 Further needs for action

- SAIF, MCTS and others to lobby with government on the scrap issue and other regulatory issues, based on the insight that the powers in favour of scrap exports are well organised and strong
- SAIF should engage more actively in the development process of the National Foundry Technology Network, which has been going on but not made much headway for some time
- The industry and supporting agencies (MCTS, CSIR, IDC, MERSETA) need to become more active in:
  - technology demonstration and promotion (cleaner production, new technology etc.)
  - attracting talent into the industry at a younger age
- Using study tours to raise interest of learners
- Put more emphasis on middle and upper management development, which is receiving very little attention at the moment. This should relate to succession planning, strategic management, or specific topics like costing
- MCTS to become a focal point for government support to industry – and SAIF the focal point for industry to government interaction

6 Conclusion and Summary: Possible quick-win activities

In order to build momentum for upgrading efforts in the foundry industry, we suggest that four proposals should receive particular attention, since they offer the potential to generate quick wins:

➢ MCTS: Connect graduate students with industry for research project (dissertations, etc.)

➢ SAIF: Conduct a survey under members to understand poor turn-out at technical meetings – adapt events to address needs of members

- There are several firms already involved in skills development that are willing to work with other firms and stakeholders – better co-ordinate and share information on available training, leverage existing goodwill and support further investment

- Present the concept of a competitiveness club at the next SAIF technical meeting

7 Annexure 1: The RALIS Team

Shawn Cunningham	082 902 4200
Mpho Dibakoane	073 888 7599
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Richard Seymore-Wright	083 297 1006
Farouk Varachia	082 788 4816
Henning Viljoen	072 111 3996

8 Annexure 2: The detailed programme of the RALIS

Monday 25 February			
Time/Date	**Workshop**	**Interviews**	**Interviews**
8.00 – 9:00			
9.00 – 15:00	Hypotheses Workshop		
16.00 – 17:30	WS with B.Tech students		

Tuesday 26 February		
Time/Date	**Workshop**	**Interviews**

8.00 – 9:00		
9.00 – 10:00		9:30 Gary Coull {Pressure die casting} (HV + JMS)
10.00 – 11:00	Aluminum Permanent Mould SC	
11.00 – 12:00		
12.00 – 13:00		Giuseppe Marengo KPL {Zinc pressure die casting} (HV + JMS)
13.00 – 14:00		
14.00 – 15:00		John Davies (JMS, HV) {Copper Bronz Consultant}
15:00 – 16:00		
16.00 – 17:00		
17.00 onwards		
18:00		

Wednesday 27 February			
Time/Date	**Workshop**	**Interviews**	**Interviews in WC (FV, JDL)**
8.00 – 9:00			Cape Town interviews arranged by John Lawson
9.00 – 10:00		Telepone: George (Limpot) / 072 153 7515	
10.00 – 11:00	Heavy engineering SC / HV	10:30 Richard Schulz (Adept Airmotive) /	
11.00 – 12:00			
12.00 – 13:00			

13.00 – 14:00		Nicky Gouws (SC)	
14.00 – 15:00		JMS + FV Danie Slabbert (Ekandustria)	
15:00 – 16:00			
16.00 – 17:00		Nthabi (Sibahle) (SC, JMS)	
17.00 onwards		Meeting with Mr Newaz Mohamed, DST Pretoria (SC + AEM)	
Thursday 28 February			
Time/Date	**Workshop**	**Interviews in Mp (HV, JMS)**	**Interviews**
8.00 – 9:00			
9.00 – 10:00		9:30 JMS + FV Daan Delport,(Thos Begbie) Middelburg	
10.00 – 11:00	Cast Iron (SC,)		
11.00 – 12:00			
12.00 – 13:00			
13.00 – 14:00			
14.00 – 15:00			
15:00 – 16:00			Johan Le Grange (Vestcast) (SC + JMS),

Friday 29 February			
Time/Date	**Workshop**	**Interviews**	**Interviews in Vaal**

			region (SC)
8.00 – 9:00			8:30 Arie Shrek (SA Roll Company) – Vanderbijl [SC]
9.00 – 10:00		Dave van Niekerk (HV)	10:00 Vereeniging Foundries [SC]
10.00 – 11:00	Suppliers (JMS)		
11.00 – 12:00			11:30 Danie Lutski, Meyerton [SC]

13.00 – 16:00	Team members meet at Tech Station to plan next week		
Monday 3 March			
Time/Date		**Interviews in KZN (HV)**	**Interviews**
8.00 – 9:00			
9.00 – 10:00		Mike Wolhuter (Pressure Die Casting-Brass)	David Langley, Roodepoort (JMS, MM)
10.00 – 11:00			
11.00 – 12:00		Raj Kumar (Natal Iron & Brass)	Bruce Crawford – SACASTING (JMS, MM)
12.00 – 13:00			
13.00 – 14:00		Wolfgang Schmidt (HW Schmidt)	Lecturers @ university (JMS)
14.00 – 15:00			
15:00 – 16:00		Graham Wilson (East Coast Die Casting- Zinc)	Pierre Rossouw (CSIR) (SC)
16.00 – 17:00			

Tuesday 4 March			
Time/Date	**Workshop**	**Interviews**	**Interviews**
07:15		Helen Brown (Merseta) (SC – telephonic)	
8.00 – 9:00			
9.00 – 10:00			
10.00 – 11:00			
11.00 – 12:30			Meeting with Greg Combrink & Derek Malone (JMS)
14:00 – 18:00	Part 1: Internal results workshop		
17.00 onwards			

Wednesday 5 March			
Time/Date	**Workshop**	**Interviews**	**Interviews**
8.00 – 9:00			
9.00 – 18:00	Internal Results WS (Whole Team)		
18.00 onwards	Finalise presentation for next day		

Thursday 6 March

Time/Date	**Workshop**	**Interviews**	**Interviews**
8.00 – 9:00			
9.00 – 13:00	Presentation event		
13.00 – 16:00	Meet with key stakeholders to discuss way forward		

Friday 7 March			
Time/Date	**Workshop**		
8.00 – 9:00			
9.00 – 16:00	Discussion of strategic options for the technology station – update key issues in the business plan		