

Review of the F'SATI programme 2008-2015

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1. Executive summary

The team of three reviewers mentioned above was requested by NRF to review the activities and outputs of an institution called the French South Africa Institute of Technology, F'SATI, for the period 2008-2015. This institute is unique in South Africa in that it has grown on the back of the merger of several technikons which were advanced technical institutions. As mentioned they were merged with the intention to grow them into universities of technology. F'SATI was formed some twenty years ago at the Tshwane University of Technology TUT, which was inherited from the Technikon Pretoria, Technikon Northern Gauteng, and Technikon North West. Almost ten years ago the Cape Peninsula University of Technology, CPUT, which had already completed its merger and had become a university, then decided and was invited, to establish the second node of F'SATI on its campus in Bellville. This evaluation is for the time from then on. The student population has grown at both establishments and impressive buildings were built. Both institutions started to concentrate on postgraduate study and that is the direction F'SATI focussed on from then on. This effort is being evaluated here.

Out of this grew a unique mixture of South African and French technical education with dual degrees. Of course there were many challenges but also many successes one of which is the upgrading of qualification of the teaching staff particularly at TUT. Research groups emerged and they started to publish in good international journals. Exchange contact was established both ways between South African and French institutions. South African students were proud that they were able to interact on equal grounds with European counterparts, situations in which they found themselves competitive. The French professors taught courses which lifted the level of mathematics and sciences of South African students to augment their technical training. All in all the evaluation team was impressed with what had been achieved. The report ends with additional recommendations for further improvement.

2. Background

Shortly after the establishment of democracy in South Africa, F'SATI started out as an interstate International collaboration between France and South Africa. The first formal agreement was signed between The Government of the Republic of France, The Foundation for Research (of SA), The Paris Chamber of Commerce and the Technikon Pretoria. It came into operation on 17 April 1996. The Institute was intended to develop, support and transfer technology within the fields of electrical and electronic engineering with emphasis on telecommunication and Control.

The Institute provided post National Diploma (ND) training which was appropriate for a Technikon at that time. With the change to the status of Technikon Pretoria with its mergers with others to become the Tshwane University of Technology, TUT, the emphasis slowly moved to postgraduate training and to MTech and DTech degrees, even though some training by members of the Institute on the BTech level continued mainly to ensure a healthy flow of students to the higher levels. Also the MoUs from then on were signed and reflected agreements between the participating institutions rather than governments, even though governments continued to be represented on the Boards.

Another change was that the MoU from then on contained a clear statement on internationalization. For instance the MoU of 2007 in article 3.3 states: "The Institute shall promote the exchange of students and lecturers with other countries including French overseas departments such as Réunion, shall be open to students from other countries with an emphasis on Africa, and shall promote cooperation between French and South African industrial companies." Such statements and others are befitting for any university. The MoU of February 2008 was signed by CCIP, TUT, CPUT (the Cape Peninsula University of Technology which resulted from a merger of the former Peninsula Technikon and the Cape Technikon).

Apart from these structural changes, the South African universities had to undergo a cultural change from technikon to university of technology. In this process F'SATI was of great value to them. It helped their students to build a more solid basis by following additional advanced courses which led to MSc degrees and which were taught to a large extent by French professors. These students were thereafter able to complete good research leading to a DTech qualification, and thus some of them became excellent lecturers for the Universities of Technology.

The most recent MOU was signed in December 2015 and it is effective for another three years. It includes a total of four institutions, two in South Africa: TUT and CPUT, and two in France: CCIP and UPEC the latter being the University of Paris Est-Créteil. It was already a member in 2013. This document also spells out the current management structure, and the articles stating the terms of collaboration remained in line with those sketched above. The purpose of the review is to evaluate the achievements and the value of the Institute and express an opinion on factors affecting its future sustainability.

3. Information gained at TUT

F'SATI at TUT is housed in the Department of Electrical Engineering and it is being developed as the Postgraduate School of the department and hence has collaborators from the whole department in addition to the staff assigned specifically to F'SATI.

3.1 Research facilities and visitors

The evaluation team was shown and was informed about the impressive facilities of F'SATI and the research projects were discussed. Firstly, research is done on "Control, Image Processing and Machine Intelligence" research Niche Area. Within this Niche, a research group called the "Enabled Environment" was started by Prof Yskandar Hamam with seed funding TUT. The research collaboration has strong ties with the Laboratoire d'Ingénierie des Systèmes de Versailles (LISV) at the University Versailles Saint-Quentin-en-Yvelines (UVSQ). The focus of the research group is to develop assistive technologies for persons with varying levels of disabilities. TUT. It includes intelligent wheelchairs, Brain computer interface. Most recently a project was funded by TIA. Intention detection and matching to motor activity. This research domain was initially started in collaboration with the LISV laboratory of the Versailles University. Robotic exoskeleton development which is used in studies of design of artificial limbs.

A leading member of this group, Prof Karim Djouani, who was at first seconded from France, has been granted a SARChI Research Chair established in 2014. There is also a laboratory technician who is obviously very passionately involved in the projects and presently doing his Doctorate on lower limb exoskeleton development. These research activities are linked with a similar program in the French laboratory, "Laboratoire Images, Signaux et Systèmes Intelligents" (LISSi). This group has various international contacts and also works with local industry particularly with an aim to produce more affordable local equipment and methods for the local market.

Another project initially funded through the Telkom Center of Excellence based at F'SATI TUT TIA deals with communication using WiFi, 4G and 5G for exterior use. In particular, one project which received seed funding from TIA concerning long range outdoor communications using low cost system based on WiFi which is seen as a vehicle to bring better communication to rural areas. Apart from Telkom, a small French company "Comsis" is involved with technology support for the project. The Evaluation Team had a Skype interview with its CEO, Mr Phillippe Leclair, on the previous day. In it he clearly expressed his support for and satisfaction with the work done at TUT.

The team was also very impressed by the excellent computer facilities which were available for students throughout the day and the night (24/7). It expressed the spirit of intensive commitment of the students to their work. We also interviewed nine students from France who had recently arrived on three-month internships from ESIEE Paris. They were in their fourth and fifth year and they found the working conditions at TUT comparable to those in Paris and they were happy with their reception and their choice.

3.2 TUT students and postdoctoral fellows

We interviewed masters, doctoral and post-doctoral students and had an open and frank discussion with each of the groups. The overwhelming majority were impressed by the good professors and by the opportunities which were presented to them. There was support and interest for the double master degree, MTech & MSc. Students reckoned that the French MSc provided important additional background in mathematics and physics which they required for their MTech research and for doctoral study. Interest was also expressed by master students for following co-tutelle doctorates. They expressed a vision for their own personal future, for instance, one of the students wanted to open a company in the agricultural field. Three of the four students we interviewed were South African and the other came from Lesotho. The three doctoral students originated from other African countries, but they all had done their masters at TUT by completing both MTech and MSc and they agreed that the MSc was very beneficial for their doctoral research, for instance in optimization

One of the problems which emerged, mainly from some individuals, was the recognition of their degree. For instance the French master degree is considered in France as an international degree and is not nationally recognized, (the technical reason being that it is accredited by CGE and not by RNC). There are

similar problems in South Africa with recognition for instance recognition as engineers by ECSA. One of the problems for co-tutelle students from other African countries is that they have no source of funding for part of their stay in France. While it is understandable that NRF reserves such funding for South Africans, efforts should be made to identify other sponsors (AU, EU or international) who would assist such students.

The two post-doctoral fellows which were interviewed were both not South Africans but one, from Nigeria, was a permanent resident of South Africa. Both were working on water networks. Both had previous experience as students at TUT. Their work is clearly important for South Africa and they were generally happy about their previous and current involvement. One suggestion put forward was that the process of submission and examination of thesis should be accelerated and streamlined.

3.3 Management at F'SATI at TUT

The management team which was interviewed included the Scientific Director, Prof François Rocaries, the Node Director, Dr Anish Kurien, and the SARCHI Chair, Prof Karim Djouani, and later also the Dean of the Faculty, Prof Ben Van Wyk and the Deputy Vice Chancellor of TUT Dr Edgar Nesamvuni. General comments on F'SATI will be covered in Section 6. *Overall view and sustainability of F'SATI*. It was explained that each Node has its niche areas within an overall joint management. Such a joint topic was the organization of the MSc courses which were taught by French lecturers who by agreement had to contribute 50% of the full MSc load. As already mentioned the niche areas for TUT were Telecommunications/ Control, Image Processing & Machine Intelligence (under which the Enabled Environment research, the SARCHI chair, the research on water network research are conducted) / Power systems and energy.

The Node Director Prof Anish Kurien is employed by TUT and is seconded to the node. Being himself a F'SATI alumnus, he understands the system very well and he passionately works to lead it into new direction with a view of sustainability. He seems to have good relations with everybody. While he clearly appreciates the French contribution and flavour, sustainability and self-reliance appear to be dear to him as well. This seems to be a spirit of the whole node. Among the achievements of the node one should mention the achievements in regard to proverbial aim of "growing one's own timber" in that eight lecturers of the department have obtained their doctorial qualification along the F'SATI route in co-tutelle. Others had upgraded their qualification to master's level.

It is also important to mention the support and understanding which the Node Director enjoys from the Executive Dean Prof Ben van Wyk. Together they have agreed to formally make the Node the Post-Graduate School of the Department of Electric and Electronic Engineering at TUT. With this arrangement comes the funding through the traditional channels from the DHET. The sustainability challenge thus becomes a challenge of graduating enough masters and doctoral students. Naturally, given the special international nature and the focus on topics of national importance, one would hope and request that additional funding would still continue to be forthcoming.

Currently the degree structures of Universities of Technology are changing and here, in this report, hope is expressed that the spirit and the course content which has developed in F'SATI over the twenty years can be greatly retained. The Executive Dean was also optimistic about attaining sustainability for the PG school. In addition to the numbers given in the self-evaluation document, he pointed out that no other engineering programmes in Africa had similar outputs in such a short time – 170 masters and doctoral graduates since 2004 and 200 accredited papers and 417 conferences since 2008. On the question of throughput, which looked low when one compares the number of graduates with the number of students, he maintained that it was in line with other engineering faculties in the country. Nevertheless, this is a point which needs close attention and detailed analysis. Prof van Wyk also reiterated how the faculty had improved its staff profile and that the contribution to it by F'SATI was fully acknowledged. However he also stressed that it still remains difficult to fill staff vacancies of which they currently have 20 in the faculty. In other words “much more timber still needs to be grown.”

The other important point is that student numbers need to grow and the scope should be broadened to include topics like engineering management and others. Another insightful discussion took place with the DVC of TUT. He is very supportive of F'SATI and of its role as the PG school with models of funding it directly from the income it generates through graduating students and research outputs. He also suggested that while Electrical Engineering had built a hub for relations between TUT and French institutions, this could now be used to extend these approaches to other departments and faculties. On the relation between TUT and CPUT within F'SATI, he was of the opinion that it was useful and that its extension to other UTs in South Africa, and also Namibia, could very well be considered. While TUT was working towards a sustainable self-reliant solution, the DVC wished to convey to NRF that its financial support was greatly appreciated.

4. Information gained at CPUT

F'SATI at CPUT is housed in the Engineering Building on the second floor in a very fine refurbished new section. During the previous evaluation which dealt solely with this node, these facilities were still only part of the planning. (see appendix). At that time a CubeSat was almost ready for its launch which has subsequently taken place successfully.

4.1 Research facilities and visitors

In the impressive new facilities the evaluation team was met by the Node Director Prof Robert van Zyl, the HoD of Electrical Engineering Prof Ben Groenewald, the F'SATI director Prof Francois Rocaries and a French technical expert and liaison person, Dr Gerard Orjubin (seconded by the French Embassy). The well-equipped production development laboratory was shown in which 5 products were tested and then sold through the Scottish company Clyde Space. Commercialization through the university is difficult and other avenues are sought.

Ten people work in the African Space Innovation Centre hosted by F'SATI and the Department of Electrical Engineering for engineering training. They also work on the preparation of the second satellite ZACUBE-2. Other laboratories focus on magnetic testing and on radio communication, and there is a Product Lifecycle Management Competency Centre (PLMCC). The Space Cadets centre houses Lego projects for young students and they plan to develop a drone. A group of eight newly arrived French students, on a three month internship, were also interviewed. They were very happy with their choice of coming to CPUT where they were well received. Four further students were still expected to come.

4.2 CPUT students and postdoctoral fellows

An interview with six masters and one doctoral student was held. All but one, are South Africans. Three of the students were preparing to work on projects related to computing and Quantum computing within Space Science, and they were not F'SATI students. They were not following the French MSc courses but instead were improving their physics background within separate studies taught by Dr Govender. (Unfortunately they received no credits for this work) Three of the others were following the dual master's courses. These considered the background from the French courses as being very valuable for the satellite projects. These courses gave them a good broad basis. They liked the French professors a lot who were said to teach in a very different and effective way. All

dual degree students have to do 60 hours of French courses through Alliance Francaise.

The advantages of F'SATI were stressed by several students. One of these was the opportunities to spend time in France. It exposed students to another perspective and another culture. The students also felt that they would have liked to have one or two more professors at CPUT for the MSc. There is a vacant SARChI Research Chair allocated to this node. The speedy filling of this would already be an important step in this direction. The general impression was that these students were passionate about what they were doing and they were in fact suggesting further improvements. One of these would of course be to increase the student numbers substantially. This will be discussed further elsewhere in this report.

The evaluation team also interviewed two post-doctoral fellows. One of them is an F'SATI alumnus who works with Prof Malik Maaza at iTembaLABS on material science aspects for satellites. His activity is unfortunately badly affected by the ill health of Prof Maaza. The other one, Dr Zaidi from Pakistan, joined F'SATI in 2015 as an older scientist/engineer who has had extensive experience in Pakistan. In coming to CPUT he did not fit in very well. One problem is, broadly speaking, that his position was apparently not well defined and that inconsistent ad hoc arrangements were made. This matter was passed on to Dr Gansen Pillay and to the scientific director of F'SATI, Prof Francois Rocaries, by the chairman of the evaluation team. The chairman discussed the matter with Prof van Zyl who was aware of the tension. Dr Pillay of NRF was also notified about this matter by the chairman of the evaluation team.

In conclusion of this section a view emerged that the academic part (coursework and research) was receiving less emphasis than it should and less than the engineering development.

4.3 Management at F'SATI at CPUT

The management team which was interviewed comprise Prof Francois Rocaries, Prof Robert van Zyl, Ms Susan Maas and Dr Kessie Govender. Because of the comments about the difficulties for the management, which appeared in the self-evaluation document, the question was posed as to who had written that and what this really means. It was said Prof van Zyl had written it, but others confirmed its content.

There were sometimes differences between the two nodes. Also the main institutions of the French side did overlap less with the activity at CPUT which had a separate agreement with for instance the institute at Montpellier but this institution was not formally part of F'SATI. However, these matters are being addressed now in a revision. Also the alignment of the core of the French courses needs more attention. Recently, the presentation for MSc courses at CPUT had stopped due to lack of funding. Another problem was the small number of students, and with it the small numbers who wished to follow the MSc, were causing failure to run the course. Nevertheless, for this year, 2017, CPUT has the biggest MSc intake yet and many of them are SA black students. So hopefully the problem mentioned will not repeat itself.

Last year student bursaries were paid out very late. It was stated that it is essential to reach a stage in which bursaries can be paid in January so that students know where they stand and whether they are able to continue. Despite differences between TUT and CPUT, Prof van Zyl believes that there are many advantages of being part of F'SATI. These include the system of internship students from France. On the question of why CPUT fails to manage to "grow its own timber" in the same way as TUT did, he pointed the differences between the situation of the two UTs, with CPUT having more expertise in a greater variety of departments. Hence they were also proposing a different positioning of F'SATI within CPUT. Their model was for an Institute that served postgraduate study in different departments and possibly even in different faculties. This institute would report to the DVC directly who would provide funds for the Institute dependent on its performance.

The lack of integration between practical engineering projects on commercial basis and academic programmes was also discussed. Prof van Zyl reckoned that this was a difficult matter and he explained how it developed historically. It was expensive to keep ten engineers in the system. The investment in the IP was very large and it would need to be developed. In the end this situation could very well result in a smaller academic group. All of this is contrary to one of the recommendations of the previous evaluation which warned against having too large a commercial involvement. The profits from the commercial activity should in fact be plough back into enriching the academic programme. The question about a Quantum based satellite future which was put forward, seems premature. Groups which work on such topics have and need a strong basis in the interpretation of quantum mechanics, and it is difficult to see how that can be develop at CPUT quickly given the typical background of most students and lecturers. On student dropout it was stated that it was not higher than

elsewhere but it was admitted that the throughput was low with lengths of time to completion having increased recently substantially.

A lengthy interview with Mr Eugene Jansen, CEO of Stonethree Venture Technology covered a view from industry about the role the CPUT Node is playing and can play. Stonethree has wide international dealings and among the projects they are involved in is Phakisa which involves identification in the maritime field. Mr Jansen has longstanding contacts with F'SATI and has even presented courses there in the past. His company employs engineers from all the universities and he is of the opinion that the gap in quality from the various universities has been closing over the past years.

During an earlier discussion with Mr. Siyabongo Copiso, a Space Industry Development Specialist of SANSA, some information around CPUT was gained. He in fact was at CPUT when F'SATI started there in 2008. And now he is responsible for strategic planning at SANSA specifically for space missions and for space missions and governance. SANSA was established in 2008 with the main aim of planning space missions and supporting human capital development in the industry. They obtained funding for a CubeSat which was launched in 2013. They have also contracted another mission for ocean monitoring as part of Phakisa.

At present the demand for students in the space field is limited and hence some are being lost. The idea is to build a space industry in order to retain space scientists/engineers. SANSA is working with F'SATI to establish a spin-off company in order to retain intellectual capital. In a similar vein Mr Lee Annamali from the Meraka institute of the CSIR reported about common broad goals with CPUT but not working on specific joint projects. However, they had common overlapping interests which include earth observations. They cover data on vessel tracking for which CPUT intends to develop payloads for this on ZACUBE-2. Other topics include spotting fires from space or even movements of wild life. There exists a wide scope of applications, and while there are several players in the field, CPUT is certainly one of them. Another interesting interview took place by video conference with Professor William Edmonson from the National Institute of Aerospace at the University of North Colorado. He is very interested in S&T in Africa, particularly in sub-Saharan Africa. He has worked with F'SATI for seven or eight years and he has given advice for PhD research work for five or six years.

On answering a question he expressed the view that satellite research was a good field for university department. Also the students in South Africa were able to hold their ground compared to international students visiting his laboratory. Even though research in the field was expensive, he was of the opinion that Africa needed to get into Space and to be involved. Those in Africa who cannot afford their own programmes should try to pool with others. On the applications he confirmed those stated above and named observations of veld fires, game trekking, illegal mining, water flooding and tracking ships. To questions on how CubeSat activities were supported at universities in the USA he responded that there were some 40 universities with such projects, and that each year there would be two conferences in the USA with some 100-200 participants at each from various universities including some from outside the USA. The funding for these centres came from grants, from departmental funds and from NASA. He concluded his discussion by saying that F'SATI is an excellent programme and that he hoped to continue to work with them in future,

During an interview with the DVC Research and Innovation the team was informed that in reaction to the request of NRF and DST to increase student numbers, CPUT had decided to go the institute route, meaning that the Node would straddle faculties and departments without being hamstrung as a centre in a particular faculty. This would elevate its visibility for marketing purposes. The Institute would also receive its subsidy according to numbers of publications and of students. An additional advantage is that pockets of expert knowledge in different departments could then collaborate much more easily.

5. French Stakeholders

The French stakeholders which were interviewed comprise:

- Prof Dominique Perrin, Director of ESIEE Paris, a French graduate school of engineering that belongs to CCIP,
- Dr. Jean-Paul Toutain, Attaché for Science and Technology, French Embassy in South Africa,
- Jean-Paul Vermès, President of CCIP

Prof Dominique Perrin has a positive evaluation of the long-term cooperation between CPUT, TUT and ESIEE via this F'SATI programme. Even though the relationship with TUT started earlier, both SA campuses with their own specialities are of equal importance and interest to ESIEE. This F'SATI programme gives the opportunity to send French students (e.g. 8 students from

ESIEE to each campus in 2017) and French professors (8-10 missions of ESIEE professors to SA for 2 weeks each), to receive SA students (internship and PhD studies) and to have international cooperation on research activities.

As a consequence, he personally thinks that this F'SATI programme should continue but has some recommendations in order to improve it:

- The numbers of SA intern students coming to France/ESIEE have decreased during the last years. They clearly used to visit more frequently but it has become more difficult to find funding for them – it would be good if this could be changed. Students work in projects in the School - it would be more complicated to organise for them to work in companies.

Moreover, Prof. Perrin would be interested to have more SA students visiting France for their PhD studies. There are only few co-tutelle students.

- French professors do not get paid for the courses they present in SA – this should be remedied. Currently only their travel and subsistence expenses are reimbursed.
- Before increasing the number of nodes, Prof Perrin would prefer to consolidate the two existing ones since these two differ in levels of maturity with respect to the F'SATI programme. Moreover, a broader participation of French partners in F'SATI would be clearly appreciated.

Dr Toutain and Mr Vermès share the same opinion – the F'SATI is a real success of scientific cooperation between France and South Africa in both training and research sectors. During the closing ceremony of the Science Forum South Africa 2016 that took place in December the F'SATI had the honour to receive the Diplomacy Award as an international STI partnership which has made an outstanding contribution to human capital development (especially for young and women scientists) in South Africa.

As noted by Dr Toutain, France is the fourth international partner of SA in terms of scientific publications. F'SATI is really a flagship that has served as a model to develop French/SA cooperation in other disciplines: e.g. F'SAGRI (Agriculture)

and F'SASEC (French-South African Schneider Electric Training Centre). Even though the French cooperation organization is actually changing quite dramatically, the replacement of the technical expert and liaison person at CPUT, Gerard Orjubin, is a priority for the French embassy.

Mr Vermès said that the CCIP will remain one of the major partners but he highlights the need to extend to other SA nodes for several reasons:

- SA clearly needs this engineering training (double the number of students) – it is really problematic since SA companies tend to extract good people from universities before they are graduated.
- From a financial aspect, too much money is spent for not enough students

This extension will be supported by Ministry of Foreign Affairs in SA. In order to cover this extension, the F'SATI programme should also extend to other French partners (help in ensuring French courses in SA, propose new Master/PhD degrees, etc). University of Montpellier with the LAAS laboratory are already enthusiastic to join the F'SATI programme. In order to attract more French partners, a workshop will be probably organised after the next board management meeting in July in Paris.

Mr Vermès mentioned a few things that could improve the programme:

- More marketing/communication of the F'SATI programme to attract SA students
- Clear differentiated budget in TUT and CPUT

Perhaps, a person could be hired in order to be in charge of the financial aspect as well as the marketing/communication of F'SATI programme.

Dr Toutain raised a question relating to the implication of the DHET in F'SATI – would it be useful to have the DHET on the board? Would it allow to have more funding? They are both convinced that this programme should continue but extend to other nodes in South Africa. To achieve this aim, a clear business and strategic plan should be done before.

6. Overall view and sustainability of F'SATI

Having discussed aspects of the separate nodes which are found to be quite different to each other in several ways, one obviously asks why they should be

in one overall organization. It is evident that they both have driven the development from being a technikon to becoming a university of technology. Hence there are now even proposals that more UTs should be considered to join this overall organization. The other new challenge is that TUT and CPUT and the others are jointly internationalizing their activities. It is hoped that the French side of F'SATI will also be expanded to include broader expertise as is already on the agenda concerning satellite development.

These interactions become efficient tools for the French and South African cooperation in different fields such as F'SAGRI (Agriculture) and F'SASEC (French-South African Schneider Electric Training Centre). Such developments would open new doors for South-African engineers and technologists to interact closely with the European and African continent and worldwide. In turn interactions of this kind become efficient tools to increase local knowhow. The different models of training engineers in Europe shows that our UTs need not only follow the path that copies the local traditional universities but they can include other innovative models. The one that stands out here is the opportunity to switch to a more academic trajectory for a student who had started with more technologically oriented study.

The F'SATI benefits are **clearly aligned with national policy** which aims to increase the number of students and supervisors, to improve the quality of education and to promote international exposure. The **sustainability of F'SATI** depends very much on the recognition of a specific focus on postgraduate study by the Universities of Technology. The specific choice as to which of the two plans (viz. a PG school of a department or an Institute across departments) is the better, is not certain. Maybe the one can develop into the other? The important point is that the funding is linked directly to the achievements in research and in student numbers and throughput. The sustainability depends on student numbers and availability of supervisors, as well as on the formal commitment of the partners on the longer term. Students need to know early in the year whether courses will be presented and whether they will be funded.

When looking at the financial presentation of Income and Expenditure, it appears that F'SATI is already sustainable albeit maybe on a lower level than is desired and without some parts of the support it would be lower than it operates presently. However, it is argued here that it should be supported to continue to reach higher levels and that the richness of its content, as in the MSc, should be kept in any new system. In order to really judge the additional financial support required one would need a business plan in which more details are given on for instance average income and expenditure per student etc.

Some comments by Dr Solomon Jacobs, Assistant Dean of the Faculty at TUT who heads the technology station and is funded by TIA, are in order here. He sees that there is a distinct advantage in a dual degree and to get a degree in France and to learn the French language and about its culture. The French degree has a good standing in industry. The French had an influence in building a platform for knowledge. For instance the successful project to build a solar car within the faculty, had gained from the EU and French experiences. The graduates from F'SATI find employment in higher education and science councils. There is a shortage of PG supervisors in universities, especially UTs. In this way the French professors continue to bring skills into South Africa. Currently there is insufficient local capacity for post-graduate supervision. The French professors supervise many students and lead them to publish international papers and present their work at conferences. Another important point is that F'SATI helps to set a focus on specific topics.

F'SATI possesses considerable publicity material which it should continue to produce and distribute. Nevertheless, it is not known as widely as it deserves to be. Its publicity needs more attention, but the best publicity is to have happy and satisfied students and alumni. It has many of these but needs many more. The self-evaluation document is generally well written and is impressive. It includes a lot of detailed information. (See attached.) The student numbers look good but one would like to have seen an in-depth analysis of the throughput. Also specific performances and highlights which clearly exist could have been given more prominence. Another important aspect of sustainability and of achieving excellence is a good team spirit and a management that addresses points of dissatisfaction and conflict quickly, fairly and completely.

7. Recommendations

- 7.1. It is recommended that F'SATI continues to receive support from DST/NRF and from the French sources for its academic mission.
- 7.2. It is further recommended that the two Universities of Technology continue to employ F'SATI for the development of their post graduate courses and their research, and that funds are provided for the purpose.
- 7.3. It is recommended that the main elements of the unique structure, of combined French and South African courses of F'SATI, is retained when the new degree structure is implemented irrespective of whether it will be within a dual or a joint degree system. The system should still enable students who start with technikon-type courses to later switch to a more

academic stream if they are so inclined. Close contact with DHET in such matters is recommended. Also an invitation to a DHET representation on the F'SATI board is recommended.

- 7.4. It is recommended that careful extension of F'SATI be considered by the inclusion of new member institutions in both countries on a case by case basis.
- 7.5. In the same way the extension to a broader set of topics should be considered with the proviso that some specific cohesion is retained.
- 7.6. It is recommended that student numbers be increased substantially through communication and marketing, and that the throughput needs to be improved, and that it be recorded and analysed more closely.
- 7.7. With the understandable restrictions of NRF on bursaries for foreign students, F'SATI should start a new initiative to secure specific sponsorship for well qualified African students, so that it can do justice to its stated mission of contributing to African development.
- 7.8. It is recommended that sponsorship be sought for many more advanced research students to visit French sister institutions, particularly for those students who have no other means to do so.
- 7.9. In complex organizations tensions and disagreements are bound to occur. It is recommended that specific structures to resolve these quickly are put in place.

Increased student numbers are essential for sustainability and for succeeding with most of the above recommendations.

Appendices:

Appendix 1



TERMS OF REFERENCE

FOR THE EVALUATION OF THE

FRENCH SOUTH AFRICAN TECHNOLOGY INSTITUTE (F'SATI)

2017

1. Assignment Title

Review of the French South African Technology Institute (F'SATI) for the period January 2008 to December 2015.

2. Background

The establishment of the French South African Technology Institute (F'SATI) flowed from country level agreements between France and South Africa. Following the establishment of the Department of Arts, Culture, Science and Technology (DACST), a Cooperation Agreement in the fields of education, culture, sport, science and technology was entered into between the Government of the Republic of South Africa and the Government of the French Republic on 04 November 1994. The agreement was valid for a period of five (5) years, with a provision to continue beyond this period by tacit agreement between the two parties. Following this agreement, on 06 September 1996, a financial protocol was entered into between the two parties.

On 28 February 2008, the two parties entered into an Agreement on Scientific and Technological Cooperation for the mutual benefit of the two countries. The Agreement was signed by Minister Mosibudi Mangena, in his capacity as Minister of Science and Technology, on behalf of the Government of the Republic of South Africa. This agreement incorporated the establishment of a Joint Committee on Scientific and Technological Cooperation between the two (2) countries for the implementation of the agreement. The agreement was valid for a period of five (5) years, with a provision to continue beyond this period by tacit agreement between the two parties.

2.1. Establishment of F'SATIE at Technikon Pretoria

On 17 April 1996, a Memorandum of Understanding (MoU) was entered into between the Government of the French Republic, the Foundation for Research and Development (FRD) (a predecessor to the NRF), the Paris Chamber of Commerce and Industry (CCIP) and Technikon Pretoria for the establishment of the French South African Technical Institute in Electronics (F'SATIE). The objectives of the Institute were as follows:

- To be a Centre of Excellence (CoE) promoting research and development to support technological development and the transfer of technology, especially in the wealth creating fields;
- To provide post national Diploma (ND) training and continued education in the fields of electrical and electronic engineering with emphasis on telecommunications and automation;
- To teach the French language within the language centre of the Technikon Pretoria; and

- To offer additional classes to prepare for the examinations leading to the French Certificate for Scientific and Technological professions of the CCIP.

A Memorandum of Agreement (MoA) was then entered into between the Technikon Pretoria and the CCIP for the creation and management of F'SATIE for a three-year period expiring on 12 January 2003. A further three-year agreement extending to 15 December 2006 was entered into between the two parties for the continuation of F'SATIE. Added to the objectives were the following:

- The offering of postgraduate qualifications, viz. (Bachelor of Technology (B Tech), Master of Technology (M Tech), Doctor of Technology (D Tech) and continued education in the fields of electrical and electronic engineering, with the emphasis on telecommunications and automation;
- The Institute shall help to promote active cooperation between the French and South African industrial companies;
- The Institute shall promote the exchange of students and lecturers with other countries; and
- The Institute shall be involved in research and development, in promoting excellence in identified priority areas, and in attaining the necessary critical mass of expertise with the support of commerce and industry and the public sector.

2.2. F'SATIE positioning in a restructured Higher Education landscape

In 2004 the South African Higher Education System underwent a major restructuring that gave rise to three categories of institutions which are Universities, Comprehensive Universities and Universities of Technology. The Pretoria Technikon was merged with the former Technikon Northern Gauteng and Technikon North-West to form the Tshwane University of Technology (TUT). During this merger, F'SATIE remained on the same institutional campus of the former Technikon Pretoria.

The new institution (TUT) entered into a new five-year MoA with CCIP on 02 November 2007. This agreement outlined the following:

- Objectives for F'SATI;
- Contributions and obligations of the CCIP, DST and TUT;
- Composition and role of the Management Board; and
- The role and responsibilities of the Institute Director and Scientific Director.

2.3. Expansion of F'SATI partners

The F'SATIE partnership was extended to include a second F'SATIE node at the Cape Peninsula university of Technology (CPUT) with the signing of a MoA between TUT, CCIP and CPUT on 28 February 2008, in the presence of the French President Nicolas Sarkozy. This coincided with the signing of the Agreement on Scientific and Technological Cooperation between the Government of the Republic of South Africa and the Government of the French Republic.

On 30 November 2012 a new three-year agreement was entered into between TUT, CCIP and CPUT with the rebranded F'SATI. The governance structure provided for under this agreement includes an Executive Management Board, an Advisory Management Board, an Executive Committee, Scientific Director and Node Directors.

The Key Performance Areas (KPA) for the Scientific Director are: (i) number of staff who have improved their qualifications; (ii) mobilisation of funds from agencies, industry and partnerships; (iii) accredited and non-accredited research outputs; and (iv) number of Master's and Doctoral students.

The KPAs for the Node Director are: (i) financial sustainability of the node; (ii) critical mass in terms of staff and students; (iii) student throughput as well as research and innovation outputs; and (iv) national and international visibility and impact of the node and the institute. The agreement also lays out a process to be followed for the incorporation of additional South African public universities as additional F'SATI nodes.

An additional French partnership was formalised on 01 July 2013 through an Addendum to the MoA of 30 November 2012. This agreement between F'SATI and Paris Est – Cretell (UPEC) paved the way for the part-time secondment of a Professor to F'SATI by UPEC and for UPEC to be included on the Executive Management Board of F'SATI.

Currently, F'SATI is constituted through a MoA between four institutions, namely TUT, CPUT, UPEC and CCIP. This three-year agreement was signed on 11 December 2015 in the presence of the Counsellor, Head of Cooperation and Cultural Affairs of the French Embassy.

3. Scope

The evaluation will include an overall retrospective view of the performance of F'SATI inclusive of all of its contractual partners, over the period January 2008 to 31

December 2015, with emphasis on the activities, outputs, outcomes and impact of the two nodes at TUT and CPUT, respectively. The review report will include recommendations regarding the future strategy and sustainability of F'SATI.

4. Evaluation Dimensions

4.1 Achievement against F'SATI objectives

The current objectives are as follows:

- The Institute shall be a national asset contributing to the creation of knowledge and prosperity and the transfer of technology in the Southern African region by establishing collaboration with other higher education and research institutes;
- The Institute shall be an internationally recognised African education, research and innovation centre, located at the University and other partners, sustaining a technology incubation facility, supporting South African entrepreneurs, conducting research and offering Masters and Doctoral degrees in Electrical and Electronic Engineering;
- The Institute shall promote the exchange of students and lecturers with other countries including French overseas departments such as La Réunion, shall be open to students from other countries with an emphasis on Africa, and shall promote cooperation between French and South African industrial companies;
- The Institute shall help to promote active cooperation between French and South African industrial companies. The Institute shall strive to promote French Technology in its activities;
- The Institute shall promote the exchange of students and lecturers with other countries; and
- French language courses shall be offered in collaboration with the "Alliance Française".

4.2 Human Capacity Development

This should include:

- Critical mass in terms of staff and students;
- Number of staff who have improved their qualifications; and
- Student throughput at the B Tech, Masters and Doctoral levels including the French-SA dual degrees.

4.3. Research Outputs

This should include:

- Accredited research and innovation outputs; and
- Non-accredited research outputs.

4.4. Financials

This should include:

- Investments from TUT and CPUT nodes and from all F'SATI partners;
- Mobilisation of funds from agencies, industry and partnerships; and
- Financial sustainability of F'SATI.

4.5. Impact of F'SATI

This should include:

- National and international visibility of F'SATI; and
- Impact of F'SATI and the TUT and CPUT nodes on research and innovation and on human capacity development.

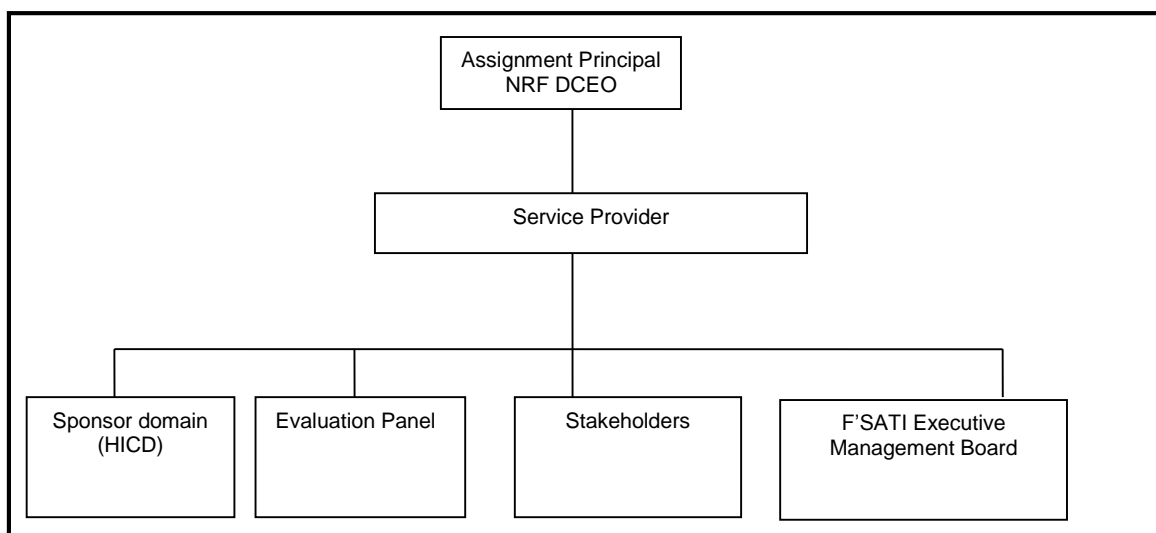
4.6. Governance

This should include evaluating the appropriateness, functioning and effectiveness of:

- The F'SATI Executive Advisory Management Board;
- The management of F'SATI at TUT and commitment to the F'SATI agreement; and
- The management of F'SATI at CPUT and CPUT commitment to the F'SATI agreement.

5. Key Role-Players

The evaluation role-players are presented in the illustration below, followed by the narrative which elaborates on the roles of the respective role-players.



5.1. 5Assignment principal

The Assignment Principal (AP) is the NRF represented by the Deputy CEO: Research and Innovation Support and Advancement (RISA). The role of the AP will be to:

- Approve the proposal;
- Approve the budget;
- Approve the members of the review panel;
- Consider and suggest suitable interviewees for the review panel;
- Approve the review programme and time frame for the review process;
- Ensure that the review report addressed the Terms of Reference (ToR);
- Accept the report submitted by the review panel;
- Accept the response of the F'SATI Executive Management Board to the report; and
- Submit the F'SATI Review Report and Executive Management Board response for NRF approval.

5.2. Service provider

The Reviews and Evaluations (RE) Domain will provide the management and secretariat for the review process. Its responsibilities will be to:

- Conceptualise the proposal for the review based on the background provided by Human & Infrastructure Capacity Development (HICD);
- Develop the ToR based on the approved proposal;
- Facilitate the identification and selection of potential evaluators;
- Prepare letters of invitation for the approved members of the review panel for the AP's signature and distributing these;
- Develop a programme for the review, including a budget;
- Coordinate and manage the entire review process, including logistics;
- Provide support to the review panel;
- Source the necessary documents stipulated in the ToR with the assistance of HICD and make these available to the review panel at least four weeks prior to the commencement of the review programme;
- Receive the final report by the review panel and submit it to the F'SATI Executive Management Board for:
 - The identification of factual inaccuracies where after RE will forward these to the review panel for consideration and possible amendment of the review report;
 - A strategic management response.
- Submit the final review report and management response to the review report to the Assignment Principal for NRF acceptance and possible further action.
- Place the final review report and response on the NRF website within one month of acceptance of these documents by NRF management and after confirmation with the Assignment Principal.

5.3. Sponsor domain

In this case the Sponsor Domain is HICD. Its role, *inter alia*, will be to:

- Provide concise information on the funds received and spent in terms of F'SATI per year, also per agreement with TUT and CPUT per year;
- Provide RE with the names and contact details of potential reviewers to be approached by RE with reasons for the suggestions on the template to be provided by RE;
- Supply names and contact details of stakeholders that should be interviewed by the review panel and rank them in order of importance on the template to be provided by RE; and
- Provide a list of the most important documents that are considered to be essential reading and additional reading for the reviewers to RE for inclusion in the ToR. HICD needs to supply RE with electronic versions of the documents that are not in the public domain.

5.4. Evaluation panel

A panel of three comprising two experts from abroad and one from South Africa with appropriate experience and skills will be appointed. The sourcing of suitable reviewers will be of critical importance taking into account areas of specialisation and expertise, race, gender and country of origin. RE will rely on the cooperation of the AP and HICD and others in this regard. One of the panel members will be appointed as Convener and will be responsible for ensuring the delivery of the report.

The responsibilities of the reviewers will be to:

- Familiarise themselves with the ToR and make recommendations for changes to the ToR, where this may advance the achievement of the objective of the evaluation;
- Conduct the on-site evaluation which includes:
 - Reading and interpreting the documents listed as “Essential reading” in the ToRs and reading those listed as “non-essential” if they see the need and have the time;
 - Interviewing the stakeholders to source information that may assist them in their task of addressing the ToR;
 - Giving a verbal feedback of their findings and recommendations to interested parties at the conclusion of the on-site review programme;
- Draft and finalise the Evaluation Report per the approved schedule, which should include:
 - An executive summary;
 - Background to the evaluation;
 - Evaluation questions that were addressed;
 - Key findings;

- Recommendations;
- Conclusions; and
- Annexures (e.g. ToR, persons interviewed, etc.).

It will be the responsibility of the Convener of the evaluation panel to:

- Facilitate the interview sessions in a manner that enables participation by all;
- Manage the activities of the evaluation panel such that they align to the ToR and Programme for the Evaluation;
- Drive the consolidation and production of the evaluation report;
- Consider any factual inaccuracies in the evaluation report communicated by RE on behalf of HICD, if applicable, and possibly amend report; and
- Deliver the report to RE by the agreed date.

5.5. Stakeholders

The stakeholders to be interviewed by the review panel will be selected from the suggestions by HICD, the AP and RE.

The interviewees will be expected to:

- Attend the interviews in person where possible, otherwise by video or telephone conference;
- Share their knowledge with the reviewers on the subject/s under review; and
- Be frank, honest and objective in their interaction with the reviewers.

5.6. F'SATI Executive Management Board

- Compile a self-evaluation report for the period under review approved by the Deputy CEO: RISA for RE's transmission to the review panel, preferably six weeks prior to commencement of the review programme. The report should address the ToR and should not exceed 40 pages with annexures;
- Check the review report for factual inaccuracies by the deadline per the project schedule; and
- Compile a strategic management response to the review report within two (2) weeks of receipt of the review report.

6. Deliverables

The following are the deliverables expected from the various role-players:

No.	Deliverable	Lead Responsibility
Deliverables into Evaluation Exercise		

1	Proposal	RE
2	Meeting documents	RE
3	Self-Evaluation Report	Director: F'SATI
4	Reading material for Evaluation Panel	HICD
5	Stakeholder nominees	HICD
6	Evaluation Panel member nominees	Assignment Principal
7	Panel Chairperson	Assignment Principal
Deliverables from F'SATI Evaluation		
8	Evaluation Report	Evaluation Panel
9	Response to the Evaluation Report	Executive Management Board
10	Submission to DST	Deputy CEO: NRF

7. Reading Material

7.1. Essential Reading

- Self-evaluation report by F'SATI Director.
- Report on the review of the F'SATI Postgraduate Programme in Satellite Engineering at Cape Peninsula University of Technology (CPUT), 2013.
- Management response to the above report.
- Annual reports for the period 2008 to 2015.
- Cooperation Agreement in the fields of education, culture, sport, science and technology entered into between the Government of the Republic of South Africa and the Government of the French Republic (04 November 1994).
- Agreement on Scientific and Technological Cooperation for the mutual benefit of the Government of the Republic of South Africa and the Government of the French Republic (28 February 2008).
- Memorandum of Understanding between the Government of the French Republic, the Foundation for Research and Development (FRD), the Paris Chamber of Commerce and Industry (CCIP) and Technikon Pretoria for the establishment of the French South African Technical Institute in Electronics (F'SATIE) (17 April 1996).
- Memorandum of Agreement between Tshwane University of Technology (TUT) and CCIP (02 November 2007).
- Memorandum of Agreement between TUT, CCIP and CPUT (28 February 2008).
- Memorandum of Agreement between TUT, CCIP and CPUT (30 November 2012).

- Addendum to the Memorandum of Agreement of 30 November 2012 (01 July 2013).
- Memorandum of Agreement between the four institutions namely TUT, CPUT, UPEC and CCIP (11 December 2015).

7.2. Optional Reading

- F'SATI Business plans.
- F'SATI Strategic plans.
- NRF Strategic Plan 2015 – 2020.
- National Development Plan Vision for 2030 (Executive summary and Chapter covering Education).
- South Africa's National Research and Development Strategy.
- Human Capital and the South African Knowledgebase.
- OECD report on the National System of Innovation in South Africa.
- Ten-year Innovation Plan of the Department of Science and Technology.
- South Africa's National Space Policy.