

INESC-TEC

Feedback

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Recommendation 1- TRLs

- TRLs cover the footprint of INESC TEC activities and can be used as an **innovative management metric** for INESC TEC performance. However, they need to be presented in context (i.e. with a description of how projects are mapped to scale, which already exists).
- INESC TEC needs to find a way to correlate TRLs with **different quality scales** appropriate for each of its 4 major divisions indicated.
- It is easy to use the current publication metric to low TRLs accepted by FCT. The high TRL scale can use broad societal impacts (# jobs created, # start ups, \$). But the challenge is how to quantify quality at the intermediate TRL levels.
- This may lead to very useful multifaceted performance analyses dependent upon the purpose (i.e. TRLs 1,2 to FCT, TRLS 8,9 to ME)

Recommendations 2 - Scientific Council (SC)

- Since 2012 the SAB states that the SC needs to be reformulated, but nothing happened, perhaps because of its statutory role!
- INESC TEC should create an institute wide **Scientific Board (SB)** that will present a multi-year road map for its scientific portfolio.
- The goal is to integrate the history of INESC TEC competences and apply collective steering and strategic thinking to the institute research agenda, which is also enabled by the TRLs.
- SB receives mandates from the BoD, and composes the scientific profile of INESC TEC, which is currently implicit (listing of areas and projects). Its function is advisory and coordinating to avoid blunt redundancies (every center is doing machine learning!), identifying gaps, phasing out areas and creating new ones.

Recommendation 3 - Clusters

- It is quite apparent to the SAB that the Cluster organization already brought synergisms to the areas and enriched INESC TEC competitiveness in different parts of the TRL spectrum. So INESC is **already benefiting from them**, but Clusters also raised new issues:
- Now, there are two Robotics groups that split an area that had perceived coherence. If this is intentional, it should be justified.
- The power and energy Cluster has a footprint that overlaps too much with a single Center (energy), so it is not benefiting from external synergisms.
- It is clear to the SAB that Clusters and Centers exist at two different levels: Centers are essential for the daily activity of INESC TEC, while clusters are essential to strengthen **INESC TEC as a high caliber science based institution**.

Recommendation 3 – Clusters (cont)

- Under the oversight of the Scientific Board, Clusters can lead to a fresh presentation of INESC TEC by scientific competences (i.e. end to end software solutions, robotics, machine learning, industrial automation), which is important for a science based institution.
- Clusters are **already** very useful in the high success rate of EU funding because they implement a win-win strategy (robotics with new sensors from CAPs, while attracting development funds to CAPs). And there is no reason to assume that it will stop here.

Recommendation 4 -Tec 4 & Clusters

- The Tec4 is a new addition to the INESC TEC organization and couples explicitly the market with the scientific portfolio of the Clusters.
- The **push-pull** between these two entities is very innovative. The Tec4 initiatives can be thought as a way of efficiently utilizing human resources by implementing a **transient, one to many mapping (the project)**, between Clusters and Centers.
- However, the Tec 4s still don't have a metric for success (although the tendencies shown were interesting).
- The SAB thinks that the **Industry Council** in the Tec4 is essential for its role because it will bring the user domain metric to evaluate progress.

Recommendation 4 -Tec 4 & Clusters (cont)

- The Tec4 areas are also a **new window** to INESC TEC activities that can be easily understood by the public/government and should be explored as such.
- Tec4 can also be applied to other domains of activity and lead to new business models.
 - For instance, we can think of a **Tec4 Academy**, which can focus on professional education, new skills (like clean room) with courses every six months that can be directly funded by the Ministry of Education.
 - Why not develop Tec4 for Financial Services, Insurance, etc. which will bring new customers to INESC TEC?
- Moreover, the Tec4 can also be used to advertise INESC TEC strengths: we write successful proposals at the TRL1 level, because we are also experts at TRL9 level. Hopefully, this will also apply to papers someday!
- Finally, Tec4 should be prominently displayed in the website and serve to fix the difficulty of organizing the information in the website.

Recommendation 5 –Format of the visit

- Please do not model the format of the next FCT review by the format of this meeting....
- It is impossible to see INESC TEC at a deep level in a two day visit.
- The goal should be to present the global picture of the institution and its elements (science organization in clusters, TEC 4 role, services, tech transfer) and then just **highlight** research projects in centers.
- Poster Forum is successful, and then you can highlight research projects in the visits to Clusters (1 page QUAD CHART format)

Recommendation 6 –Gender sensitivity, etc

- The SAB noticed that all the members of BoD & SAB are male, as well as the science leaders of the Clusters and Centers.
- Although not mentioned explicitly during the SAB meetings, the following concerns were raised in discussions with the SAB Chair.
 - The professional research career personnel duties should not include supervision of students
 - The slowness of the BoD response to internal requests may hinder the effectiveness of INESC TEC.
 - The high turn around of personnel in the services may mean that career promotions should be revisited.
- We suggest that these issues should be looked at.

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Directors Questions

- No time to address these questions, but we will.....

Cluster Specific Recommendations

Power and Energy

Observations

- Preliminary work on mapping common research lines and capabilities with associated centers, resulting in 13 research lines that are not interrelated
- Bottom up incremental approach based on a proposal from CPES to the potential associated centers does not fully utilize the expertise of the other Centers (because it biases the responses).

Recommendations

- Adopt a more innovative and high level approach with contributions from external views of stakeholders and more balanced with the rest of associated centers
- Anticipate science breakthroughs in 10 years term
- Present a storyline aligned with the major challenges in the energy area; for instance climate change leads to an integrated approach energy and climate, with future totally decarbonized power systems, where all the strategic research lines can be allocated and coordinated (take the European agenda as example)

Cluster Specific Recommendations

Computer Science

- Impressive topical coverage but should add “embedded computing”
- Maintain good aggregate performance indicators
 - Balanced diversified funding portfolio
 - Good TRL profile
- Capitalize on potential for further improvement
 - Leverage “surplus”
 - Leverage synergies!!
 - Leverage downstream (i.e. >TRL 5, TEC4) opportunities
 - Use TRL 5-9 activities to generate TRL1-4 project proposals (virtuous cycle)
- Uniformly sustain high-quality publication record
- Define and meet high-quality TRL5-9 performance criteria/metrics
- Continue to develop and leverage cross-center funded projects and activities
 - “Rising tide lifts all boats”!!
 - Impressive levels of funding
- Develop, convey and promote scientific profile/image of cluster
 - Areas of unique capabilities, recognized leadership, critical mass, impactful services and products, ...

Cluster Specific Recommendations

Networked Intelligent Systems

Observation: NIS was formed in 2014 and the Advisory Board observes its activities for the first time as a cluster.

- There is an intrinsic synergy between centers within the cluster.
- The Cluster has already enabled a few collaboration projects among the centers.
- CBER could become a new platform for new collaborative projects.

Cluster Specific Recommendations

Networked Intelligent Systems

Recommendation:

- The Cluster would benefit from organizing seminars for researcher to know of other activities and capabilities within the cluster.
- The Cluster could encourage development of large collaborative projects amongst its centers.
- The microfabrication facilities managed by CAP could be used as a resource for all centers within the cluster.

Cluster Specific Recommendations

Industry & Innovation

Observations

This Cluster is currently developing an understanding of its Capability Matrix and is taking advantage of the synthesis to expand research and funding possibilities

Cluster is composed on its four different centers, which could support each other to reach out for further opportunities

- two well established (CESE and CRIIS), two new ones (CEGI and CITE)

The internal project “shaping the future” is a good approach to focus the whole team

The idea of mid term allocating of resources seems to be very promising

- the five collaboration axis give a mid term guideline for the teams

Actually the Cluster has an unbalance in regards to Publications

- CITE and CRIIS are behind CESE

Some areas are not covered by contracted Staff, which could cause problems in regard to an continuous knowledge expansion

The Cluster includes a highly experienced and motivated Management team

Cluster Specific Recommendations

Industry & Innovation

Recommendations

- Be careful with the 5 collaboration axes, this causes additional complexity
- First define very clearly, what the cluster aims at, then redesign the centers and finally think about feasible collaborations axes
 - i.e. What is the role of CRIIS in relation to CESE and CEGI?
 - Why is it useful to integrate CITE in the cluster portfolio
 - Take care on the broadness of CEGIs main areas of application
- Use the actual Europe/ World wide activities in Industry 4.0 and Smart services
- Foster on the clusters high potential regarding decision support, Predictive analytics and Business intelligence through big data

Cluster Specific Recommendations

Industry & Innovation

Recommendations

- Consider an additional business model to better support Cluster concepts, strengths, and contributions
 - Example: Industrial Research Collaborative opportunities involving multiple industrial members with annual fees
 - Work with Collaborative members to identify research opportunities
 - Use this long term funding model to fund contract research positions, post-doc positions, etc.

Centre Specific Recommendations

CPES

Observations

- Steady increase in research staff, grant holders and financed projects, but not in publications
- High rate of success in obtaining European projects (FP7 & H2020)
- Added value from new post-docs contracted as INESC researchers
- New organization in 5 areas well interconnected and with a flexible structure

Centre Specific Recommendations

CPES

Recommendations

- Define area coordinator responsibilities. They should play a more strategic role at scientific and project management levels
- Increase the number of publications in journals. Annual control of published papers by PhD students and define a target of papers for PhD theses conducted at INESC
- Define the professional career for permanent INESC research staff who are not faculty members
- Integrate the smart grids laboratory in the formal structure of CPES and report added value and indicators of activity

Center-Specific Recommendations

CSIG

- Good strategic goals addressing current weak aspects of center
 - Improve research impact, publications, cooperation, balance and sustain tech transfer
- Emphasize center strength and unify activities: production systems that are
 - End-to-end
 - Robust and
 - User-centered
- Increase TRL1 and TRL2 activity
- Leverage rich virtual environments research facilities to pioneer unique end-to-end user-centered systems
- Leverage and amplify activities in embedded systems
 - Naturally associated with virtual environments but so far unexplored
 - A rich target for software engineering methods
 - A current gap in the Inesctech scientific portfolio
 - A timely area with many opportunities (IoT, smart cities, smart sensing, pervasive intelligence!! ...)

Centre Specific Recommendations

HASLAB

Observations

- Excellent achievements in basic science, engineering, and applied research
 - As demonstrated in important and prominent papers and tools
 - Shown through FCT and FP7/H2020 projects
- Somewhat non-uniform internal distribution of these achievements
 - SW Engineering (more FCT-sponsored) differs from Distributed Systems and Cryptography (more EU)

Centre Specific Recommendations

HASLAB

Recommendations

- Continue with a strong scientific record
- Invest in international visibility (through events)
- But consider also impact on local industry, via initiative like a new TEC4 for ICT, in digital services/finance/insurance
 - More consistency in TRL-balance across topics of Center
- Engage/align with other centers through the HASLAB-specific expertise (distributed data & cryptography/security)

Centre Specific Recommendations

LIAAD

Observations

- LIAAD presents excellent productivity in terms of journal and conference publications with a good balance between both
- Their publications have received a large number of citations, especially those related to data streams
- The degree of internalization is very high and they have been very active and successful in getting grants from national and international agencies
- Their topics of research cover a large number of machine learning topics, i.e., data streams, anomaly detection, inductive logic programming, text mining, ...

Center Specific Recommendations

LIAAD

Recommendations:

- The “data mining” section of LIAAD depends very much on the topic of “data streams”. Try to avoid this situation
- To provide data science advice, expertise and assistance to the rest of centers when needed
- To adapt machine learning methods to big data scenarios
- To offer short introductory courses in machine learning and in advanced statistics to industrial patterns

Centre Specific Recommendations

CRACS

Observations

- Languages and Distributed Computing continues to be an area of international excellence, but very strong competencies have been added in Security&Privacy and in Big Data related techniques. The team remains cohesive and delivers relevant research.
- Sources of funding are now more diversified, and synergies with other centres have strengthened the centre's profile.
- The engagement with organisations such as INCM (vCardID project) and GSN gives the centre high visibility and its impact has very wide reach. The on-going contacts with VisionBox are a recognition of the centre's expertise in algorithms, code optimisation and data privacy.

Centre Specific Recommendations

CRACS

Recommendations

- Continue to produce excellent research and strengthen the publication record.
- Follow-up on the opportunities that the engagements mentioned before have created for higher levels of TRL (spin offs, patents, and commercialisation of research outputs) and to strengthen the competencies of the team at those levels.
- Use the experience gained in working with other centres to identify complementarities and gaps that could be filled through an alignment of research strategies, especially in relation to cybersecurity and Big Data.
- Use the increase in post-docs to help offset the high overhead incurred by the senior members due to their university commitments.

Center Specific Recommendations

CTM

Observation:

- CTM Publications in indexed journals is almost constant, publication in conferences is decreasing but this appears to be a deliberate INESC TEC decision
- CTM covers a broad area and succeeds in developing excellent results – both in science and innovation – in specific niches
- CTM has a good balance between R&D and Exploitation

Center Specific Recommendations

CTM

Recommendation:

- CTM needs to develop a more strategic views of where to invest
- Absent of more structural interventions, CTM should develop ever closer contacts with CSIG, specifically in Computer Graphics, to stay relevant in multimedia

Center Specific Recommendations

CAP

Observation:

CAP has successfully incorporated the recommendations of Advisory Board;

- The Center has refocused its efforts on “SENSORS” with new emphasis on Chem/Bio in addition to physics sensors.
- The micro-fabrication infra-structures are being used to serve the major activities of the Center.
- Interdisciplinary research projects have increased.

Center Specific Recommendations

CAP

Recommendation:

- The Center would benefit from more collaborations among the center's members.
- The Center would benefit from more collaboration with other centers within the INESC.
- The Center would benefit from targeting large European projects for funding and collaboration with researchers in other countries to increase its chance of success.

Center Specific Recommendations

CBER

Observation:

CBER joined INESC in 2014 and the Advisory Board observes its activities for the first time.

- The Center is very active in all areas of Biomedical Imaging, Bio-Instrumentation and Neuroengineering.
- The Center has a good mix of short-term and long-term projects.
- The Center is enriched by its national and international collaborative partners.
- The Center funding is appropriate for its undertaking.

Center Specific Recommendations

CBER

Recommendation:

The Center's knowledge of the field/understanding of the problems is an institutional resource that should be used to develop

- Major research programs in collaboration with sensor activities,
- Major research programs in collaboration with researcher in the areas of imaging and image processing,
- Understanding of commercialization efforts/challenges in the area of biomedical devices.

Center Specific Recommendations

Advanced Autonomous Systems

Observation:

CRAS is devoted to field robotics (marine robotics)

- High success attracting highly competitive projects
- Strong Expertise in Mechatronics, Systems Integration and Field Robotics
- Synergies with other centers (f.i.CAPS) are actually happening within the cluster as a win-win approach

Center Specific Recommendations Advanced Autonomous Systems

Recommendation:

- The centre has potential to increase the number of journal publications (f.i. forwarding some contributions to journals instead than to high impact conferences).
- Its is recommended to re-inforce some of their research lines to be more easily recognisable internationally (What is CRAS excellent at?)

Center Specific Recommendations

CESE

Recommendation:

- CESE is the strong backbone of the Cluster, with a highly motivated group of professionals
- think about an approach in the field of “Industrial Analytics” to foster on Industry 4.0
- After such a large expertise in the shoe industry, a white paper on “Digitalisation of shoe industry “ is missing
- what about enlarging the Centers expertise in Industrial business software versus Platforms and multi layer approaches for further digitalisation in its core business areas
- actual opportunity through networked industries of the future should be underlined by appropriate activities, perhaps the center needs some new wordings and branding like:
 - horizontal and vertical integration of SCs
 - new technologies for linked industries
- rethink and possibly reconfigure the future research guidelines, i.e. business analytics and decision support in relation to CEGIs positioning

Center Specific Recommendations

CEGI

Recommendation:

- the Center has an excellent starting point for actual recommendations in Research and industry, but it should focus more in order to not lose control on its own spread of competencies
- the field of “service design” needs calibration with the international state of the art
- CEGI has a profound potential to collaborate with other Centers, if it focuses on its expertise around Big data and data science.
- Foster the expertise on predictive and Preventive maintenance, this area keeps a lot of potential in both, scientific and industry research
- Keep an eye on the EU activities around Blockchain and data driven services
- possibly reduce the application areas,

RETAIL, HEALTHCARE, MANUFACTURING, MOBILITY & ENERGY is too large to be recognized as an expert group

(without enough contracted people)

Center Specific Recommendations

CITE

Observations

- Active Projects
- Enterprise Europe Network Member
- Let-In Catalyst supports entrepreneurial activities
- Recognition (by Center participants) of benefits of INESTCTEC in generating new topics and broader understanding of potential applications

Center Specific Recommendations

CITE

Recommendation:

- CITE should rethink on intensifying on
 - Innovation & VC, Innovation & Start ups, Innovation & Digitalisation/ IOT, Innovation & “Disruption”
 - Interdisciplinary (research) projects should be increased.
- The Center would benefit from more collaborations among the Cluster’s members.
- Think about an “school” –approach, like school of management, which combines all Cluster knowledge and turns it into “Money for qualification”
 - perhaps even INESC Approach for “school of...” is thinkable
- Think about a Industrial Affiliate Program

Center Specific Recommendations

CITE

- Industrial Affiliates (IA) could be developed in several areas of INESC TEC to provide long term (multi-year) funding for research topics of medium and long term interest of industrial members while also providing stable funding for research staff and students.
- Affiliates programs can also provide graduates of the program who are capable of knowledge and capability transfer to industry
- IA can also enable rapid response to research funding opportunities requiring university/industrial collaboration.
- IA Allows significant long term industrial funding for problems/opportunities facing industrial concerns not possible with single company funding sources . (Potentially multi-million euro source over time.)
- IA's "inform" Academic communities of significant problems facing industry.

Center Specific Recommendations

CRIIS

Observation:

CRIIS is devoted to industrial and service robotics

- Successful attracting projects
- Human resources have grown. The centre has a significant size in terms of Phd.
- Number of journals and conference papers seems adequate.

Center Specific Recommendations

CRIIS

Recommendation:

some question need to be answered

Why, besides history purposes is CRIIS belonging to the Cluster,
what is it's USP for the Cluster?

How is the relation to be defined to the other INESC wide activities in this field

- There is an possible USP in the area of industrial Logistics, but this should be clarified
- Possible strength in localisation, sensing and mobile manipulation could help on focusing
- ...and even rethink a possible allocation in the Robot specific domains, to get more speed through focalisation

For the FCT Review it would be good to differentiate the scope of CRISS wrt CRAS as well as why they are in different clusters

Thank you for the hospitality

Very interesting (but heavy) 2 days!