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ENABLING A CULTURE OF RESEARCH EXCELLENCE AT THE SAAO

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1. INTRODUCTION

A culture of research excellence is an essential ingredient for a thriving and sustainable research institute. Therefore the research culture at the SAAO should ideally be properly managed and monitored if we (the SAAO) are to remain an attractive and internationally relevant institute for astronomical research.

This document reports on the systems thinking exercise carried out at the SAAO on 23rd August 2019. The objective of the exercise was to identify the key components in order to answer the question: "what is required for a culture of research excellence at the SAAO?"

The exercise consisted four phases, starting with an initial short free flow discussion on the meaning of research culture, followed by an Ideation phase, an Interrelationship Phase and, finally, the Results and Conclusion phase. Photographs of the different phases of the can be seen in the appendix.

2. RESEARCH CULTURE

Several perspectives on the understanding of "research culture at the SAAO" and what is meant by "excellence" were put forward. These included:

- It is the environment in which researchers work in.
- It is how external researchers perceive the SAAO, e.g. a welcoming place to do research, has well known research groups ... or not.
- Engaged and active research groups and leaders ... or not.
- Friendly or not.
- How researchers behave towards one another, e.g. competitive or in teams/groups.
- A common purpose or individual research agendas.

This free flow discussion served only to set the context of the exercise. More perspectives and ideas were put forward in the Ideation phase which are listed below:

3. IDEATION PHASE

The Ideation phase consisted of a brainstorming session where as many ideas or solutions as possible were listed that could answer the question: "what is required for a culture of research excellence at the SAAO?"

From the 12 participants there were approximately 60-70 solutions or ideas put forward. 12 appropriate groupings were identified. These are listed and unpacked below together with a ratio which refers to the input and output tallies as described in the interrelationship section below:

Leadership 0:11

- Expert leaders of research areas and groups.
- Senior researchers lead by example – attend colloquium, talk science
- Research mentoring by senior researchers – including non-research skills transfer
- Internal quality control – senior researchers give constructive feedback on publications.
- Experts at navigating the funding and grant landscape.
- Senior researchers prioritizing and promoting science focus areas.

Vision and strategy 1:10

- Shared vision
- Shared research goals
- Discuss and develop and astronomy strategy – rather than the generic NRF strategy

Research Groups 2:9

- Organized research groups
- Encourage research teams
- Collaboration between researchers
- Active group participation in key areas
- Regular group discussions

Science engagement (External and Internal) 4:7

- Actively engage/inform all staff in SAAO science

- Internal communication of ongoing science
- Excellent relationship with NRF HQ promoting our science
- More press releases highlighting SAAO science
- Live dashboard
- Happy safe space for idea discussions
- Break research group silos

Research equipment 3:8

- Excellent and unique instruments – with project focus
- Excellent efficient telescopes
- Good telescope allocation policy
- Leveraging SAAO telescopes

International opportunities and partnerships 5:6

- Sabbatical policy/programme for ALL researchers across SAAO
- Research leave policy/programme for ALL researchers across SAAO
- Fund one trip/conference per year
- International interaction opportunities for postdocs and students
- Regular international visitors
- Good international partnerships
- Understand what works in international teams

Workshops/Colloquiums/Meetings 7:4

- Regular seminars colloquium and journal club
- Host/organize international and national conferences and workshops

Skills transfer and upskilling 6:5

- Sharing of skills
- Transferring of specialized skills
- Research skills workshops

Research funding 8:3

- Consistent research funding
- Incentive for rating
- Funded PhD programme
- Competitive research funding

Staff facilities 9:2

- Meeting spaces conducive to discussions

Students and postdocs 10:1

- Students and postdocs
- Student programme

Admin services 11:0

- Funding tools – timing, reporting etc
- Lower admin load for researchers
- Research offices – grant admin and opportunities/calls notifications

Photographs of some of the post-it groupings can be found in the appendix.

4. INTERRELATIONSHIP PHASE

This part of the system thinking process determined how each of the groups relates to all of the other groups. Each relationship is considered in terms of which group is the driver in the context of the question. This is visualized and indicated by connecting the groups with arrows (Figure 1).
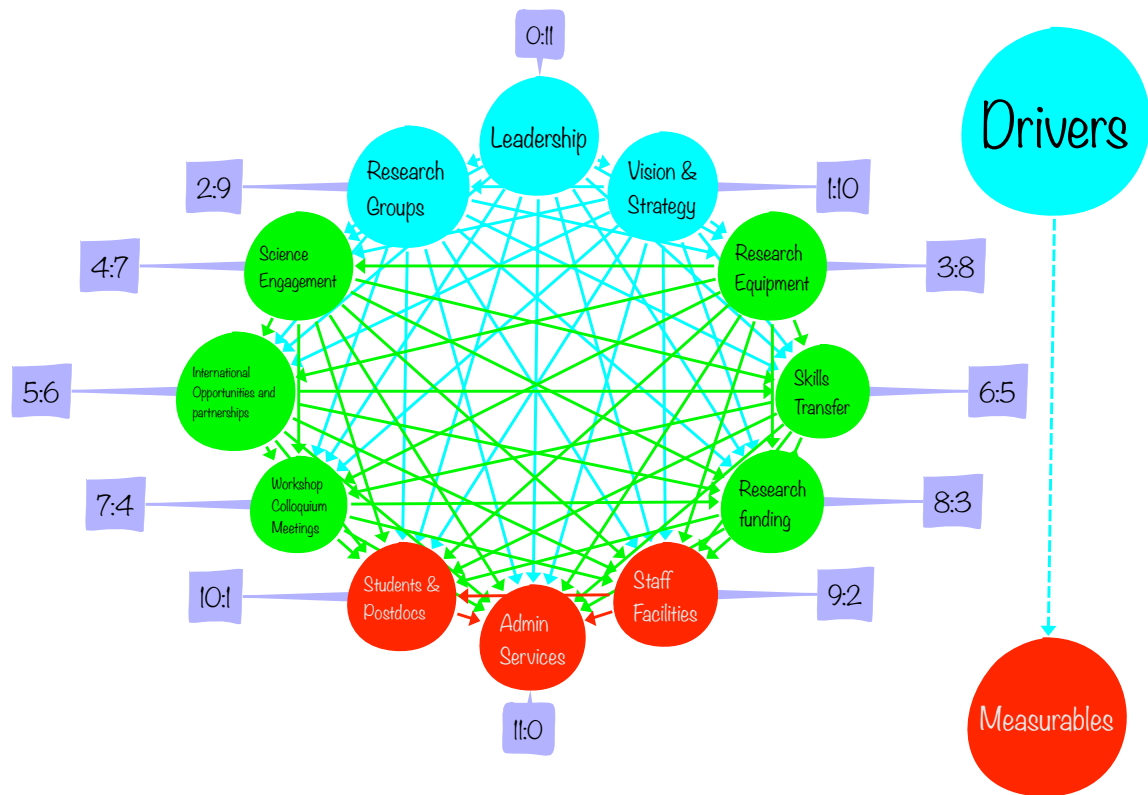

Figure 1: Interrelationship diagram for a culture of research excellence at the SAAO. Note that the general direction of the arrows is from top to bottom.

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For each group, the total number of inputs and outputs were tallied. The numbers are indicated alongside the group headings in the ideation section above. In Figure 1 the groupings have been reorganized compared to the original diagram (see photo in appendix), in order to best indicate the input and output scorings. I.e. groups with the highest output scores, and therefore considered to be the main drivers, are grouped at the top and, conversely, groups with the most inputs, and therefore considered to be the main measurables, are grouped at the bottom.

It is important to note that all of the groups are considered to be either drivers or measurables to some extent. However, by considering how all the groups are all interrelated then a broader interrelationship picture emerges.

5. RESULTS AND CONCLUSIONS

The final phase involved assigning a level of difficulty to each of the groups. Each participant was invited to indicate on a scale of 1-10 (easy-hard), via an electronic questionnaire, on the level of difficulty of each of the groups in the context of research culture. A final difficultly score for each group was calculated by simply taking the average of all the participants. Figure 2 shows the results combined with the interrelationship results in the form of a scenario matrix.
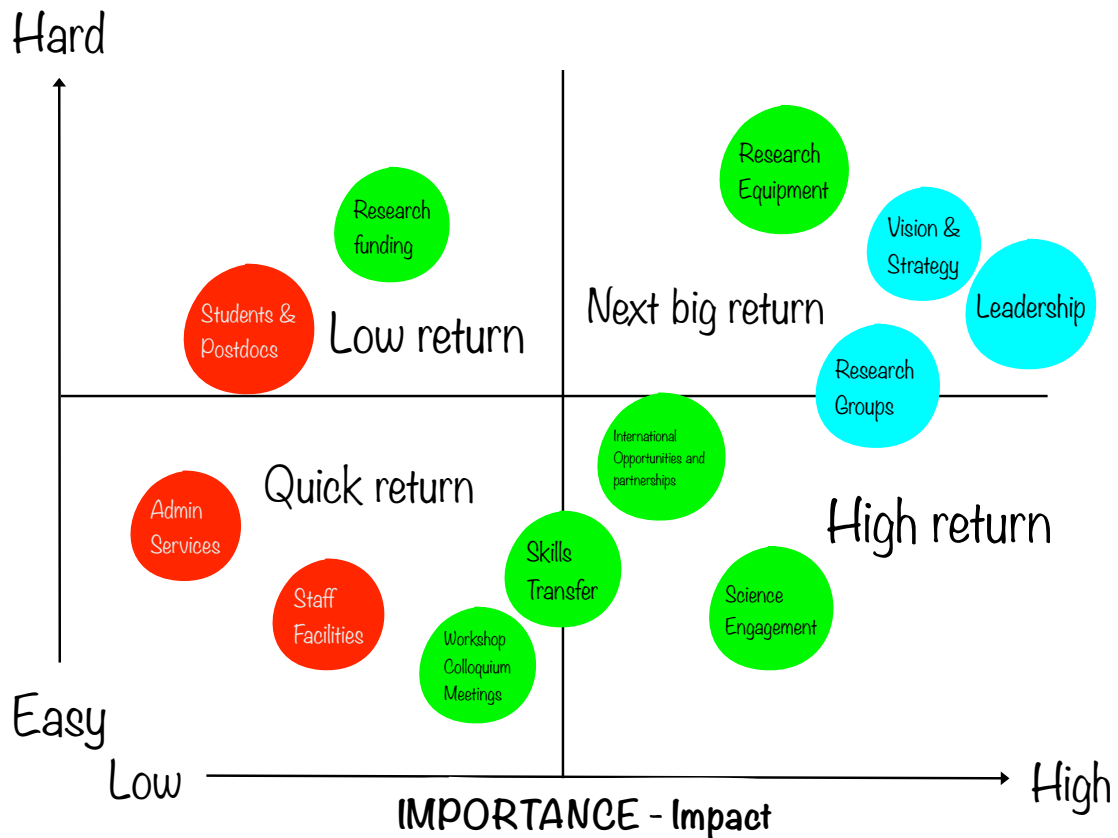
Figure 2: Scenario matrix: Level of Importance/Impact vs level of difficulty for the key components of a culture of research excellence at the SAAO.

The groups are plotted such that left to right indicates increasing level of importance or impact and bottom to top indicates increasing level of difficulty. The scenario matrix is then generalized into four main quadrants.

The lower right shows that science engagement and international partnerships are the easiest with high impact resulting in high returns. To the top right are the areas in which the next big returns will emerge from, i.e. leadership, vision and strategy, research groups and research equipment.

The lower left shows those lower impact groups but are easy such that they will produce a quick return, i.e. skills transfer, workshops/colloquium, staff facilities and admin services.

Students/postdocs and research funding are both difficult and of low impact resulting in their location within the low return quadrant. This may seem contradictory, however it is important to consider them in the context of driving a culture of research excellence. In this case students/postdocs and funding would be the measureable outcome of the research culture rather than the main drivers.

The most important essence of systems thinking is not to simply identify the individual systems (groups) but rather how they relate to each other and to ensure that the relationships are actively pursued.

Combining the results from the interrelationship diagram and the scenario matrix (Figures 1 and 2), can lead to the following conclusions:

- Investing in research leadership should be the highest priority. This is not limited to the director or head of divisions, but encompasses leadership at all levels from leading projects, groups, grant and observing proposals to leading and championing ideas. This involves both recruiting and leadership training. Leadership should also speak to and be informed by the SAAO (and NRF) vision and strategy.
- Research groups must have leaders and be aligned with the vision and strategy. The group leaders provide the vision and strategy guidance in e.g. group meetings.
- Research equipment needs to be aligned with the vision and strategy and informed by the research groups.
- Simply recruiting and funding students and postdocs will not build a culture of research excellence without an established and *purposeful leadership* in place first.
- Simply funding research will not result in a culture of research excellence. Rather the converse.
- Research excellence requires a relevant vision and strategy that appropriately informs the direction and focus of research.
- Research equipment (telescope and instruments) needs to be in line with the vision and strategy and also driven by the research leaders. In turn the research equipment is one of the contributing factors for recruiting postdocs and students. I.e. postdocs and students should be working on projects that are relevant to the operations of SAAO.
- Science engagement must be both internal and external. Internally it drives for better communication and enhancing staff's understanding and connection with the SAAO's vision and strategy. External engagement will promote SAAO's research hopefully leading to increase support for funding.

As a final note: culture and leadership need to work together. Culture needs motivation, passion, recognition, pride and some fun. Leaders need to orchestrate, create relationships and make sure everything works together.

APPENDIX

EXCELLENCE

Leadership **Admin services** **Group)**

INTERNAL QUALITY CONTROL

RESEARCH MENTORING BY SENIOR RESEARCHERS

Leadership/ Vision

Good Leadership

"Non-research" skills transferred to junior

Resources

Time to do Research

RESEARCH GROUPS

ORGANIZED RESEARCH GROUP

Research Groups

Research Groups