Evaluation of the MultiPark Research Infrastructures 2022

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Background

The strategic research area (SRA) Multidisciplinary research focused on Parkinson´s disease (MultiPark) is one of 11 SRAs where Lund University is involved[1]. MultiPark is supported by the Swedish Government with a yearly grant of approx. 30 MSEK to carry out leading research on neurodegenerative diseases, in particular Parkinson's and Alzheimer's disease. The SRA host altogether 51 MultiPark senior researchers affiliated to the Faculties of Medicine, Engineering, and Natural Sciences (Chemistry) at Lund University, and Gothenburg University. Together, these research groups work to meet the main scientific goals: (1) to understand the origins and progression of neurodegenerative disease; (2) To develop early and differential diagnostics and prognostics; (3) To create new therapeutic approaches for prevention, disease modification and management of unmet medical needs. The Research Infrastructures at MultiPark have over the years developed to an impressive collection of resources allowing studies at the levels of molecules, cells, tissues, whole organisms, and all the way to people affected by disease. To meet the challenges of financial sustainability and development of state-of-the-art technologies and competences, there is a need for evaluation, monitoring and strategic planning both for the individual Research Infrastructures and for the MultiPark Research Infrastructure park as a whole.

All support to MultiPark Research Infrastructures should aim at lean, efficient, sustainable, and future-oriented operations in line with the strategic plans for MultiPark[2], the Faculty of Medicine[3] and Lund University[4]. The organizational model for the MultiPark Research Infrastructures should provide flexibility to meet changing user demands and enable them to take decisions in a timely manner. Moreover, decisions should be made according to formally correct procedures, avoiding any excess weight of individual arbitrary interests.

The MultiPark Board decision on what and how to support as a Research Infrastructure is explained in the following principles[5]:

MultiPark principles for Research Infrastructures[5]

MultiPark supports a number of research infrastructures consisting of personnel, equipment, or both. The criteria for appointing and evaluating these infrastructures are as follows:

(a) The infrastructure brings about clear benefits in terms of scientific impact/competitive edge, and it helps MultiPark fulfil its strategic plan.

(b) The infrastructure addresses a clear need; there are no equivalent infrastructures within LU/BMC/RegionSkåne offering the same service at the same level of accessibility and cost-effectiveness.

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[1] https://www.lu.se/forskning/starka-forskningsmiljoer/strategiska-forskningsomraden/multipark
[2] https://www.multipark.lu.se/sites/multipark.lu.se/files/multipark_5_page_lu_strategic_questions_2020-2025.pdf
[3] https://www.med.lu.se/intramed/styrning_organisation/strategier_riktlinjer_foereskrifter/fakultetsgemensamma/strategisk_plan_2019_2024
[4] https://www.lu.se/sites/www.lu.se/files/strategisk-plan-lunds-universitet-2017-2026-2.pdf
[5] MultiPark steering document

(c) The infrastructure has a solid management plan, including a steering group, a steering document, clear access rules/user fees, and a manager providing tutorials to new users.

(d)   The budget computation is well justified.

(e)   The infrastructure should be made accessible to the MultiPark researchers who need to use it. The academic managers of the infrastructure are requested to cooperate with the MultiPark leadership in order achieve this goal.

(f) Expensive, large infrastructures should have a steering group composed of researchers representing different areas of activity in MultiPark."

The principles of MultiPark should, when possible, be considered together with the general principles at the Faculty of Medicine. The Faculty of Medicine support Research Infrastructures both within and outside the SRAs through both strategic funding and open calls. The factors used by the Faculty of Medicine when planning for, supporting, and/or evaluating Research Infrastructures include:

- Accessibility,
- Visibility (LUCRIS, FoM web page, own web page, etc.),
- Access to expertise,
- Opportunities and strategies for competence development and career development for the infrastructure personnel,
- A dissemination plan,
- Transparent model for management team/manager/director,
- Transparent model for steering committee that ,after a start-up phase, is non-user based and distinct from the management team,
- Interactions with other research infrastructures locally and nationally,
- Actively working to increase the user-base locally and nationally,
- Charging motivated user-fees and having a plan for how to reach the set goal for user-fee income ,
- A long-term sustainable financial model,
- Cost-effective operations,
- Service portfolio development - quality procedures, impact evaluations and Research Infrastructure management,
- Reporting and planning for activities (annual report, business plan, etc.),
- Active in dialogue with the faculty leadership and FoM "Forskningsinfrastrukturs nämnd",
- Participate in infrastructure events organised by LU.

Impact of the Lund University Research Quality evaluation 2020

In connection to the evaluation of the quality of research at Lund University in 2020 (RQ20), a special external evaluation panel evaluated various aspects of research infrastructure. In the RQ20 evaluation, Research infrastructure was identified as one of the five issues that Lund University will continue to work on at a university-wide level[6]. The vice-chancellor has tasked the Lund University 'Forskningsnämnd' with developing an action plan for how the recommendations in RQ20 concerning research infrastructure can be put to good use. The working group for research infrastructure (in Swedish: Arbetsgruppen för

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[6] (STYR 2021/1521)

forskningsinfrastruktur, AGFI) has in turn been tasked under the 'Forskningsnämnd' to identify measures that are urgent at a university-wide level and to prepare the action plan for their implementation. It is therefore in the interest of MultiPark to align with the criteria and performance indicators that would enable its infrastructures to compete for support at the university level.

Method

General considerations

A number of processes are critical for a Research Infrastructure to be prioritized for support, whereof the most important is the reporting and planning. The reports and plans must include Key Performance Indicators (KPIs) on expenditures and revenues, the policy for service prices, target cost-recovery, and when needed, plans for corrective measures resulting in cost-effective operations. Financial KPIs are important to monitor the performance. The efficiency can be deduced from including the number of users or projects in relation to the budget of the Research Infrastructure. However, the number of projects, users and/or instrument usage are highly specific for a service or instrument. For example, with equal overall usage a flow cytometer can be used for up to 300 projects per year while a high-end microscope might be used for only 10 projects.

Due to heterogeneity in the services provided, the reported KPIs cannot be directly compared across Research Infrastructures. However, success of individual Research Infrastructures can be assessed by longitudinal analysis of their performance (e.g. temporal changes in number of projects and users). Additionally, KPIs provide valuable information if compared to specific target values, which can be carefully defined for an individual type of Research Infrastructure.

Evaluated material

MultiPark Research Infrastructure reports until 2021, steering documents, and information on financial support have been used for this evaluation. Importantly, some aspects that contribute to the success of Research Infrastructures were not included in the annual reports from Research Infrastructures at MultiPark. Examples include:

- User satisfaction: whether a Research Infrastructure meets the users' expectations and needs (e.g., as for quality and speed of the services) is currently not assessed. Possibly the number of complaints or results from user surveys could serve as indicators of user satisfaction.
- Training of users: educating and training users in essential technologies is an important aspect of Research Infrastructures. However, the number of users trained by the staff of the platforms is not reported.
- Lifetime and maintenance costs of complex and expensive infrastructure: equipment at the Research Infrastructures is generally used and professionally maintained by well-trained researchers and technical staff. Analysis of its lifetime and costs for repairs could be recorded.

Criteria

Based on the factors and principles set by the MultiPark Board, the Faculty of Medicine, and the RQ20 recommendations, a number of criteria have been used for evaluation of the MultiPark Research Infrastructure park. The factors analysed include:

- strategies and reporting (e.g., steering document, annual report, financial plan, communication plan, business plan, decommissioning plan)
- governance and steering,
- accessibility,

- financial model and conditions incl. user fees,
- technical personnel,
- visibility (e.g., at the Faculty of Medicine RI listing, presence in LUCRIS),
- number of users and distribution,
- publications,
- relation to other RIs.

The MultiPark strategy, Steering documents, and annual reports until 2021 for 36 the Research Infrastructures below and a stakeholder analysis have been used as a base for recommendations for possible development work for each of the following infrastructures:

Infrastructure	Academic manager
Bacteria Lab	Cecilia Lundberg
Retroviral Production	Cecilia Lundberg
In vivo core facility, mouse node	Angela Cenci Nilsson
In vivo core facility, termination node	Cecilia Lundberg
In vivo core facility, rat node	Malin Parmar
Biobank platform	Maria Swanberg
Cell and Gene Therapy Core Facility	pia.johansson@med.lu.se, C Lundberg
Cellomics	Anna Hammarberg
Confocal microscope, A11	Malin Parmar/Gunnar Gouras
Confocal microscope, A10	Jia-Yi Li /Gunnar Gouras
FACSAria III	Anna Hammarberg
Image Analysis platform	Gunnar Gouras
Light sheet microscope	Anders Björklund
Live cell imaging	Jia-Yi Li
MESO QuickPlex	Shorena Janelidze
MultiPark & Stem Therapy joint electrophysiology core facility	Daniella Ottosson
NextGen Sequencing (NGS)	Johan Jakobsson
Operetta CLS	Anna Hammarberg
Plate Runner	Andreas Heuer
Sapphire imager	Oxana Klementieva
Simoa Analyzer	Shorena Janelidze
Translational Pharmacology platform / Drug Candidate Screening TPG	Laurent Roybon / Roger Olsson
Two-Photon microscopy	Karsten Ruscher
Neurology research unit nurses	Per Odin
Neurology research unit medical doctors	Per Odin
Neurology research unit coordinator	Per Odin
Neurology clinic biobank	Per Odin
Bioinformatics, genetics	Andreas Puschmann
NGS Database	Andreas Puschmann
Memory clinic research unit nurses	Oskar Hansson
Memory clinic research unit medical doctors	Oskar Hansson
Memory clinic research unit coordinator	Oskar Hansson
SweTRAP, Swedish Trial Ready Cohorts for early AD and PD	Oskar Hansson
MRI physicist	Markus Nilsson
PET ligand production	Markus Nilsson
MRI nurses	Markus Nilsson

Outcome and recommendations

All of the above MultiPark Research Infrastructures have provided documents for analysis and evaluation. The steering documents and annual reports provided key information at a basic level but lacked important part of financial analysis and plans for long-term sustainability. Neither business plans nor decommissioning plans were available for any of the Research Infrastructures. Moreover, service portfolio development including quality procedures, impact evaluations and Research Infrastructure management would increase the cost-efficiency over-time. **The need for templates and support should be brought forward to the MultiPark and Faculty leadership.**

Governance and organisation

The governance and steering models were similar for many of the Research Infrastructures and for many of the Research Infrastructures consisted of a management team that also were part of/were identical to the steering committee. In some cases, the SRA Stem Therapy was engaged, e.g., in the Science Advisory

Group of Cell and Gene Therapy[7]. Several of the steering committees were user-based. Even if user-run Research Infrastructures are common in early stages, the development of these Research Infrastructures should strive for a model with distinct management and steering committees.

The impact of conflicting interests in the steering committee on the Research Infrastructure success is unknown. Participation in the steering committees of MultiPark Research Infrastructures is voluntary and not reimbursed. Therefore, the steering committee comprises a selection of the main clients of the respective Research Infrastructure. Since the Research Infrastructures lack performance contracts with verifiable indicators, the steering committee designs its strategy mainly along their own research needs. Thus, short term scientific interest of the members might conflict with the long-term strategic orientation of the Research Infrastructure which should be the main intention of the steering committee. In addition, the members of the steering committee might favour low user fees since they must pay them as well. Thereby, they might restrict the potential of their Research Infrastructure to develop new skills and implement new technologies. These considerations should however be weighed against the fact that the most knowledgeable persons about specialised technologies are the researchers who apply these technologies for their research projects.

The governance, along with a streamlined strategy, is the underlying structure allowing fast and intelligent decisions to be made. These lead to fundamental appreciation and support of the Research Infrastructure by the users of the Research Infrastructure as well as important stakeholders, including the MultiPark Board, Lund University 'Forskningsnämnd'. The organisational structure should support the management team (MT). The MT should be empowered to perform corrective actions timely in all aspects of its responsibilities for objectives that are defined periodically, giving the MT planning reliability. The MT should report to a clearly defined supervising level (e.g., the steering committee). The reporting should be based on the KPI's set by the supervising level (e.g., steering committee).

Visibility, awareness, accessibility, users, and publications

According to the steering documents the accessibility policy for MultiPark users is good. However, the listings of users and publications indicate that targeted efforts are needed for several of the Research Infrastructures to increase the access for users not part of the Research Infrastructure's management team/steering committee. In particular, the Research Infrastructures with substantial support from MultiPark have a responsibility to make them visible and accessible to a broader user community. A broad user-base is essential for cost-efficiency and financial sustainability. The trend over-time should be presented in the annual reports and when appropriate measures to address a non-satisfactory trend should be presented in the business plans. With a few exceptions, for most MultiPark Research Infrastructures the user base includes researchers external to MultiPark (figure 1). Attracting and serving non-MultiPark users is important for the long-term sustainability and will help attract funding from different bodies. In addition, the non-MultiPark users can contribute to development of the Research Infrastructure and increase the output in terms of publications for both staff and other connected MultiPark researchers.

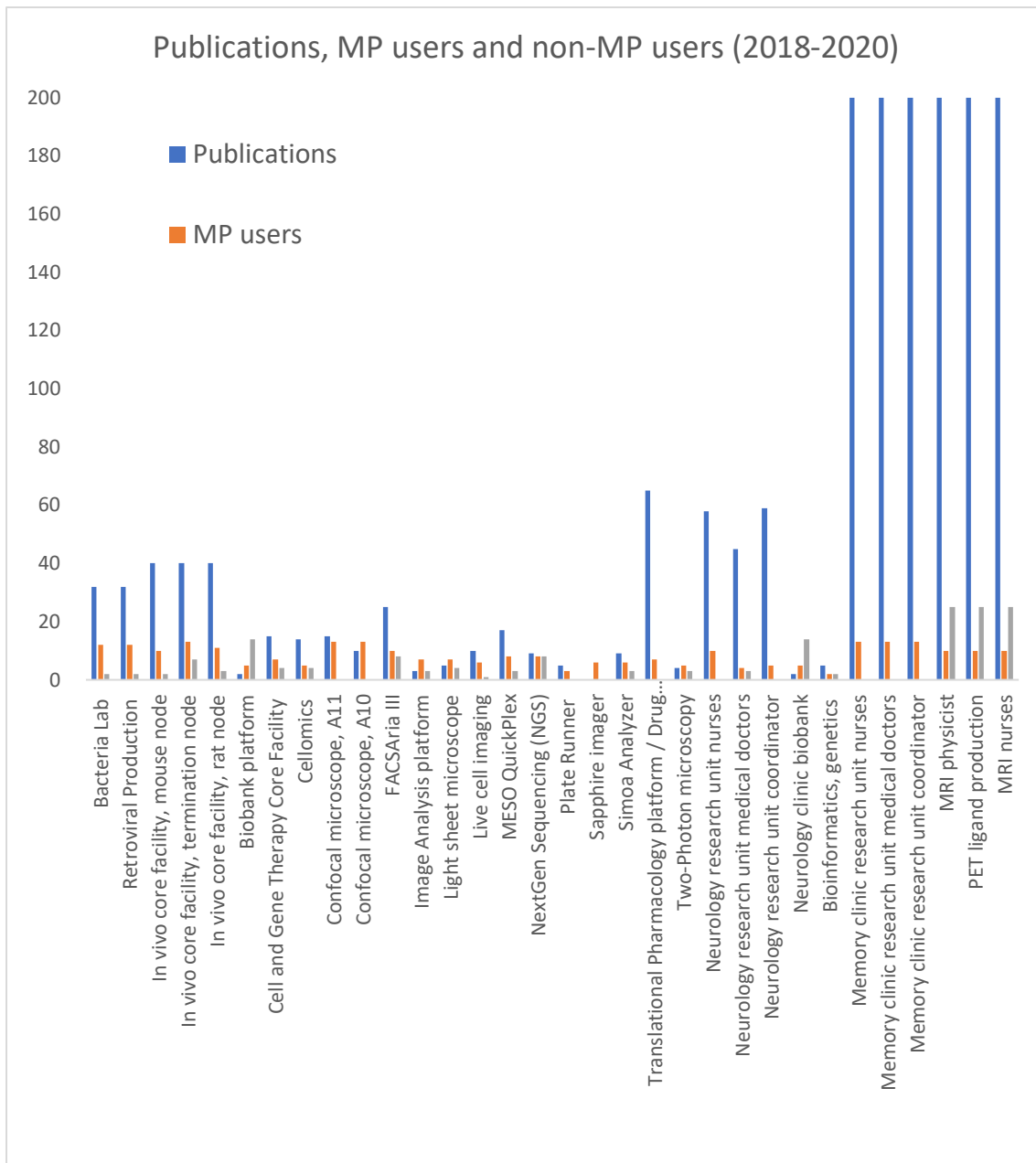[7] https://www.lu.se/forskning/starka-forskningsmiljoer/strategiska-forskningsomraden/stemtherapy

Figure 1. *Publications during 2018-2020, MultiPark (MP) users and non-MP users. New infrastructures, hence not reporting publications and users are MultiPark & Stem Therapy joint electrophysiology core facility, Operetta CLS, NGS Database and SweTRAP. Non-MP users are not reported in direct numbers for Translational Pharmacology platform / Drug Candidate Screening TPG and Memory clinic units.* Most of the Research Infrastructures have users from both MultiPark and *from outside of the SRA. The exceptions are Sapphire, the plate runner and the two confocal microscopes. The Translational Pharmacology platform has not reported non-MP users but it is clear from the publication list that there is a major proportion of non-MP users for this Research Infrastructure.*

The MultiPark research infrastructure visibility is low outside the SRA environment with only six MultiPark Research Infrastructures present in the Lund University database LUCRIS[8] and four MultiPark Research Infrastructures present at the Faculty of Medicine's web page for research infrastructure[9].

Improved documentation of the user base is needed. A broad user-base is of high importance for a sustainable financial model and engagement of several stake-holder groups. Many of the Research Infrastructures are already successfully used not only by MultiPark researchers but also by both national and international users from academia and industry. For future reports it is recommended that the user-base is even more carefully described, i.e., users from other faculties, universities, the private sector, hospitals etc should be specified.

Financial models

The financial reporting and addressed KPIs were very limited, e.g., a lack of long-term sustainable financial models and financial steering. KPIs for cost-efficiency including reporting on 'user-fee income' was neglected and/or absent from most of the reports and should be addressed in future reports. Importantly, the development and trend over-time for user-fee income versus financial support from MultiPark should be presented as a base for decision on support and Research Infrastructure performance. Several Research Infrastructures within MultiPark receive staff-funding. Almost all the Research Infrastructures receive funding from MultiPark (figure 2).
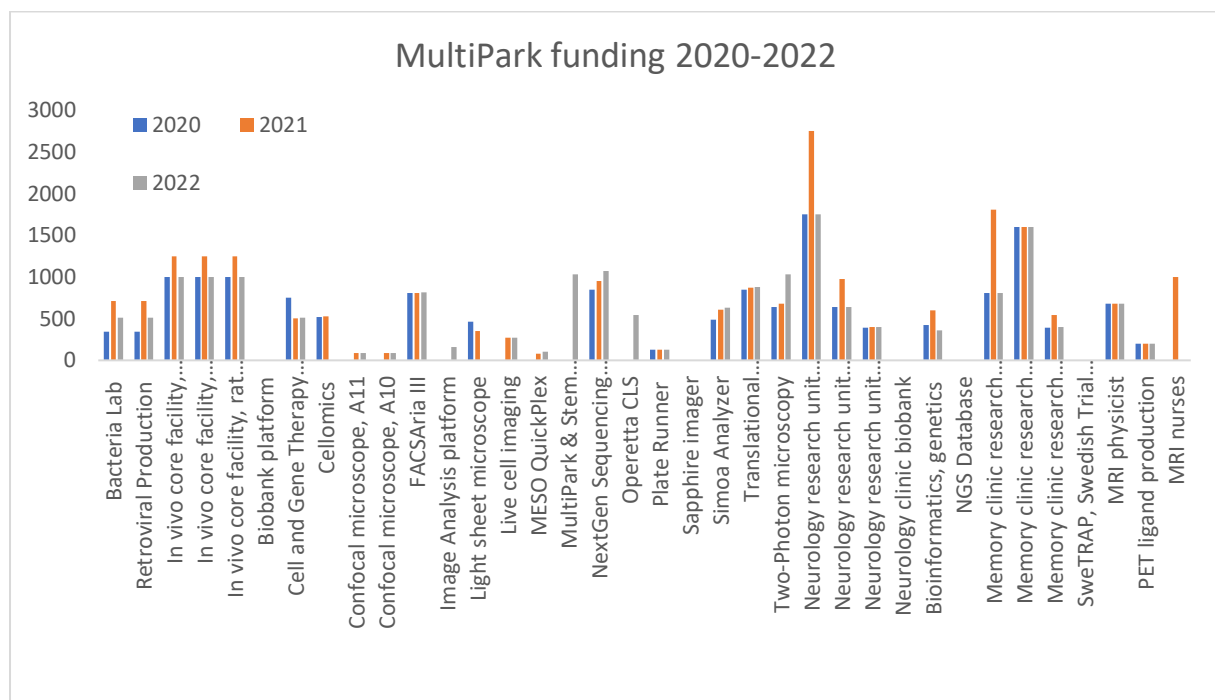

Figure 2. *Funding in kSEK years 2020-2022 by MultiPark for research infrastructures within the SRA.*

The funding of staff from MultiPark needs to be handled carefully. Long-term or renewed staff funding could be required for some Research Infrastructures but should be justified by development towards or into a cost-efficient model. The clinical Research Infrastructures Neurology, Memory clinic and Neuroimaging were funded with 8,5 MSEK 2020 and 2022, and 12 MSEK 2021 (figure 3).

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[8] https://portal.research.lu.se/sv/
[9] https://www.medicine.lu.se/research-and-research-studies/house-infrastructure/list-research-infrastructures
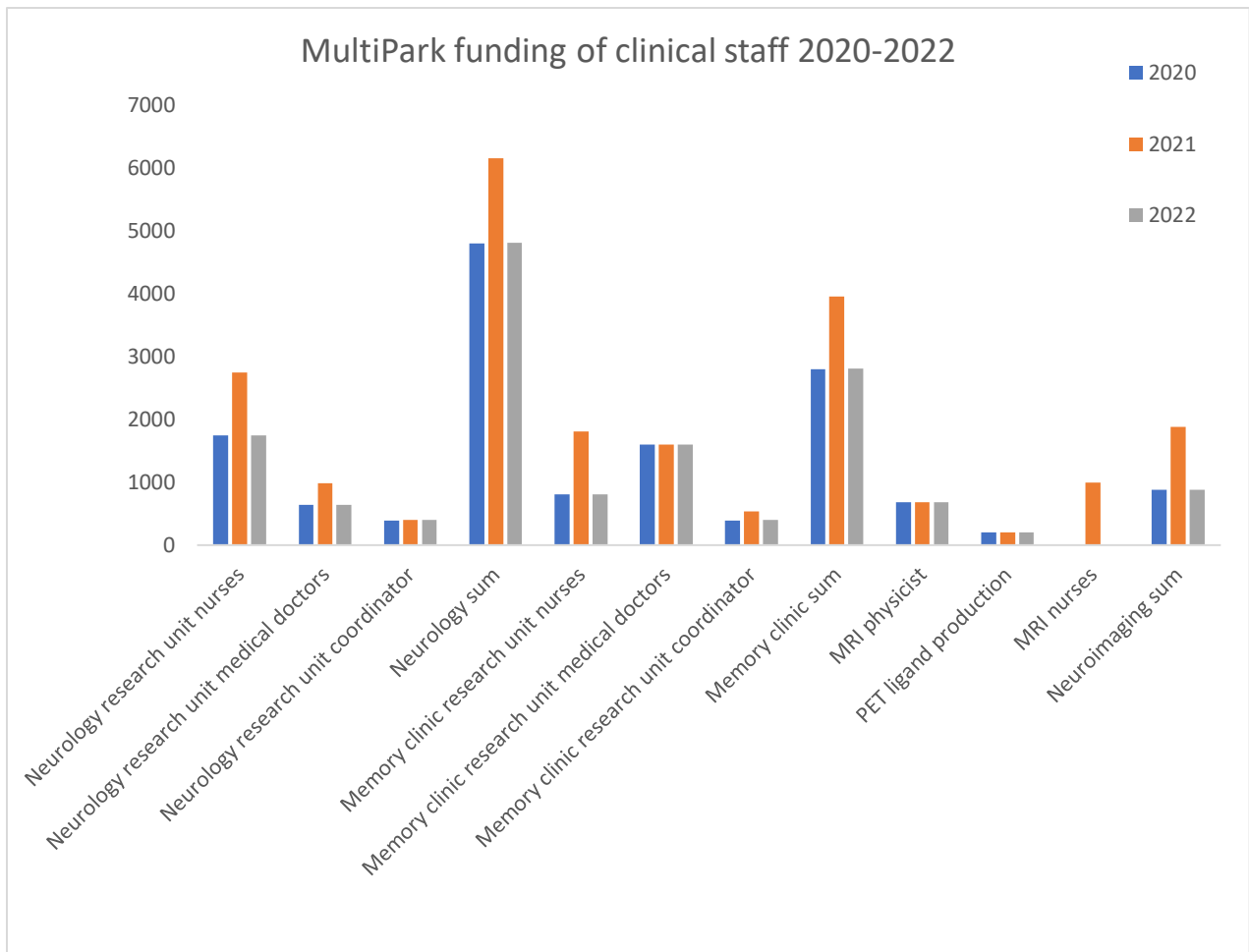
Figure 3. *Funding in kSEK years 2020-2022 by MultiPark for clinical staff at infrastructures within the SRA. Year 2021 included additional funding for costs of research nurses, freezers, and secretary.*

Competence development and career paths

It is admirable that MultiPark has invested in personnel connected to many of its Research Infrastructures. The personnel is a key resource and actions are needed to promote competence development as well as to prevent drain of competence. Business plans and annual reports should address both competence development and long-term career paths for Research Infrastructure personnel. The success of Research Infrastructures relies heavily on its staff. The personnel should combine excellent scientific, methodological, and technological knowledge with a service-oriented personality. The staff should be flexible enough to meet changing user requirements in a fast and efficient way. The Research Infrastructure's ability to adapt to future user needs and the flexibility to omit unnecessary services is also dependent on efficient processes and a functional organizational structure.

Maturity

An increase in the maturity of the MultiPark Research Infrastructures should be considered as a strategic goal not only for those Research Infrastructures that are interested in funding from e.g., the faculty of Medicine or Lund University, but for MultiPark as a whole.

Cooperation

Many of the individual Research Infrastructures are to a large extent managed as independent units without close connections to either other MultiPark Research Infrastructures or external Research Infrastructures at the Faculty of Medicine or Region Skåne. The few documented cases of active relations with other Research Infrastructures include interaction with Lund Bioimaging centre (LBIC) and Centre for Comparative Medicine (CCM).

A stakeholder analysis is frequently used during e.g., the preparation phase of a planned re-structuring or as a basis for developing a strategic plan with the aim to assess the attitudes of the stakeholders regarding the potential changes or subject. Stakeholder analyses can be done either once or on a regular basis to track changes in stakeholder attitudes over time. Here, a stakeholder analysis was performed based on the experience and information in the provided MultiPark documents, and in documents and information on Research Infrastructure organization at Lund University (figure 4).
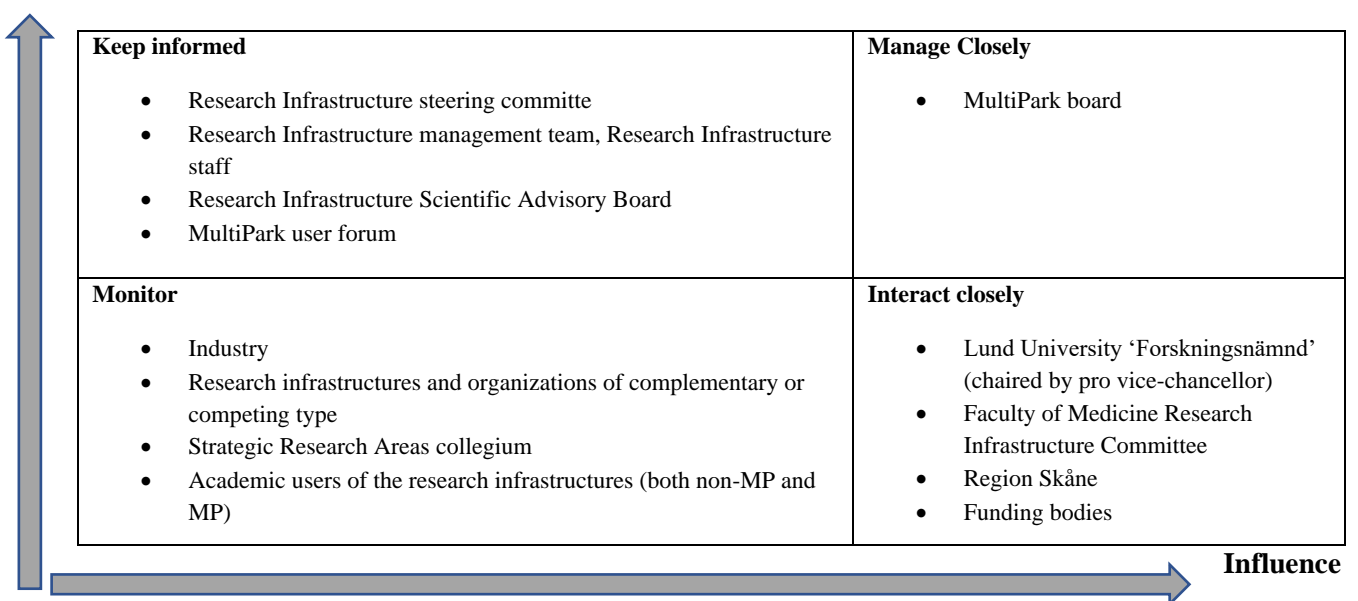
Interest

Keep informed	Manage Closely
• Research Infrastructure steering committe • Research Infrastructure management team, Research Infrastructure staff • Research Infrastructure Scientific Advisory Board • MultiPark user forum	• MultiPark board
Monitor	**Interact closely**
• Industry • Research infrastructures and organizations of complementary or competing type • Strategic Research Areas collegium • Academic users of the research infrastructures (both non-MP and MP)	• Lund University 'Forskningsnämnd' (chaired by pro vice-chancellor) • Faculty of Medicine Research Infrastructure Committee • Region Skåne • Funding bodies

Influence

Figure 4. *Stakeholder analysis of a model MultiPark Research Infrastructure.*

With the aim of developing the Research Infrastructures, the stakeholder analysis points out the need of targeted and balanced dialogue with a set of different stakeholders, including but users within MultiPark but also with e.g., other Strategic Research Areas as well as with the Faculty of Medicine's Research Infrastructure Committee[10] and the staff at the Research Infrastructures. It is important to prevent reactive engagement of stakeholders who feel their interests as disregarded and their position regarding the Research Infrastructures diminished.

Suggested general action points
• Increase the visibility of individual Research Infrastructures as well as the joint collection of resources.
• Develop financial models and focus on long term sustainability.
• Support and create career development opportunities for the Research Infrastructure personnel.
• Define what constitutes the different MultiPark Research Infrastructure categories.
• Brand MultiPark with the high-profile flagship Research Infrastructure Park in LUCRIS and at the faculty of Medicine web page listing of Research Infrastructures.

[10]https://www.med.lu.se/intramed/styrning_organisation/naemnder_kommitteer/forsknings_och_infrastrukturnaemnd

- Develop a joint value proposition ("Research Infrastructures at MultiPark provides state-of the art services and assistance on your way to high quality publications"). Staying with the core values is a success factor even when facing global challenges and new strategies[11].
- Create an action plan for the MultiPark Research Infrastructure including KPIs.
- Apply for joint funding and affiliation to other initiatives[12].
- Support and encourage a broadening of the user-base.
- Support and encourage interaction regarding Research Infrastructure with other SRAs.
- Support and encourage interaction and joint initiatives with other Research Infrastructures.
- Prioritize among the Research Infrastructures based on present performance and status but also on the potential.
- Monitor the stakeholder communities, including both internal and external users and adapt the Research Infrastructures services to meet the user needs.
- Support the Research Infrastructures with tools for development e.g., a toolbox on how to manage a Research Infrastructure with templates and instructions for communication plan, annual report, business plan, strategic plan, decommissioning plan etc.
- Establish a collegium for exchange of experiences and dialogue between the MultiPark Research Infrastructures.
- Communicate expectations from the Board regarding deliveries, user-fee implementation, steering model etc., for each Research Infrastructure
- Support from MultiPark should be conditional, i.e., the Research Infrastructure only receives the support if it delivers and reports according to the expectations stated by the MultiPark Board.
- The financial support from MultiPark should be given to the Research Infrastructures that need it the most. Financial income from e.g., the Faculty of Medicine, external grants or user-fees should be reported, and over-time gradually replace the MultiPark support. The presented budget should include a prognosis for the coming 3-5 years with at least two different scenarios (given the support by MultiPark and not).
- Financial support from MultiPark should be given to only those Research Infrastructures that have an active plan for financial development and fit into the MultiPark strategic plan.
- Financial support should be possible for both new and already established, strategically prioritised Research Infrastructures.

Support from MultiPark should come in different shapes

Renewed financial support and/or recurring investment should be argued for with the help of numbers based on user fees and/or contributions from external projects. A long-term financing model based on several sources of income should be established. The financial model should establish a comparable fee that is applied to all users from LU, while external users pay full cost coverage and/or cost at the same level as competing infrastructures outside the university. Long-term funding of staff will in some cases be needed but requires a correlation to cost-efficient development.

Research Infrastructures that do not qualify for financial support should be supported in, among other things, project management, calculation of user fees, state aid rules, financial accounting, making resources visible, etc. A sustainable model of organization of the Research Infrastructure Park requires that resources are allocated to planning and organizational work, including collecting information about and monitoring needs from the user communities as well as from the Research Infrastructures.

[11]Collins, JC and Porras, JI (1996) Building your company's vision, Harvard Business Review
[12] For example, the European infrastructure for translational medicine (EATRIS-ERIC) and EBRAINS.

General conclusions

- Together, the collection of MultiPark Research Infrastructures is truly impressive and a treasure chest for both the SRA itself and the Faculty of Medicine as a whole.
- The MultiPark Research Infrastructures have a broad coverage from molecules to cells to tissues to whole organisms.
- Many of the MultiPark Research Infrastructures are much needed assets for neuroscience at Lund University.
- Several of the MulitPark Research Infrastructures are used in a high number of publications.
- The Research Infrastructures at MultiPark have a limited number of users. On the other hand, a low number of users is not a contraindicator of financial support but could instead become an argument to finance a Research Infrastructure that is not likely to be funded by other channels at the Faculty or university.
- With the present models for governance there is a risk for biased access and low progression of the development and quality management of the Research Infrastructures at MultiPark. The models where management and steering are mixed, or where users constitute the predominant steering committee members, are not uncommon in the early development of Research Infrastructures (particularly small and local ones). In this context, these models are not necessarily non-productive. Nevertheless, it is recommended that the MultiPark Board actively engages in discussions regarding the preferred governance models for the future.