RESEARCH REVIEW

INSTITUTE FOR LANGUAGE, LOGIC AND COMPUTATION

UNIVERSITY OF AMSTERDAM

2012–2017

ONDERZOEKERIJ

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ONDERZOEKERIJ

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Preface

The evaluation committee that authored this report was assembled by the University of Amsterdam, and it included expertise from a broad spectrum of disciplines, consisting, as it did of Prof. Dr. C. (Christine) Baier, Technical University, Dresden; Prof. Dr. E. (Edwin) Mares, Victoria University of Wellington; Prof. Dr. L. (Louise) McNally, Pompeu Fabra; Barcelona; and Prof. Dr. Ir. J. (John) Nerbonne [chair], em. Groningen and Freiburg. Beyond their specialist expertise, the members were remarkable and valuable for their broad view of the study of logic, language and information, and for their willingness to examine scientific areas well outside their research foci proper. They were also energetic in considering practical issues of organisation, financing and management that also seemed foreign at points. These topics were also included in the evaluation. The committee also enjoyed its collaboration and I am grateful to all of them for their professional attitudes and pleasant interaction.

Annemarie Venemans served as secretary to the committee, and she was essential to the process at all stages, suggesting a division of labour, providing more concrete instructions to committee members on how to follow the Standard Evaluation Protocol (SEP), as well as on how to keep the "Terms of Reference" (ToR) of our particular evaluation in mind. She sat at my right-hand during meetings and kept notes to ensure that the committee was addressing all the crucial points of the SEP and the ToR. She also received the rough drafts of all the various parts of the report, which she edited with me, and I was very grateful not only for her close attention to the report's expected topics, but also for her efficient and clear style of writing. I am grateful for all the very competent work that she invested in this report.

The researchers of the Institute for Logic, Language and Computation (ILLC) at the University of Amsterdam (UvA) were assiduous in providing us with a great deal of information on their work in the six year review period, 2012–2017, not only with respect to matters that are normally catalogued carefully, such as publications and grants, but also with respect to their record in matters that often fall outside academic reporting, such as work on scientific popularization or marks of recognition from outside academia. We received a forty-two-page report plus several substantial appendices on the research programmes, most of them informationally dense. All of this material facilitated the committee in obtaining as complete a picture of the work at the ILLC as possible. On the occasion of our visit on December 3 and 4, 2018 we spoke with over 40 ILLC members about their scientific work; their aspirations, and how well they found themselves able to work and advance professionally at the UvA; how well their various research lines dovetailed with the institute's strategic emphases – both scientifically and with respect to extra-scientific interests and applications; and, perhaps most extensively, about their frustrations in seeking to realize serious scientific and applied-science ambitions at the ILLC. I am certain that I speak for all committee members when I acknowledge how much we profited from the very cooperative atmosphere we encountered during our visit.

A chair who is currently an emeritus professor may be forgiven a personal note, even in the foreword to a very official document. Science, I believe, profits a great deal from its younger practitioners. They see correctly that they can contribute and be recognized if they are tenacious enough to continue to insist on their insights, to search for new evidence, and to keep developing new demonstrations, even while ignoring some criticism. The stereotyped self-opinionated researcher isn't without problems, but lots of advances are due to the tenacity and energy of young researchers working hard to prove that they're right. If indeed we profit a lot from the energy and tenacity of young researchers, then it behoves us as a profession to see that they get a fair chance to prove themselves. We therefore include in the report below a suggestion to provide younger scholars with more opportunity than they now have.

Our visit was well organized and our reception at ILLC was cordial. We thank Prof. Dr. Sonja Smets and Ms. Jenny Batson for their hospitality.

John Nerbonne, Chair of the Evaluation Committee

1. Introduction

1.1 Terms of reference for the assessment

The quality assessment of research of the Institute for Language, Logic and Computation (ILLC) is carried out in the context of the assessment system as specified in the Standard Evaluation Protocol For Public Research Organisations by the Association of Universities in The Netherlands (VSNU), the Netherlands Organisation for Scientific Research (NWO), and the Royal Netherlands Academy of Arts and Sciences (KNAW).

The review committee was asked to assess the scientific quality and the relevance and utility to society of the research conducted by the ILLC of the University of Amsterdam in the reference period 2012-2017, as well as its strategic targets and the extent to which it is equipped to achieve them.

Accordingly, three main criteria are considered in the assessment: research quality, relevance to society, and viability. In addition, the assessment considers three further aspects: the PhD training programme, research integrity and diversity.

This report describes findings, conclusions and recommendations of this external assessment of the ILLC.

1.2 The review committee

The Board of the University of Amsterdam appointed the following members of the committee for the research review:

- Professor Nerbonne
- Professor Baier
- Professor Mares
- Professor McNally

More detailed information about the members of the committee can be found in Appendix A. The Board of the University of Amsterdam appointed Dr. Annemarie Venemans of De Onderzoekerij as the committee secretary. All members of the committee signed a declaration and disclosure form to ensure that the committee members made their judgements without bias, personal preference or personal interest, and that the judgment was made without undue influence from the ILLC or stakeholders.

1.3 Procedures followed by the committee

Prior to the site visit, the committee received detailed documentation comprising: The Self-assessment report of the ILLC, including appendices and the Standard Evaluation Protocol (SEP) 2015-2021. In addition, the committee studied the midterm review report and previous assessment report.

The committee proceeded according to the SEP. The assessment was based on the documentation provided by the institute and the interviews with the management, a selection of researchers of the institute, and PhD students. The interviews took place on December 3 and 4 2018 (see Appendix B).

The committee discussed its assessment at its final session during the site visit. The members of the committee commented by email on the draft report. The draft version was then presented to the Institute for factual corrections and comments. Subsequently, the text was finalised and presented to the Board of the University of Amsterdam.

2. Organisation of the Institute

The scientific mission of the Institute for Logic, Language and Computation (ILLC) is to advance the information sciences in the area of research devoted to logic, language and computation as well as their intersection, specifically by ensuring the interaction of different formal methods.

The ILLC is governed by the Faculty of Science (FNWI) and the Faculty of Humanities (FGw). It is headed by a scientific director, who is supported by an administrative office led by the institute manager. The director is supported by the ILLC management team consisting of the manager and the leaders of the three ILLC programmes, the director of the ILLC PhD programme and the director of the Master of Logic.

The Institute includes three research programmes:

- Logic and Language (LoLa);
- Logic and Computation (LoCo);
- Language and Computation (LaCo).

The committee notes that the programme names, while historically justified, no longer suggests the range of work being done. Language and logic are each named twice, while philosophy, cognition, music, information and mathematics aren't named at all. Since the names of the programmes probably function to orient visitors and colleagues outside Amsterdam, changing these names will probably also not negatively affect the recognition of the programmes. The committee suggests the ILLC consider changing these names.

3. Assessment of the research

3.1 Quantitative assessment

The committee assessed the Institute both quantitatively and qualitatively. For the quantitative assessment a four-point scale is used, according to the standard evaluation protocol 2015-2021. The explanation of the criteria underlying the scores can be found in appendix D. The qualitative assessment of the ILLC can be found in the next sections.
According to the SEP scoring system, the committee has awarded the following scores to the Institute:

Research quality: 1
Relevance to society: 2
Viability: 1

3.2 Research quality

The ILLC is an excellent Research Institute, that continues to build on an extremely successful foundation laid in the 1980s. The mission of the ILLC is to study information in its myriad forms. Its members and groups examine how information is coded and processed, using the resources from logic, computer science, and linguistics. The original strategy of the ILLC was ground-breaking and prescient, so much so that the appreciation and use of its perspectives and techniques have now expanded from the disciplines originally in focus, to include now even biology and the social sciences. The general perspective is now shared by many more researchers than in the 1980s, and its enormous variety of work is breath-taking.

In terms of the research it produces, the Institute is extremely successful. Members of the Institute are producing world-class research. The research is disseminated largely in terms of publications (authored books, edited books, journal articles, and book chapters) which are published in very reputable, often very prestigious, venues. ILLC's publications are very strong, and the unusually detailed bibliometric analysis testifies to the leadership's concern for the quality of its work. 530 journal articles were published in 2012-2017, which translates into 4.6 articles/year/FTE (of permanent staff), an excellent level of productivity. This figure is inflated a bit due to the ILLC's success in attracting funding, which adds to publications but not to permanent staff. But even if postdocs are included in the figure (who also tend to have more research time), then 2.5 articles/year were produced, still an excellent number.

ILLC publications were cited 1,659 times in the Web of Science (WoS) alone during 2012-2017. Non-WoS citations would raise this number by a lot.

As the bibliometric data provided by Institute makes clear, a great deal of the work published in the review period has already had at least a high average relative impact (RI). In addition, publication in conference proceedings is likewise very strong in fields such as computational linguistics, where proceedings have archival status. The journal articles are on average cited better than other articles in their fields.

During the review period, members of the ILLC have taken a leading role in producing handbooks and handbook articles in their various fields. While handbooks generally do not contain new results, they are a key way in which to disseminate information about a field. The production of such materials both do a service to other academics as well as make the research done at the ILLC even more widely known. The ILLC also produces many products for academic peers, such as software and data sets.

In addition, the ILLC has contributed a lot to conferences and summer schools (such as the European Summer School in Logic, Language and Information). The local, but internationally known, Amsterdam Colloquium has been held 21 times. Members of the ILLC have also played a central role in setting up and running the Tbilisi Symposium on Language, Logic and Computation, which has now been held 12 times. All in all, the ILLC membership have served the academic community well -they have shown great commitment to professional service.

Research of the highest quality is conducted at all levels, often in jointly authored publications or other forms of collectively constructed research. The ILLC is justly famous for its foundational work in logic,

linguistics, and computer science, but now it is producing an increasing amount of research in neighbouring disciplines.

In recent years the ILLC has diversified from being an Institute largely dedicated to logical approaches to computation and language, to one in which a variety of different approaches and applications thrive. Some members of the Institute deal with very large data sets, others produce mathematical proofs, and yet others conduct empirical experimentation. These approaches seem not only to coexist in the Institute but also reinforce one another. Joint research is not restricted to members of a single group; instead there is a very healthy cross-fertilisation of ideas and labour across the three groups. The committee was also impressed with the effect of the flat organisational structure on encouraging the discussion of ideas between students and faculty and among faculty of different academic grades. Still, some ILLC younger members said in interview with the committee that they heard little of the interdisciplinary opportunities and therefore made little use of them. Perhaps the Institute might review its internal communications practices.

Not only are the methods used in the ILLC extremely diverse, so are the topics studied. The brave and unabashed interdisciplinary attitude of the Institute is reflected in the fact that during the review period ILLC researchers published in no fewer than twelve Web of Science scientific categories. These range from mathematics and physics, to social science, neuroscience, and psychiatry. Looking within each category to see what has been accomplished, one is even more impressed. One can see a very wide range of work in formal logic, logical and linguistic semantics, applications of data driven models to linguistics and other fields, logical approaches taken towards decision theory and economics, and this list goes on and on. Some of this work is ground-breaking, and it is all of very high quality.

Researchers at the ILLC can rightfully be proud of its accomplishments and its status in the scientific world. It nonetheless makes a lot of sense to continue the pioneering spirit of the earlier period and to continue to seek new collaborations where they make sense. There appear to be colleagues doing excellent, closely related work at other institutes at the UvA, where collaborations might be least costly. When the committee brought this up during its visit, the ILLC staff was optimistic that the new building would play a facilitating role.

Grant-based earnings during the period of evaluation were very impressive. Members of the Institute were awarded 29 million euros in 70 different grants. This is an exceptionally high figure, even for an institute of the size of the ILLC. During the previous evaluation period (2007-2012), ILLC members were awarded 17 million euros. Much of the current funding comes from very competitive sources, such as the European Research Council, and the NWO. (Industry-based funding is dealt with in section 3.3.) Whether the ILLC can maintain such a high level of funding in future periods is impossible to predict, but the members of the Institute deserve praise for their current funding success.

The leadership of the ILLC has taken care to position it well with respect to similar organisations locally in Amsterdam, but also nationally and internationally. They present very demanding benchmarks in comparing the ILLC to the Center for the Study of Language and Information at Stanford University, the Munich Centre for Mathematical Philosophy at Ludwig Maximillian University in Munich, and the Institute for Language, Cognition and Computation at the University of Edinburgh. The ILLC may honestly be compared to these world-class institutes with regard to quality, and it does not suffer in the comparison, even while remaining distinctive among these institutes in its breath of interests and its emphasis on logic.

The ILLC prepares PhD candidates in a conscientious and demanding way. This is reflected in the fact that 41 PhD candidates defended in the reporting period and in the fact that ILLC graduates have gone on to important positions in academia and industry.

3.3 Societal relevance

In considering the dimension of societal relevance, the committee distinguished two sorts of activities that may contribute: on the one hand public outreach sorts of activities such as films, websites, publications and productions for a popular audience, and on the other hand, activities that flow into useful products and processes. The latter may be software components but also consulting and advisory reports. They are often commercially oriented, but they might also arise in collaboration with organisations that are not geared toward profit, i.e. governmental or charitable organisations.

The ILLC is outstanding in outreach activities, in particularly in conducting courses aimed at high-school aged participants, and in producing excellent popular science books and games for the scientifically interest public. The committee applauds the Institute's introduction of "master classes" for high-school students in logic, in cognition, and in logic, language and computation. It is likewise enthusiastic about ILLC's participation in and contribution to *Leve de wiskunde*, which has now been held 16 times, and most recently attracted over 100 high school teachers and students. The strategy of trying to introduce a module on logic into high school curricula could well bear fruit, and would ensure greater public support for the field.

Some outstanding science popularizations have been undertaken at the ILLC, including the popular books on musical cognition as well as the TEDx talk on the same subject together with many newspaper and magazine articles. The demonstrations (on parsing, music cognition and mapping cultural heritage data) noted in the sections on the use of research products are likewise excellent.

When the committee turns to societally relevant activity that is aimed at improving products and processes, then the panel is very positive about events organized to bring ILLC staff and PhD candidates together with companies that work in related areas, e.g., the thesis fairs and the Beta career event, and especially about the internships the PhD candidates have taken on. The eight companies where the interns have worked are excellent addresses for the ILLC to connect to, and it would be fantastic to strengthen and build on these connections. The committee is intrigued by the start-up incubator and agrees that it takes a step in the right direction. The appointment of a valorisation officer was an excellent step.

The work reported on the DatAptor and BEER packages clearly aims to improve products and processes, and it is very positive that the ILLC can point to this as an indication of its societal relevance. The "relatively small contribution" of €800K during the six-year period from companies that directly supported the ILLC is a beginning that the committee encourages the Institute to try to improve on. It estimates that this corresponds to about 1.5% of the ILLC budget, which might profitably be increased.

When the committee brought this up in interviews with the ILLC, some answered that the foundational work was ILLC's forte, and that one should build on that strength. The committee notes, however, that many of the giants in the foundational study of language, logic and computation also contributed greatly to applications, among them Turing, von Neuman, and Shannon. While the committee is sceptical that every researcher should contribute to application-oriented activities, an excellent group of 100 FTE may be expected to include more such activities than the ILLC does now.

The committee therefore recommends that the ILLC – the Institute, not each individual researcher – consider more seriously what opportunities exist for more applied work. This is in accordance with the ILLC's explicit strategy. In making this recommendation the committee very explicitly does not ask that the ILLC do different work and absolutely not that the Institute refocus its research. It urges the Institute rather to keep in mind that ongoing work may already be able to contribute to interesting applications, even while acknowledging that the opportunity costs associated with seeking these applications may be non-negligible (see Recommendations, below). The committee is convinced that the foundational studies in logic, language and information will genuinely lead to interesting improvements in applications.

3.4 Viability

The ILLC is a world-class institute that shows every sign of continuing soundly into the future. There are many truly excellent individuals in the Institute, and the level of external funding is excellent, which is an unassailable sign that the researchers themselves are doing a great deal to ensure a healthy future. The ILLC has also grown during the reporting period, and this, too, is a sign of health. It is very impressive to see how successfully the ILLC has survived the retirement of its founders. The current generation of researchers is likewise creative, productive and influential to an unusual degree.

The ILLC enjoys reflective and aware leadership. The SWOT discussion in the self-evaluation is well informed, and the director and management team were obviously prepared for the committee's at times critical questions.

The ILLC's flat structure and fluidity of connections and collaborations must be one secret to its success. It seems a key to the atmosphere in which new ideas are given a chance to take root and to flourish. Given the very flat structure, it is clearly a good thing that the programmes (research groups) do not have the function of channelling research, but rather that of keeping an eye on things, and ensuring that regular responsibilities, for example, those of an employer are met. This seems very sensible, but the relatively informal atmosphere and loose lines of authority (over the content of research) probably mean that it would be difficult for the director or management team to reposition or refocus the research, i.e., the structure is not flexible in the sense that managers might easily redirect the content of the work. The committee asked about collaboration with researchers outside the ILLC, and in particular within the UvA. The dean of Science indicated that he would welcome more such collaborations, and the ILLC and the dean agreed that the new building for information sciences would likely facilitate collaboration beyond the Institute.

Although this is an evaluation of research, the committee wishes to explicitly appreciate the wisdom of ILLC's educational activities, which on the one hand ensure a steady stream of excellent PhD candidates into ILLC, and which also, on the other, educate the public about its work. This is a further circumstance that augurs well for the viability of the Institute.

The Institute is embedded within two faculties that are clearly supportive and appreciative, again cause for optimism, but the situation within the Humanities faculty warrants monitoring. The Science and Humanities Faculties differ regarding the amount of research time normally allotted (and its converse, the amount of time required for instruction) and ILLC members in the Humanities Faculty indeed reported being worried about their research time, citing discussions about a more flexible allotment. The committee would recommend that the faculties and the Institute strive to be as transparent as possible with respect to the allotment of research time. Regarding appointments, the ILLC leadership has taken care to reduce the impact of faculty differences on staff as much as it can. The ILLC director could point to a number of appointments and promotions of staff in Humanities in the reporting period. All this is excellent, of course.

Hiring in the Humanities faculty is also more complicated, where there may even be a question as to whether to replace retiring ILLC scholars with faculty members with ILLC research interests. Departmental and instructional needs must be served, and competing research institutes may wish to be involved and may wish to see their own research areas strengthened. The ILLC explained that the more complicated situation in Humanities arises from the fact that the instructional and research organisations do not overlap perfectly in Humanities, while they do in Science. This certainly explains the situation, but it also means that the ILLC must continue to monitor its cooperation in the Humanities faculty closely.

The well-being of all members of staff requires systematic attention, but especially young scholars are vulnerable. ILLC will need to remain mindful of how it retains not only horizontal but also vertical forms of professional development in a context where lack of promotion opportunities for junior staff might generate disaffection in the long run. The committee appreciates that such decisions are partly taken elsewhere and not entirely within the Institute's control.

A final, less verifiable reason for the committee's optimism about the future of the ILLC is the excitement that is almost palpable among its staff members, postdocs and PhD candidates. The atmosphere is charged with innovation and energy, and ILLC members are proud to work there, passionate about their work, and enthusiastic in reporting about it.

3.5 PhD programme

The committee interviewed current and former PhD students in various stages of development of their PhD research about their supervision, research facilities and possible constraints of their research. The PhD students the panel spoke with were unanimously enthusiastic about working there, enjoyed the open atmosphere, and reported absolutely no problems in getting feedback about their work. They were laudatory about the assistance they had received in moving to Amsterdam and in finding housing, which can otherwise be very difficult in the city. They were also aware that help could be found in case of difficulties, whether difficulties involving supervisors or those arising, e.g., due to illness.

Within the first three months of their appointment, each PhD candidate and their supervisor must put together an ILLC Education and Supervision Plan, which outlines the PhD project and formulates the candidate's tasks and goals. The plan lists the frequency of supervision meetings between the candidate and supervisors and includes all the training items that have to be completed by the PhD candidate during the full PhD track. The PhD training programme consists of a scientific programme and a transferable skills programme. PhD students were satisfied with the courses they could attend.

Forty-one PhD students finished during the reporting period. This is an excellent number, but only 64% of the candidates defended within six years. Although some measures have been taken, such as a bonus for PhD candidates who finish their dissertation on time, this number suggests room for improvement. The committee recommends that the Institute keep monitoring completion rates and, if necessary, take further measures to increase the numbers of PhD candidates completing their degree in a more timely fashion.

According to the self-evaluation report, the job perspectives of the PhD candidates are quite good. Of the 41 ILLC graduates who defended their thesis during the evaluation period 26 graduates are employed in academia, 12 in industry (ICT), 2 in non-profit organisations and 1 in a governmental organisation. PhD candidates the committee met, felt well prepared for further academic but also non-academic careers. They are encouraged to attend career development courses and career lunches.

3.6 Research integrity

Faculty and staff of the faculty are subject to the ILLC code of conduct. It builds on a number of more detailed and comprehensive documents that deal with these matters, such as: The Netherlands Code of Conduct for Academic Practice (VSNU), A European Code of Conduct for Research Integrity (ALLEA), 'On Being a Scientist: A Guide to Responsible Conduct in Research' (NAP). This document lists a number of "do's and don'ts" that should be ingrained in the work ethics, and hence the day to day practices, of everyone who is engaged in research in some way or other (as an active researcher, as a student, as a supervisor, or as an administrator).

The committee was satisfied with the formal processes in place for ensuring research integrity. We also asked the PhD candidates about their training in research integrity, and in particular about the game 'Dilemma' used for this purpose (mentioned in the self-evaluation report). Without wishing to evaluate the game itself, the PhD candidates found that it definitely provided occasion for the discussion of potential ethical problems. Such discussions are valuable in situations where "grey areas" may easily arise, even if accusation of serious fraud is blessedly absent. Especially given ILLC's new ambitions in the social sciences, new issues can arise, e.g. in dealing with human subjects, confidentiality or anonymizing data.

Data management issues were discussed directly with the Language and Computation group, who were clearly stewarding their data well, although they hadn't been gathering the links in a central place. That is little work, however.

3.7 Diversity

The composition of the faculty and academic staff as a whole reflects a rather high level of diversity in terms of both age and nationalities. The effort to internationalize the professorial staff has been truly impressive, increasing by a factor of 7, to nearly 30% of the total staff during the evaluation period.

However, the Institute still has not achieved the sort of gender balance that might be expected, even taking into account the fairly low percentage of women entering the fields within the Institute's scope. Currently, among the full professors, the relative numbers of men/women is 12:3, among the tenured research staff (assistant and associate professor) it is 25:6, and among the PhD students it is 30:15. Thus, the committee noted that guaranteeing gender diversity remains an issue; moreover, there has been little improvement in overall ratios during the evaluation period, and extremely limited success in efforts to recruit new female assistant and associate professors. Part of the problem in improving these ratios has been difficulty in obtaining sufficient female candidates to compete for new assistant and associate positions.

To redress this situation, in 2016, the FNWI set a gender diversity target in order to increase the number of permanent female staff appointed at the ILLC. The goal is to have a gender ratio which reflects the gender balance of the Master's student population. Part of this strategy has included offering a MacGillavry fellowship to hire a new female assistant professor in 2017 — a positive step. The Institute has also implemented a range of sensible measures to work on this imbalance, including improving the visibility of female researchers and coaching and mentoring initiatives. However, one important set of (potential) measures that are not mentioned involve reconciliation of work/life issues. The Institute should consider looking at some of the creative measures currently being promoted by the German DFG, including things like emergency child care, the possibility of spouse hires, or efforts to help partners find work in the Netherlands in the case of international job candidates, and other sorts of support that can improve the compatibility of maintaining a cutting-edge research profile with having a family. Additional, proactive efforts should be made to guarantee that enough female candidates apply for the positions that open up.

4. Assessment of the research programmes

4.1 Logic and Language

The LoLa programme studies different aspects of the representation of knowledge and information transmission by communication through meaningful language use.

Quality

The LoLa programme is unquestionably a world leader in research in logic and language and in training next generation of innovators. The programme produces research that is not only rigorous but also, and more importantly, able to cross disciplinary boundaries and push forward the fields of logic and linguistics. Relevant examples in innovative potential are the bridges from Philosophy to Digital Humanities, and the research that brings logical approaches to language to bear on distributional semantics, or the growing framework of Inquisitive Semantics. The "bottom-up" research approach adopted within the LoLa programme has worked well because the ILLC has hired extremely smart, productive, and – perhaps most crucially – broad-minded, creative researchers who are able to collaborate across the different ILLC programmes. These hires have diversified the LoLa profile especially in the area of philosophy.

At over 12M€ during the evaluated period, LoLa funding has been outstanding, including various ERC grants across the Starting, Consolidator, and, perhaps most notably, Proof of Concept calls. The programme has demonstrated capacity to participate in large consortia via a Marie Curie ITN and Language in Interaction Gravitation programme. The programme has also been successful in NWO grants, including a notable number of VENI/VIDI/VICI grants.

Not only the senior LoLa staff but also several of the junior/non-permanent staff are well known, highly respected researchers, serving as editors at major journals and for leading handbooks such as the Cambridge Handbook of Formal Semantics, and as officers in organisations like FoLLI. Several of them are highly cited in comparison to others in their cohort. The Amsterdam Colloquium organised by the LoLa programme continues to be one of the most important conferences for presenting research related to natural language and logic, and the Tbilisi Symposium, while newer, has established a strong tradition and helped develop and maintain connections to the academic community in Georgia. As with the ILLC as a whole, LoLa publications regularly appear in top venues.

The LoLa programme has consistently produced 2-4 PhDs/year during the review period, similar to the other ILLC programmes, with somewhat greater regularity in numbers. Several of these have produced very strong publishing/conference presentation records even before finishing the dissertation.

Societal relevance

The LoLa area has undertaken various efforts to bringing its research to the public. Of these, the three most notable are the outreach efforts to Dutch primary and high schools; the collaborations with external companies and institutions, such as the in the area of Digital Humanities that have grown out of GlamMap and applied ontology; and the collaborations to develop autism diagnostics. More information about the results of these efforts and their future prospects would have been welcome. The LoLa programme is clearly primarily focused on basic research, but the above-mentioned efforts show that the programme has demonstrated its ability to bring its work closer to the public, and these efforts could be strengthened and highlighted more without sacrificing the basic research profile of the programme.

Three of the five themes that the Institute will focus on in the coming years – Explainable and Ethical AI, Logic, Games and Social agency, and Quantum Information and Computation – are directly connected to LoLa staff strengths/interests; the choice of these themes has been informed by societal needs and reflect the interest of the connected LoLa research. LoLa work in semantics/pragmatics, highly valued within linguistics, should continue to strive to connect to research in the human and natural language processing domains in LaCo.

The ongoing collaborations with Stanford and Tsinghua are especially important for LoLa, given the importance of these institutions, and will promote the dissemination of LoLa research.

Viability

The LoLa area has a long-standing, distinguished reputation, an excellent new generation of researchers, and the highest per-capita funding within the ILLC in the evaluation period. It has, in recent years, notably broadened its influence in the field of linguistics. Its researchers maintain rich international networks. All of these factors will contribute considerably to the viability of the programme.

The increased diversity of the philosophy staff as compared to the previous generation, while clearly representing an opportunity for the ILLC as a whole and probably positive for the Department of Philosophy, does introduce some risk of diluting the "Language and Logic" label, or alternatively suggests that perhaps some of the LoLa staff might be better situated in other areas.

In order to guarantee the continued strength and viability of the programme, various aspects of the programme's relation to the Faculty of Humanities should be monitored. The decrease in first stream funding (FTEs) to the LoLa programme in recent years contrasts notably with the increases that have occurred in the LaCo and LoCo programmes; the fact that these LoLa researchers succeed in obtaining funding to buy out their time should not lead to a decrease in the university's commitment to maintaining a core teaching/research staff in Philosophy. Similarly, the chair held until recently by F. Berto, should be filled by a researcher with a comparable profile. More generally, the differences in the way staff hirings and teaching loads are managed between the FGW and the FNWI merit further consideration. The articulation between the ILLC and the FNWI appears to be smoother than that between the ILLC and the FGW, and the impact that this difference could have on the long-term development of the LoLa area, particularly in Philosophy, should be monitored (see, too, remarks in Institute evaluation).

4.2 Logic and Computation

The programme on Logic and Computation (LoCo) complements the other two research groups LoLa and LaCo by strong expertise in different areas of formal methods. The joint research mission of the LoCo programme is to gain a deeper understanding of the nature of information and the processes of reasoning and interaction.

Quality

The LoCo consortium is a world-leading methodological unity where experts in mathematical logic, theoretical computer science and artificial intelligence (AI) join forces. Common tools are taken from complexity theory, modal logic, and game theory. On this theme, the programme members all take their individual angles and share the intellectual flexibility to overcome disciplinary boundaries by discovering common patterns and identifying synergies in apparently very diverse areas. The latter has not only led to various collaborations with the LoLa and LaCo programmes and other institutes of UvA, but also to the very fruitful and close cooperation with the Research Institute CWI in Amsterdam.

In the years 2012-2017, the programme published a series of exciting results at first-class conferences and in high-impact journals. They developed formalisms for the verifying quantum programmes and for analysing the flow of information in social networks. They showed that quantum protocols cannot be used to prove an agent to be located at a specific geographic position. They advanced the topological semantics of modal logic, including applications to formal learning theory and epistemology. With respect to decision theory the LoCo programme analysed logic-based judgment aggregation. In addition, the programme can point to yet further results in bridging the semantic theory of natural language and computational cognitive science, in developing the theory of modal fixpoint logics, and on the use of univalent foundations in constructivist mathematics, enabling inductive types for use in set theory.

The publication record of LoCo is outstanding. The total number of publications reported in the self-evaluation report are impressive: among others, 245 articles published in journals and 140 conference papers. More notable than the absolute number of publications is the fact that many of these papers

appeared in top-ranked publication venues with strict selection criteria and low acceptance rates, which provides a clear indication for the high quality of the papers and significance of the scientific advances.

The LoCo programme was successful in acquiring prestigious research grants. Among others, this includes two NWO top grants for outstanding research groups, one ERC starting grant, and two grants from NWO's innovational research incentives scheme (one VENI grant and one VIDI grant). Besides these and other individual grants listed in the self-evaluation report with a total amount of ca. 5 Million Euro, the LoCo programme also contributed significantly to the foundations of research networks. Most notable is the research centre for quantum software (QuSoft), which is a joint initiative of UvA, VU and CWI, co-founded by one of the LoCo members. The QuSoft consortium is clearly one of leading teams addressing the challenge of harnessing the power of quantum information. Another example is the (co-)leadership of a European research network (EU COST) on computational social choice and algorithmic decision theory.

Further evidence for the international visibility and the high reputation of the LoCo members is provided by the formidable number of editorial products: in total 23 edited books and an average of 40 other editorships per year, including editorial work for flagship journals in logic, AI, and complexity theory. Likewise, the LoCo consortium is very active in the steering and programme committees of international conferences.

Overall, there have been 15 PhD defences in the period 2012-2017. Just as in the other ILLC programmes, the average quality of the PhD theses is very high. An impressively high percentage of the PhD alumni of LoCo have started an academic career. This yields another clear indication for the high quality and significance of this research programme.

Relevance to the society

The focus of the LoCo programme is fundamental research in directions that can have tremendous impact on the society. This clearly applies to the recent work in the directions of quantum information science and explainable AI. Quantum computing is an emerging research field in academia and industry, which might lead to dramatic changes compared to conventional hard- and software systems. The LoCo programme and their partners at CWI and in QuSoft are one of the very few teams world-wide addressing the challenges in processing information efficiently according to quantum-mechanic rules, ensuring security by cryptographic protocols that are difficult to break even when attackers may use large quantum computers, or developing algorithms for fundamental problems that fully exploit the potential of quantum computing. Likewise, thanks to the unique combination of strong expertise in logic, games, AI and mathematics, the LoCo programme has the potential to overcome the intransparency of machine-learning-based decisions and resulting automated actions by developing the foundations of model-based explanations for machine behaviours, and hereby significantly contributing to the implementation of the European Union's regulation 2016/679 that creates a "right to explanation". These are just examples illustrating the high potential relevance of the outstanding foundational work of the LoCo programme. Other research directions of the LoCo programme might have less immediate effect for the society, but can provide important impulses for and beyond the research community. The committee looks forward to LoCo's further efforts in bringing its world-class theoretical research to more tangible practical significance.

The LoCo programme has implemented several measures to disseminate their research results for a broad audience. Among others, these include articles and lectures for the general public and the joint initiative with the LoLa programme to establish logic courses at Dutch high schools.

Viability

The LoCo programme has an outstanding international reputation. The LoCo programme consists of world-leading researchers at the senior, mid-career and junior academic level. In the period 2012-2017, and the LoCo programme was very successful in hiring outstanding researchers to fill open positions. LoCo has attracted innovative researchers who nonetheless continue some of the research lines of the departing staff (emeriti). Concerning diversity with respect to nationality and age, the composition of the LoCo programme is exemplary. Diversity with respect to gender is a concern of all academic institutions

with similar research directions. The ILLC's measures to improve the gender ratio have been successful as the percentage of female full professors in the ILLC has increased from 0% to 20% in the period 2012-2017. It is clear that a good deal more improvement is still possible and desirable.

The LoCo programme is very well embedded in the ILLC, FNWI and UvA. Beyond collaborations inside UvA, the LoCo programme is very well interconnected through national and international research networks. Most notably is the very fruitful collaboration with the CWI. This long-standing collaboration clearly leads to a win-win situation for the ILLC and the CWI.

4.3 Language and Computation

The Language and Computation (LaCo) programme is focused on computational models of human information processing, especially in computational linguistics, music cognition and digital humanities.

Quality

The LaCo programme works in several areas, which, taken together, constitute a broad field of activity. The strategy is deeply innovative and brashly multidisciplinary: where computationally research lines have led to insights that could be better pursued in neighbouring fields, these have indeed been pursued, for example in well-cited publications from the reporting period on the history of the humanities and on the biological basis of music, the two best cited key publications of this group. The strategy fits very well within the priority areas of the UvA, which has resulted in €870K additional research monies.

The LaCo programme has innovatively developed expertise in neural machine learning methods that are in dialog with linguistic theory and cognitive neuroscience on the one hand and graphical modelling on the other. This contrasts with the strictly application-oriented work which characterizes most computational linguistics (CL, the historical core of LaCo) They have developed expertise in the Digital Humanities, where, together with other UvA researchers in the Humanities, they constitute the strongest programme in the Netherlands. The special focus on music cognition is unusual and, in addition to its inherent scientific interest, has great public appeal. These areas are all certain to grow in the future. LaCo also continues its excellent research in both computational linguistics, both with excellent applied work (see section below on societal relevance), and also with an innovative and already very successfully line of research focused on understanding the incredible success of "black box" deep learning, asking in particular, about the potential cognitive interpretation of the multi-layer neural nets typically employed.

The key publications all appeared in excellent venues, including a book in the selective Oxford University Press (OUP), a journal article in the general high impact Philosophical Transactions of the Royal Society B, two articles in the very selective conference proceedings Empirical Methods in Natural Language Processing, and one in the likewise selective proceedings of the ACM special interest group on information retrieval (SIGIR). These publications are clearly having impact, as they've been cited more than forty times each on average, an astounding number for work published in the last six years. The overall publishing output is likewise strong, with 145 journal articles, or 2.7 articles per FTE of university staff. Even more articles were published in conference proceedings, which is also a healthy sign in the fields involved, where proceedings articles are often authoritative. The programme provided the committee with three pages of other products for peers, such as github repositories (software), corpora, and online demos.

The LaCo programme is extremely successful in securing financing for its research. They were awarded nearly €11 Million for research during the reporting period (including the UvA grants noted above). These included one ERC starting grant, one grant each in the very competitive NWO VIDI and VICI programmes and two successful open competition proposals (NWO). The programme was also deeply involved in the NWO Language in Interaction programme, where whey secured nearly €1.3 Million in research funding. The committee discusses funding for applied research in the following section.

16 PhD dissertations were defended in the LaCo programme during the reporting period, a very good number, but one leaving room for improvement.

The senior members of the LaCo programme are recognised leaders in their fields, at least two recognised as profound innovators and others as among the technically most accomplished anywhere.

Two have been elected members of the Royal Holland Society of Sciences and Humanities (KHMW), a prestigious distinction. There is obviously substantial talent among the less senior members as well. Further, the programme serves its profession(s), assuming the editing responsibilities of an average of 12 journals per year.

Societal relevance

The LaCo programme is clearly committed to producing societally relevant work, as they are deeply involved both in work aimed at improving products and services using language technology but also in outreach work, aimed at informing and intriguing the scientifically interested public.

With respect to applying LaCo research to societally relevant problems, the committee notes first that several PhD students have interned at technical companies such as Xerox in Grenoble, SONY in Paris, Microsoft Research, Unabel in Lisbon, Google in Switzerland, Google in London, Lattice Data/Apple in Menlo Park, and Amazon in Zurich. Several alumni hold positions at companies such as Pacmed, Funda, Adyen, Google, eBay, ING-bank, Deltares, and Apple. The LaCo programme received nearly €800K directly from industry during this period, and they also directly collaborated with industry, e.g. in the project, DatAptor, that is funded by STW, the NWO Domain of Applied and Engineering Sciences. DatAptor features a software package BEER version 2.0 which offers a trained machine translation evaluation metric with high correlation with human judgment.

The programme focused on Natural Language Processing (NLP) and information retrieval developed Political Mashup in the NWO Creative Industries programme (http://politicalmashup.nl/2013/04/nwo-creatieve-industrie-project-expose/), a project that involved two private companies, the royal library (KB), the national archive, and the Dutch parliament. This work is being continued in ACCESS, a second NWO Creative Industries projects, but geared toward providing access to the minutes of city councils meetings. Two companies are participating as well.

With respect to outreach, the committee notes that the subgroup focusing on music has produced an engaging game, "Hooked on Music", which has been visited over three million times. They also prepared the "miracles of music" project, aimed at raising the awareness of the importance of music in development, education and health, and involving performances, lectures and a film. An English translation of a popular science book that was successful in Dutch also appeared, viz. 'Musical Cognition: A Science of Listening' (Transaction Publishers, 2011/2013) and was reviewed in several journals and newspapers including Volkskrant, NRC Handelsblad and USA Today. A data-oriented parsing demo was also developed and deployed during the reporting period.

Viability

If one of the best indicators of future health and strength is past performance, and, in particular, performance in the recent past, the LaCo programme should have a very bright future. The senior staff within the four subgroups (music cognition, digital humanities, language technology, and information retrieval and extraction) clearly understand their respective fields thoroughly, think strategically about them and can provide astute leadership. They range from extremely good to genuinely outstanding, a further reason for optimism about the future. A very interesting research line in dialogue has recently joined the effort, accompanied by a VIDI project.

During our interviews LaCo members complained that they have in the past had to seek grant support in order to cover the costs of hardware needed for their research (and not only needed for specific grants). The ILLC management was confident that the solution to this problem had already been implemented, and suspected that some researchers' knowledge was not completely up to date in this respect. The committee nonetheless recommends vigilance with respect to the provision of easy access to advanced computing facilities for this group.

The programme regularly attracts a generous amount of external funding (see sections above), which indicates that it can independently assure a healthy amount of energy, a certain further sign of its viability. The ILLC's foci on explainable and ethical AI, interpretable machine learning, and cognitive modelling offer many possibilities for LaCo members to fund their research more generously, perhaps in collaboration

with members of other ILLC programmes. LaCo is also well positioned to participate in the UvA's new research priority area (RPA) in AI and for continued participation in the RPA `Brain & Cognition'.

The LaCo programme's clear commitment to societally relevant work and its success in that respect are two further reasons for faith in the future of this programme.

5. Recommendations

The ILLC is an outstanding Research Institute that compares to the very best in its area in the world. The committee nonetheless suggests that it might further improve in paying heed to the following points.

1. A great institute focused on foundational issues in the study of information ought to be a welcome partner for many companies, governmental agencies or perhaps even charitable organisations. It will be exciting to see ILLC ideas result in improvements in practical problems and processes, and it may be the source of important new ideas. The committee urges the ILLC to consider how it might engage societal partners less modestly;

2. The Institute should track its products for peers – especially data sets and software – as it now tracks its publications. The committee received a substantial list during the evaluation, so it has no doubts about the contributions of the group in this respect, but it would be worthwhile to do this systematically and to collect links to it (perhaps in links to pages provided by the different research lines). Numbers on use (page views, downloads, etc.) are also useful;

3. The more complicated organisational situation in the Faculty of Humanities warrants careful monitoring to protect ILLC's position there;

4. ILLC is encouraged to use a wider variety of measures to attract and retain female faculty, especially ones that help with work-life balance;

5. The Faculty of Humanities should maintain its commitment to First Stream funding for faculty profiles in Philosophy and review its policies concerning the hiring profiles for substitutes for faculty who are granted teaching relief as a result of obtaining research grants;

6. The programmes should re-evaluate the adequacy of their labels to reflect the changing profiles of the staff in the programmes.

Appendix A – Curriculum Vitae

John Nerbonne (chair) worked at Hewlett-Packard Labs and the German Research Center for Artificial Intelligence before becoming professor of digital humanities in Groningen in 1993 (now emeritus). His research focuses on machine learning and computational techniques for studying language variation, and he has published extensively in these areas, but also in a wide range of other topics in computational linguistics. He has had visiting appointments as professor or researcher in Stanford (1985-90), Saarbrücken (1991-92), Nippon Telephone and Telegraph Labs (Yokosuka, 1997), Musée de L'Homme (Paris, 1998, inter alia), Stuttgart (2002), MIT (2005), Tübingen (2006) and the Freiburg Institute for Advanced Study (FRIAS, 2012-2014). Nerbonne served as president of the Association for Computational Linguistics in 2002, joined the Royal Netherlands Academy of Arts and Sciences (KNAW) in 2005, was the American Dialect Society professor at the 2005 Linguistics Institute of the Linguistics Society of America, and received the Humboldt research prize in 2013. He has been an honorary professor in Freiburg since 2014. See www.let.rug.nl/nerbonne/.

Christel Baier is a full professor and head of the chair for Algebraic and Logic Foundations of Computer Science at the Faculty of Computer Science of the Technische Universität Dresden since 2006. From the University of Mannheim, she received her Diploma in Mathematics in 1990, her PhD in Computer Science in 1994, and her Habilitation in 1999. She was an associate professor for Theoretical Computer Science at the University of Bonn from 1999 to 2006. She is a member of the DFG review board for computer science since 2012 and co- speaker since 2013. Since 2011 she is a member of Academia Europa. Her expertise is on modelling, specification and verification techniques for reactive systems. In particular, she is interested in algorithms for the quantitative analysis of stochastic systems, probabilistic model checking, verification of infinite-state systems, coordination languages, compatibility of components, temporal and modal logics, and automata over infinite structures.

Edwin Mares is a full professor in the philosophy programme at Victoria University of Wellington, New Zealand. He works in logic and epistemology, and has published three books –– Relevant Logic (Cambridge University Press, 2004), A Priori (Routledge 2011), and (with Stuart Brock) Realism and Anti-Realism (Routledge 2007). He has published more than 60 articles and book chapters, and has edited three collections on logic and philosophy. He has been the managing editor of the Australasian Journal of Logic since 2013 and from 2009 until 2018 he was the director of Victoria's Centre for Logic, Language, and Computation.

Louise McNally (PhD in Linguistics, U.C. Santa Cruz, 1992) taught at Indiana University, The Ohio State University and the University of California, San Diego before joining Universitat Pompeu Fabra in 1995, where she is Professor of Linguistics in the Department of Translation and Language Sciences. Her research is mainly concerned with semantic theory and the syntax/semantics/pragmatics interface; she has also collaborated with computational semanticists and philosophers of language. She is associate editor of the journal Semantics & Pragmatics, co-editor of Springer's Studies in Linguistics and Philosophy series and Advisory Editor for the Oxford Research Encyclopedia of Linguistics. She has been panel member (2011) and chair (2013-2017) for the European Research Council, and was a member of the Electorate Nominating Committee of the Section on Linguistics & Language Science for the AAAS (2016-2019). In 2017 she received a Humboldt Research Award.

Appendix B - Programme of the site visit

Monday December 3

Time	Part	Collocutors
09.00 – 10.30	Preparation of the site visit	committee
10.30 – 11.30	Introduction and meeting with Management ILLC	Maria Aloni, Jenny Batson, Luca Incurvati, Robert van Rooij, Sonja Smets, Yde Venema, Jelle Zuidema
11.30 – 12.15	Logic & Computation Programme (LoCo) Meeting and discussion	Alexandru Baltag, Nick Bezhanishvili, Ulle Endriss, Chris Schaffner, Jakub Szymanik, Yde Venema
12.15 – 12.35	Closed session: conclusions and recommendations LoCo	committee
12.35 – 14.00	Lunch	committee
14.00 – 14.45	Logic & Language Programme (LoLa) Meeting and discussion	Maria Aloni, Arianna Betti, Paul Dekker, Luca Incurvati, Floris Roelofsen, Robert van Rooij
14.45 – 15.05	Closed session: conclusions and recommendations LoLa	committee
15.05 – 15.15	Break	committee
15.15 – 16.00	Meeting with PhD candidates	Samira Abnar, Bas Cornelissen, Levin Hornischer, Dieuwke Hupkes, Frederik Lauridsen, Anthi Solaki, Zoi Terzopoulou
16.00 – 16.20	Closed session	committee
16.20 – 17.30	Informal tour of ILLC Posters, meeting with staff and PhD candidates	plenary
18.00	Dinner committee members / secretary	committee

Tuesday December 4

Time	Part	Colluctors
9.15 – 10.00	Language & Computation Programme (LaCo) Meeting and discussion	Rens Bod, Ashley Burgoyne, Raquel Fernández, Katia Shutova, Khalil Sima'an, Jelle Zuidema
10.00 – 10.20	Closed session: conclusions and recommendations LaCo	committee
10.20 – 11.05	Meeting with postdocs	Wilker Aziz, Elia Bruni, Ronald de Haan, Peter Hawke, Aybuke Ozgun, Shane Steinert Threlkeld
11.05 – 12.00	Closed session: discussion	committee
12.00 – 13.00	Lunch with Deans (Humanities and Science)	Fred Weerman, Peter van Tienderen
13.00 – 13.30	Preparation meeting with management	committee
13.30 – 14.15	Meeting with management ILLC (questions, advice)	Maria Aloni, Jenny Batson, Luca Incurvati, Robert van Rooij, Sonja Smets, Yde Venema, Jelle Zuidema
14.15 – 16.00	Closed session: Discussion, preparation of preliminary results	committee
16.00 – 17.30	Plenary session: Presentation of preliminary results	plenary

Appendix C - Tables

Table 1 Staff in fte

	2012	2013	2014	2015	2016	2017
Scientific staff	14.9	17.6	20.6	21.0	21.2	20.6
Post-docs	15.1	16.9	16.6	16.7	19.0	22.1
PhD students	25.2	33.0	40.6	43.0	42.4	39.5
Technical support	0.0	0.2	0.9	0.9	0.5	0.2
Total research staff	**55.2**	**67.7**	**78.6**	**81.7**	**83.1**	**84.2**
Visiting fellows	5.7	3.9	3.5	6.4	6.1	7.4
Support staff	3.3	3.9	4.5	4.5	5.1	5.8
Total staff	**64.2**	**75.5**	**86.6**	**92.6**	**95.3**	**100.4**

Table 2 Main categories of research output

	2012	2013	2014	2015	2016	2017
Refereed journal articles	85	97	90	85	66	107
Books/monographs	4	4	6	5	4	2
Edited books	10	12	8	6	6	6
Book chapters	28	28	39	21	24	19
PhD theses	10	3	5	5	10	8
Conference papers	52	77	67	74	78	83
Publications aimed at the general public	5	10	11	16	8	7
Editorships	66	68	67	67	70	77

Table 3 Funding

	2012		2013		2014		2015		2016		2017	
	FTE	%	FTE	%	FTE	%	FTE	%	FTE	%	FTE	%
Direct funding	23.7	39	28.5	40	30.5	37	31.7	36	29.7	33	32.1	35
Research grants	23.7	39	27.9	39	31.4	38	30.9	35	31.6	35	31.3	34
Contract research	2.6	4	5.5	8	10.2	12	12.2	14	14.6	16	13.0	14
Other	10.6	18	9.7	14	10.0	12	13.2	15	13.4	15	15.3	17
Total funding	60.9		71.6		82.1		88.1		89.2		91.6	

Table 4 PhD candidates

Enrolment				Success rates											
Starting year				Graduated in year 4 or earlier		Graduated in year 5 or earlier		Graduated in year 6 or earlier		Graduated in year 7 or earlier		Not yet finished		Discontinued	
	M	F	M+F	#	%	#	%	#	%	#	%	#	%	#	%
2008	9	2	11	5	45			2	64						
2009	2	–	2	1	50			1	100						
2010	5	2	7	3	43			1	57	1	71				
2011	9	3	12	3	25	3	50	2	67						
2012	10	9	19	6	32	3	47	3	63	1	68				
2013	9	1	10	4	40	2	60								
2014	12	1	13	4	31	4	62								
Total	56	18	74	26	35	12	51	9	64	2	66				

Appendix D – Meaning of the scores

Category	Meaning	Research quality	Relevance to society	Viability
1	World leading/ excellent	The research unit has been shown to be one of the few most influential research groups in the world in its particular field	The research unit makes an outstanding contribution to society	The research unit is excellently equipped for the future
2	Very good	The research unit conducts very good. internationally recognised research	The research unit makes a very good contribution to society	The research unit is very well equipped for the future
3	Good	The research unit conducts good research	The research unit makes a good contribution to society	The research unit makes responsible strategic decisions and is therefore well equipped for the future
4	Unsatisfactory	The research unit does not achieve satisfactory results in its field	The research unit does not make a satisfactory contribution to society	The research unit is not adequately equipped for the future