RESEARCH REVIEW

Institute for Logic, Language and Computation
University of Amsterdam (ILLC)

2018-2023

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Preface

It has been an honor and a pleasure to chair this review of the University of Amsterdam's Institute for Logic, Language and Computation (ILLC). The report presented in this document reflects the evaluation of a committee of specialists covering the fields of logic, theoretical computer science, data science, computational linguistics, theoretical linguistics and their interfaces with artificial intelligence and cognitive science. The committee members also brought to the process different perspectives from within and external to the Dutch university system. I am extremely grateful to all of them for their contributions to the evaluation and its successful completion: Prof. dr. Christel Baier, Technical University, Dresden; Dr. Hein Duijf, Universiteit Utrecht; Dr. Dominik Klein, Universiteit Utrecht; and Mr. Timo Westlake, Tilburg University. Thanks also to Prof. dr. Walter Daelemans, Universiteit Antwerpen, for valuable written comments on the ILLC self-evaluation report prior to the site visit.

The committee was fortunate to benefit from the expertise of Esther Poort of De Onderzoekerij, who served as its secretary. I thank her for the excellent guidance that she provided to the committee throughout the evaluation process, the extensive notes she took during the site visit, and her role in the preparation of this final report.

The report reflects information obtained both from the ILLC's self-evaluation report and the presentations and discussions during our site visit on December 2-3, 2024. I thank Prof. dr. Robert van Rooij, dr. Peter van Ormondt, Mr. Ewout Arends, and Ms. Alexandra Zieglerová for their roles in making our visit and the more general evaluation process productive, smooth, and enjoyable.

Prof. dr. Louise McNally, chair of the committee

Executive summary

The ILLC, part of the Faculties of Science (FNWI) and Humanities (FGw), is a leading international research hub advancing the interdisciplinary study of information through formal and computational methods. It encompasses disciplines such as philosophy, computer science, logic, mathematics, musicology, linguistics, and cognitive science. This integrated approach is central to the ILLC's research excellence.

The institute's dual strategy of maintaining its traditional strengths in foundational research while embracing new areas, particularly in artificial intelligence (AI), has proven highly successful. This is evidenced by consistently high research output, strong citation impact, impressive grant success, and the broad influence of its academic contributions.

The committee has been highly impressed by the ILLC's diverse and impactful outreach activities, which draw on its broad expertise and address timely topics like the impact of generative AI. The institute engages with local, national, and international stakeholders through a mix of long-term projects, collaborations (e.g., SignLab), recurring initiatives (e.g., Logic and Math outreach), and short-term activities. Notable collaborations such as with the Dutch deaf community highlight ILLC's societal impact. To enhance the focus and effectiveness of these outreach activities, the committee recommends better coordination of and reflection on these outreach efforts.

The ILLC's viability is very high, supported by its international reputation, robust funding, and clear societal impact. While funding cuts in Dutch universities pose challenges, the institute's interdisciplinary focus, particularly in AI, and its points of contact with research in quantum computing, position it well to adapt. The recent reorganization into focused research units has been successful, though further adjustments may be needed for balance and cohesiveness. The development of three interdisciplinary themes—Learning and Reasoning, Language and Communication, and Technology and Society—provides a promising path forward. One of the main challenges for the ILLC is to maintain its internal cohesiveness, especially as the institute has grown and spread across multiple locations. The committee encourages the University to support the ILLC's continued success by ensuring structural support for unified working spaces at the FNWI location. Until greater physical proximity is possible, the ILLC management should foster connections through additional events, complementing current initiatives like the ILLC Colloquia and social activities.

The ILLC is committed to Open Science, promoting open access publishing in collaboration with the Universities of the Netherlands. A publicly accessible inventory of datasets and code, including a full index of ILLC code on GitHub, reflects this commitment and the institute's dedication to transparency and open science.

The ILLC fosters an inclusive and open academic culture. Efforts include a social code of conduct, regular surveys, and a Diversity Committee addressing work-life balance, childcare support, and the integration of international staff. The institute maintains a strong commitment to research integrity, adhering to ethical practices in research. Industry partnerships present unique challenges for maintaining research integrity. One key challenge concerns co-funded research, particularly regarding the conditions for setting research questions and reconciling open science with industry confidentiality. The committee recommends that ILLC provide structured guidance for researchers engaging in such collaborations. Dedicated advisory committees or workshops could help address these challenges while preserving the ILLC's commitment to research integrity.

The ILLC takes a proactive approach to talent management, focusing on staff development, diversity, and equality of opportunity, with the goal of fostering a strong academic community. Although some progress in gender balance is apparent, further efforts are required to improve diversity at higher

academic levels. The path for career progression is clearer in the Faculty of Science, and aligning practices across faculties would support early-career researchers. Additionally, improving work-life balance support could boost hiring and retention especially of female researchers. Such efforts will help the ILLC maintain its competitiveness in attracting top talent.

The ILLC offers an outstanding PhD program focused on training, supervision, and career development. The program features multiple supervisors, a flexible Teaching and Supervision Plan (TSP), and a variety of courses designed to build transferable skills. Its success is evident in low dropout rates, strong research outputs, and the subsequent career trajectories of its graduates. The committee recommends clarifying the PhD Council's role, improving the scheduling of annual evaluations, and exploring additional initiatives to strengthen networking and social cohesion among PhD candidates across different locations.

1. Introduction

1.1 Aim of the assessment

All publicly funded university research in the Netherlands is evaluated at regular intervals in compliance with a national Strategy Evaluation Protocol (SEP 2021-2027), as agreed by the Universities of the Netherlands (UNL), the Netherlands Organization for Scientific Research (NWO) and the Royal Netherlands Academy of Arts and Sciences (KNAW). The evaluation process, which is applied at the research unit level, consists of an external peer review conducted every six years.

The committee is requested to assess the quality of research conducted by the Institute for Logic, Language and Computation (ILLC) as well as to offer recommendations to improve the quality of research and the strategy of the ILLC. This report describes the findings, conclusions, and recommendations of this external assessment of their research.

1.2 The committee

The Board of the University of Amsterdam appointed the following members of the committee:

- Prof. dr. Louise McNally (chair), Universitat Pompeu Fabra, Barcelona, Department of Translation and Language Sciences;
- Prof. dr. Christel Baier, Technische Universität Dresden, Faculty of Computer Science;
- Prof. dr. Walter Daelemans, Universiteit Antwerpen, Department of Linguistics;
- Dr. Hein Duijf, Universiteit Utrecht, Department of Philosophy and Religious Studies;
- Dr. Dominik Klein, Universiteit Utrecht, Department of Philosophy and Religious Studies;
- Mr. Timo Westlake (PhD candidate), Tilburg University, Department of Cognitive Science and Artificial Intelligence.

The Board appointed Drs. Esther Poort of De Onderzoekerij as the committee secretary. All committee members signed a declaration form stating no conflict of interest and ensuring impartiality and confidentiality. Due to sudden illness, Prof. dr. Daelemans was unable to participate in the site visit, although he completed an individual report of preliminary findings and questions for the site visit, based on the self-assessment report, which the rest of the committee took into account when preparing the site visit.

1.3 Procedures followed by the committee

Before the site visit, the committee reviewed detailed documentation comprising the self-assessment report of the institute including appendices.

The committee proceeded according to the Strategy Evaluation Protocol (SEP) 2021-2027. The assessment was based on the documentation provided by the ILLC and interviews with the ILCC management, selections of senior and junior researchers, and PhD candidate representatives, as well as the Deans of the Faculties of Humanities and Sciences. The interviews took place on December 2 and 3, 2024 (see Appendix A).

The committee discussed its assessment at its final session during the site visit. The committee chair had a coordinating role in the writing procedure and delegated the writing of sections to members of the committee. The committee members commented by email on the draft report. The draft version was then presented to the ILLC for factual corrections and comments. Subsequently, the text was finalized and presented to the Board of the University.

2. Management and organization of the ILLC

The ILLC, part of the Faculty of Science (FNWI) and the Faculty of Humanities (FGw), fosters a vibrant community of scholars—philosophers, computer scientists, logicians, mathematicians, musicologists, linguists, and cognitive scientists—dedicated to advancing the interdisciplinary study of information using formal and computational methods, and in which artificial intelligence plays a central role both as a method and as an object of research itself. Building on Amsterdam's strong tradition in logic and foundational research at the intersection of logic, language and computation, the ILLC combines techniques from the humanities and exact sciences to create a unique, cutting-edge hub in the international landscape.

The ILLC members are employed by either FNWI or FGw and adhere to the regulations of both faculties. While FNWI acts as the administrative host, the ILLC reports to both deans and actively contributes to decision-making and teaching within both faculties. This inter-faculty collaboration, formalized through a covenant, is considered by the ILLC as essential to its success. Research programs are jointly approved by both faculties, and FGw staff are provided workspace at FNWI to ensure cohesion.

Due to its dual-faculty structure, the ILLC operates within a complex framework, requiring coordination across distinct administrative systems. In FNWI, research institutes function as primary organizational units for budget and personnel matters. In contrast, FGw organizes academic staff within departments, with research and teaching managed through institutes. Five of the six research institutes in FGw together form the Amsterdam Institute for Humanities Research (AIHR); the sixth is the ILLC, which is a separate interfaculty research institute, operating alongside the AiHR. Within FGw, ILLC members are distributed across six departments (which also include non-ILLC members): Philosophy, Literary Studies and Linguistics, Arts and Culture, Modern Foreign Languages and Cultures, Media Studies, and Dutch Studies.

In response to the recommendations from the previous review committee, the ILLC underwent a restructuring in 2021, establishing six research units:

- Mathematical & Computational Logic (MCL)
- Theoretical Computer Science (TCS)
- Formal Semantics & Philosophical Logic (FSPL)
- Epistemology & Philosophy of Science (EPS)
- Natural Language Processing & Digital Humanities (NLP&DH)
- Language & Music Cognition (LMC).

The restructuring introduced a new management structure, consisting of a Management Team Small (MTK) and a Management Team Large (MTG). The MTK comprises the scientific director, the institute manager, the director of the ILLC Doctoral Program, and two vice directors. The scientific director oversees the institute with support from the vice directors. One vice director coordinates the teaching activities of ILLC members at FNWI, which participates in nine education programs, while the other focuses on the institute's research activities. The MTK meets biweekly to discuss and make decisions on key institute matters. The MTG includes the MTK members, leaders of the six research units, and the director of the Master of Logic. The MTG meets bimonthly to address issues raised by ILLC staff through unit leaders and to make major strategic decisions for the institute.

The unit leaders participate in MTG meetings and act as liaisons between ILLC senior staff and the management. They organize regular unit meetings and oversee the units' travel and colloquium budgets. The ILLC Office, part of FNWI, supports members from both faculties.

3. Assessment of the research of ILLC

3.1 Mission and strategy

Mission of the last six years

The scientific mission of ILLC has been and is to study information, including the logical structure and algorithmic properties of processes of encoding, transmitting and comprehending information. This encompasses a wide range of information types, from the flow of information in natural and formal languages to the information contained in music and graphics. The ILLC aims to develop formal systems that can handle this rich variety of information, making use of insights across disciplines such as linguistics, computer science, cognitive science, artificial intelligence and philosophy.

Beyond specific research goals, the ILLC strives to bridge traditional boundaries between faculties and disciplines, serving as a hub for information scientists in fields like computer science, theoretical linguistics, computational linguistics, philosophy, musicology, and the social sciences. Interdisciplinary research is central to the ILLC's mission, emphasizing collaboration across its primary research lines. The institute is committed to a strong presence in all relevant departments and faculties through teaching as well as involvement in various activities and decision-making processes. This fosters mutual understanding between disciplines and balances the academic cultures of the sciences and humanities.

At the ILLC, research and education are deeply intertwined. The institute's graduate programs, including the Master's programs (in particular the Master of Logic and the Master of Artificial Intelligence) and the Doctoral program, are closely aligned with its research vision, and researchers collaborate with postgraduate students intensively.

Strategy

Over the past six years, the ILLC's core strategy has been to strike a balance between tradition and innovation—maintaining excellence in established fields while exploring emerging areas, including AI and its societal impact. The self-evaluation report identified five key goals which responded to the main recommendations of the previous evaluation committee.

- Reorganize the institute's structure (G1).
- Enhance and better highlight cross-disciplinary links within the institute, striving towards a better balance across the three pillars of ILLC's research—logic, language, and computation—within the two faculties, Science and Humanities (G2).
- Enhance diversity and attract and retain female staff members, especially at the Faculty of Science (G3).
- Strengthen ILLC's societal relevance by designing a new strategy for a stronger engagement with local, academic, industrial, and societal partners (G4).
- Protect ILLC's position in the Faculty of Humanities, thereby maintaining a strong presence within both faculties (G5).

Reorganize the institute's structure (G1)

The ILLC's research originally built on three main pillars: logic, language, and computation. Initially, the institute was organized into three 'programs' reflecting key intersections of these pillars: Logic & Computation, Logic & Language, and Language & Computation. However, as the institute grew, these labels no longer captured the full range of research topics pursued by its members. In response to the previous review committee's recommendation, the ILLC underwent an intensive bottom-up process to

re-evaluate its research structure, leading to the creation of six research units and a new management structure.

Strengthen balance (G2)
The self-evaluation report further explains that a key goal was to rebalance ILLC's involvement in FNWI and FGw, strengthening the ILLC's role in both faculties and promoting significant growth in the Humanities, which had previously seen more limited expansion. The figures in the self-evaluation report indicate that growth in FGw has in some respects outpaced that in FNWI, resulting most relevantly in a shift in the balance of assistant professors in favor of FGw.

Enhance diversity and attract female staff (G3)
The third goal was to enhance diversity and attract female staff members, particularly in FNWI. To achieve this, the ILLC implemented several strategies, including career development plans for female scientists, participation in FNWI's MacGillavry recruitment program (2019 and 2023), and involvement in the NWO Aspasia fund. Additional efforts included actively recruiting female candidates, increasing female representation in decision-making bodies, and addressing gender bias in hiring committees. ILLC also aims to achieve greater diversity in other ways, such as the hiring of five researchers from the deaf community in 2023 as part of the SignLab initiative.

Strengthen societal relevance (G4)
The fourth goal was to enhance societal relevance through deeper engagement with local partners, both within the academic context and in the industrial and societal spheres. An important development on this front has been the ILLC's presence, since 2022, in Lab42 and the Humanities Labs—both of which are designed to serve as networking hubs. Lab42, located at Amsterdam Science Park, focuses on artificial and digital innovation, connecting researchers, students, and companies; the ILLC occupies one floor of this building. The Humanities Labs, situated in the historic Bushuis, support innovative humanities research, including the ILLC's Music Lab and SignLab, both of which are very involved in social engagement activities. Another key development has been the rapid growth of research related to artificial intelligence (AI), particularly the use of large language models in science and society.

Protect ILLC's position in the Faculty of Humanities (G5)
An ongoing structural issue is that research units have a different status in the FGw vs. the FNWI. This means that the ILLC's status in the two faculties is distinct. As a research institute within the Faculty of Humanities, the ILLC has only an advisory role in hiring. In contrast, as a research institute in the FNWI, the ILLC can decide to create a new position or to fill a vacant one, draw up profiles, prepare proposals for tenure or promotion, and so on. It is therefore essential that the ILLC maintain strong contacts with the FGw Dean and Departments (where such decisions are made), as well as work to ensure coordination between the deans of FGw and FNWI.

Overall, the committee was very satisfied with the way in which the ILLC responded to the recommendations of the previous evaluation, and with the coherence between those recommendations and the goals in this evaluation period. Goals G1 and G4 have led to numerous actions and outcomes in the evaluation period. Goals G2, G3 and G5 have been the subject of clear actions and some successes, but the degree to which success has been possible has been limited partly by structural issues related to the ILLC being an interfaculty institute. Further comments and recommendations related to these goals will be provided below. One general recommendation for all goals, looking ahead to the next evaluation period, is that more specific targets and measures for determining the success of outcomes be developed for each strategic goal. Specific targets and measures enhance actionability and accountability, thereby improving the chances of progress.

3.2 Research quality

The ILLC has been a top international research institute for decades; its research continues to be excellent across a variety of indicators. The ILLC is unique for its interdisciplinarity and the breadth of its topics. The ILLC is a dynamic and forward-looking institute that manages to maintain its traditional strengths and excel in new research areas – especially with regard to the recent advances in artificial intelligence.

Research at the ILLC encompasses a wide range of academic disciplines, including philosophy, computer science, logic, mathematics, musicology, linguistics, cognitive science, and some subareas of the social sciences. The unifying feature of the ILLC is the use of formal and computational methods in the interdisciplinary study of information. It has a strong tradition in logic and foundational research, and a widely acknowledged reputation as an excellent research institute. The committee is strongly supportive of the ILLC's dual emphasis on tradition and innovation: sustaining its research excellence in its traditional strengths, while also innovating in new areas of research in complementary and synergetic ways.

During the review period the outstanding academic quality of the ILLC has been demonstrated by a range of indicators. The consistently high volume of research output, strong citation impact, and impressive benchmark results clearly demonstrate the institution's excellence in research quality. In all its research areas, the ILLC consistently excels in terms of research impact. The case studies further illustrate the significant influence and importance of specific research contributions.

The impressive number of successful applications for highly competitive research grants further emphasizes the outstanding research quality at ILLC. During the review period, ILLC secured two ERC Starting Grants, one ERC Consolidator Grant (plus one announced on the second day of the site visit), three Veni grants, one Vidi grant, and two Vici grants. Notably, the number of grant recipients is substantial; while some researchers have achieved remarkable success, many others across various programs have also obtained funding, underscoring the breadth of talent within the institute.

ILLC's excellent reputation is further demonstrated by the number of awards and prizes received for papers, books, and theses. Additionally, the institute's members are often recognized as experts in their fields as evidenced by a significant number of invited lectures and editorships of journals. Furthermore, members have organized numerous conferences and workshops. Many international research fellows have visited the institute. These observations all attest to the flourishing academic environment at the ILLC.

3.3 Societal relevance

Increasing its societal relevance and engaging its societal partners less modestly were among the recommendations of the previous research review committee. Correspondingly, the ILLC had given itself the objective of developing a strategy for a stronger engagement with local, academic, industrial and societal partners.

The institute has amply delivered on this goal. Over the past evaluation period, the ILLC has hosted an impressive range of offerings for and contacts with society broadly speaking. The ILLC's outreach involves i) science outreach proper e.g. for high school students, interested laypeople, as well as the

academic public; ii) policy advising, e.g. on the regulation of AI or on aggregation and voting procedures for local decision makers; iii) interaction with and products for other members of civil society, e.g. SignLab's interaction with the Dutch deaf community; and iv) industry collaborations of various sorts, detailed below.

The ILLC and its members have also played a driving role within various self-organizational and political initiatives within the research community, including organizing the *Logic4peace* conference to collect funds for supporting logicians in Ukraine as well as co-founding *WOinActie,* a national action program to lobby for adequate university funding.

Societal engagement of the ILLC involves a resilient mixture of different formats, target groups and cooperation styles. It occurs at a local, national and international level, making the institute a relevant societal actor within Amsterdam, the broader Dutch scene and beyond. Local collaborations include, e.g. with the Municipality (on voting) and the Rijksmuseum, but also with corporate actors such as PacMed or Booking.com. National societal relevance is gained through the SignLab's interaction with the Dutch deaf community, through collaborations with the Ministry of the Interior and Kingdom Relations and the Ministry of Foreign Affairs or through developing teaching materials for the high school-level logic curriculum. International outreach involves e.g. proposals to the European Commission for AI regulation, but also various industry products, algorithms, data sets and test cases, used by e.g. Google or OpenAI.

Moreover, societal outreach takes place in various forms, including long running projects and collaborations (e.g. SignLab) and repeated initiatives (e.g. in relation to Logic and Math outreach events), as well as short term and one-off activities. In some cases, the ILLC's outreach activities reflect the institute's own interest of putting its research topics on the public agenda. In other cases, the ILLC's public engagement has successfully attached to hot themes of public discussion, whether it is on the potential, limitations, and regulation of generative AI, or on musicality during the Eurovision Song Contest.

Despite its strong focus on foundational research, the ILLC has produced a number of products, algorithms, databases and collaborative research projects with the collaboration of, or which are relevant for, industrial partners. Direct funding coming with industry collaboration has doubled compared to the previous evaluation period and has now reached over 1.8 million euros. Besides direct collaborations, ILLC members have also produced methods, algorithms and datasets that are being employed by OpenAI, Google, and Universal Music.

While being successful in industry collaborations, the ILLC gives the impression of being selective in which partners to collaborate with and has declined collaborative offers where the proposed project or partner was not judged compatible with the ILLC's goals and mission.

Overall, the committee is highly impressed by the diverse range of outreach activities that ILLC has organized across various levels. This is clearly a strength of the ILLC, as it exploits the broad array of expertise present at the institute and involves timely debates, e.g. on how to prepare for, assess and regulate the influence of generative AI. That said, given the broad variety of formats and topics, the different activities run the risk of becoming somewhat dispersed and not fully coordinated. Here, the committee encourages the institute to have an internal dialogue to agree on a set of common goals or targets for outreach activities, similar to the dialogue that has resulted in the adoption of the three new interdisciplinary research themes described further in section 3.4. Having such clarity may help reshape

existing activities or lead to the creation of new ones, more effectively furthering the institute's goals and affording it even greater societal impact.

Moreover, the institute has, by now, accrued significant expertise in attracting and managing outreach activities. To maximize the benefits of this experience, it may help to temporarily work with an internal or external outreach manager to establish an overview database of existing initiatives and to collect and disseminate best practices.

One aspect of such an institute internal dialogue could specifically focus on interaction with the private sector. So far, these interactions have happened through a wide array of activities involving co-funded projects and PhD positions, but also techniques, datasets, products and algorithms developed by the ILLC and being used by industry. Here, a recommendation is to clarify the ILLC's position towards such industry related activities. This recommendation is further elaborated on in section 3.6.

The committee notes that outreach activities are not evenly distributed across all of the ILLC's research units, let alone individual researchers. The committee views this as an instance of a justified division of scientific labor, especially given that some of the units happen to find themselves much closer to current societal debates or industrial needs.

3.4 Viability

Overall, the ILLC is an eminently viable unit, with strong footing both in the FGw and the FNWI, excellent external funding and research indicators and clear societal relevance, as indicated above, as well as a decades-long international reputation for research and training of early career researchers.

These are tough and uncertain times for Dutch universities, given impending funding cuts. The ILLC can face the challenges ahead with the advantage of its overall interdisciplinary strength. The ILLC is defining clear and very specific roles for itself in the key area of artificial intelligence that exploit this interdisciplinarity. Its long international leadership in foundational aspects of this field, and its continued expertise at the intersection of logic and computation, will help it maintain relevance, given that major advances in AI will increasingly depend on conceptual breakthroughs rather than on the simple accumulation of additional training data and computing power. The institute is also extremely well placed to evaluate the societal impact of AI and to lead in developing applications of AI in the humanities and social sciences.

Similar comments can be made about the ongoing role of the ILLC in quantum computation, although in this field the institute's strategy is clearly focused more on the societal impact of quantum technology, with a secondary focus on quantum logic.

Moving forward, the new organizational structure of the ILLC can contribute in important ways to maintaining the ILLC's viability and highlighting its unique profile. The committee found the new structure convincing and was impressed at how smoothly the reorganization process has worked. The new units are more focused; their names are likewise more informative of the ILLC's activity, helping the institute to achieve its goal of better communicating its research areas to the outside world. That said, the committee also observes that the units are somewhat imbalanced: the NLP&DH unit is considerably larger than the others, while the LMC unit is somewhat smaller and its current professor in Music Cognition will soon retire. The committee considers the possibility, mentioned by the management, of dividing the former unit in two (NLP and a unit comprising the Digital Humanities component) a sensible option. It further suggests that the management consider merging the LMC group with the Digital Humanities component, under a new name. More generally, the committee recommends that ILLC

management implement a mechanism to periodically review the units to ensure they adequately reflect changes in the institute's research.

As the ILLC has grown larger and more diverse in its research, maintaining internal cohesiveness will be essential to its long-term viability. The committee found the plan to establish three interdisciplinary themes (Learning and Reasoning, Language and Communication and Technology and Society) that crosscut the research areas a promising way to move forward. However, for the strategy of the themes to work, it will be essential to implement specific measures and incentives to ensure that the themes are indeed adopted by ILLC researchers and used to establish new links across research areas. The current plan to use the ILLC Colloquia to this end is sensible, but more creative measures (e.g., an internal seed grant program, incentives for cross-area supervision of theses, or even hiring profiles with these themes in mind) are likely to be necessary. The ILLC management should also develop complementary measures to the current bibliometric analysis of cross-unit coauthorship to monitor cohesiveness and the effectiveness of these themes.

In addition, it was clear in the interview that as the ILLC has grown and spread over multiple locations, it has become harder for the institute members to get to know individuals and research outside of their individual areas. This is an added challenge to maintaining cohesiveness and a sense of ILLC identity. Moreover, physical proximity is important for building relationships upon which future collaborations organically emerge. Just as locating the SignLab and MusicLab in the Humanities Labs building has been extremely positive for the ILLC's presence in the FGw, concentrating the part of the ILLC that is housed on the FNWI campus into one building would contribute greatly to promoting cohesiveness and creating opportunities for synergies. The committee urges the University to support the past and future success of the ILLC by doing everything possible to ensure structural support for unified ILLC working space at both the Humanities Labs and FNWI locations. However, until greater physical proximity can be assured, ILLC management should develop as many ways as possible to keep its staff in contact – events like the ILLC Colloquia, the current affairs meetings, and social activities are good examples, but should be complemented with additional measures.

Related to both visibility and cohesiveness, the committee observes that *information*, rather than *logic*, *language* or *computation*, is the single term that best describes what holds the institute together – both historically and as it moves forward. ILLC Management should consider ways to make this term more prominent in projecting the ILLC to the outside world.

Finally, the long-term viability of the institute will depend on finding the optimal balance between the ILLC's tradition of foundational research and engagement with society, be it through dissemination, implication in policy making, or transfer to industry. In the past six years, the institute has made a tremendous bottom-up effort to increase its societal engagement on multiple fronts. The committee recommends as a next step to analyze the success, costs and benefits of these efforts in pursuit of this balance. Specific recommendations include developing concrete measures of societal impact beyond the sheer number of activities engaged in, establishing a more focused set of engagement priorities, and, as noted at the end of section 3.3, perhaps having a dedicated role within the institute's management structure whose for coordinating, promoting and evaluating societal engagement, or alternatively contracting occasional consulting on this aspect of the institute's activity.

3.5 Open Science

Being situated in the Netherlands, the ILLC is embedded in an environment that strongly promotes and facilitates open access publishing. For instance, following an agreement between UNL (the Universities of the Netherlands) and most major publishers, the vast majority of journal and proceeding publications of ILLC researchers are published under an open access license, with the exceptions largely stemming from books and book chapters that are not covered by this agreement. Moreover, following an amendment of Dutch copyright law, all shorter UvA publications become open access six months after publication. Correspondingly, more than 80% of publications have been published under some form of open access arrangement.

Also, the ILLC has committed to the FAIR (Findable, Accessible, Interoperable, and Reusable) data practices alongside a number of other practices instituted by UvA as well as by research funders.

Finally, a further commitment to open science stems from the last research review, when the institute received the recommendation to track its products for peers, especially datasets and software. Here, the ILLC has laudably opted for a fully open approach and has established a publicly available inventory of codes and datasets by ILLC staff members including a complete index of all ILLC code on Github.

3.6 Academic culture

Openness, (social) safety and inclusivity

The ILLC's academic culture is underpinned by a strong commitment to openness, social safety, and inclusivity. These principles are essential in fostering a collaborative and supportive environment for its diverse community of researchers. Initiatives such as the development of a social code of conduct and regular surveys demonstrate the institute's proactive approach to addressing concerns and ensuring inclusivity. The Diversity Committee plays an active role in identifying and addressing challenges, such as work-life balance, childcare support, and the integration of international staff. Informal networks and peer connections further enhance the sense of belonging within the institute, particularly as its members are spread across multiple locations. Nevertheless, challenges remain. As noted in section 3.4, the physical distance between locations can hinder spontaneous interactions, which are critical for building relationships and maintaining a cohesive sense of ILLC identity. While events such as the ILLC Colloquia, social gatherings, and interdisciplinary meetings help bridge this gap, more structured measures could further strengthen the sense of community. For example, centralized spaces or regular institute-wide forums could help foster openness and collaboration. By continuing to prioritize social safety and inclusivity, the ILLC is well-positioned to maintain its reputation as a welcoming and supportive research environment.

Research integrity

The ILLC's dedication to research integrity is a core component of its academic culture. The institute actively promotes responsible research practices, ensuring that all members adhere to the highest ethical and professional standards. The ILLC fosters a culture of research integrity by embedding ethical practices into its organizational structure, ensuring that all members, students, postdocs, and senior researchers are guided by its Code of Social Conduct and Code of Scientific Integrity. These codes, which address a wide range of issues such as plagiarism, privacy breaches, and the misappropriation of ideas, are regularly discussed in staff meetings, management sessions with PhD students, and included in the onboarding materials for new members.

Industry partnerships bring unique challenges for maintaining research integrity, such as navigating contractual and legal matters, addressing ethical considerations, and the need to balance openness in

science with the potential proprietary nature of business. A critical question is to what extent the ILLC is willing to engage in privately co-funded research -- for example, which conditions is the institute willing or not willing to agree to when it comes to setting research questions or balancing the goal of open science with confidentiality desires of industry. A recommendation would be for the ILLC to provide structured guidance to researchers venturing into these collaborations. Such guidance could include offering support for negotiating contracts, ensuring that ethical standards are upheld, and fostering an awareness of the importance of maintaining scientific openness. Dedicated advisory committees or specialized workshops could help researchers address these challenges while preserving the ILLC's commitment to research integrity.

By continuing to reinforce its culture of openness and transparency, while proactively supporting researchers engaging with societal and industrial partners, the ILLC can maintain its high ethical standards and ensure that its contributions remain both impactful and principled.

3.7 Human Resources Policy

Overall, the ILLC demonstrates a strong and proactive approach to talent management, ensuring its continued excellence and relevance as a leading interdisciplinary institute. With its focus on staff development, diversity, and equitable opportunities, the institute has laid a solid foundation for nurturing its academic community.

Planning for staff renewal is a key priority, as evidenced by the institute's preparations for retirements. The Music group (LMC), with its growing significance at the intersection of AI and music, represents an important research area for the ILLC. This convergence of fields, increasingly aligned with methodologies from Natural Language Processing (NLP) and imaging, offers the ILLC a unique opportunity to secure its leadership in a dynamic and interdisciplinary domain.

The institute's commitment to diversity is visible in its recent strides toward gender balance in hiring, including diverse recruitment committees and heightened awareness of gender equity. Challenges remain, particularly in expanding cultural and socio-economic diversity and ensuring equitable opportunities across all levels of staff.

Regarding gender diversity, the committee acknowledges the increase in the absolute number of female staff but notes that proportional representation and progress across career stages could be further improved. Therefore, it encourages continued efforts to enhance gender diversity, particularly at higher academic ranks, and recommends additional measures to ensure that diversity goals are consistently met at all levels. These efforts are critical as the ILLC aims to sustain an inclusive and welcoming academic environment.

Additionally, the committee emphasizes the need for the ILLC to clarify its perspective on diversity and define the specific targets it aims to achieve. For instance, is a 50-50 gender balance a realistic target, or would it be more appropriate to aim for a level of gender equity that reflects (or slightly improves on) the current distributions found in the academic educational programs in the relevant fields? Clarifying these goals is essential to ensure the ILLC's diversity efforts are both meaningful and measurable.

Career progression pathways are another area of focus. The Faculty of Science provides a clear path for promotion, while such a path is less predictable in the Humanities – despite recent (laudable) steps to increase transparency. It would be beneficial to have alignment across faculties to provide all early-career researchers in comparable positions with a similarly clear and equitable path to senior academic positions. Mentorship programs and leadership training could further support these efforts.

Finally, retaining talent requires more than the prospect of promotion alone. Enhanced work-life balance policies, such as improved dual-career support and childcare access, would contribute greatly to ensuring the ILLC's competitiveness in attracting the best researchers worldwide.

The ILLC's proactive approach to talent management, coupled with targeted improvements, will ensure its continued ability to attract, retain, and nurture top talent, securing its long-term success as a globally recognized research institute.

3.8 PhD policy and training

The ILLC has a well-designed PhD program which offers a stimulating work atmosphere and provides excellent preparation to doctoral students for their future careers.

The ILLC has established a series of measures to guarantee high quality PhD training. This includes a supervision concept with two (and, in some cases, three) supervisors. Within the first few months of the PhD project, the doctoral student and the supervisors agree on a Teaching and Supervision Plan (TSP) which specifies the research topic as well as the role of the supervisors, the teaching tasks of the doctoral student and a plan for participating in the ILLC's PhD training program for transferable skills. The latter contains a variety of courses on topics such as scientific integrity, project management, academic writing, presentation and teaching skills, and career development. The TSP can be adjusted on demand and is reevaluated in annual evaluation meetings of the doctoral student with the supervisors. Following a suggestion from the doctoral students, ILLC introduced a "buddy system" in 2022 where more senior doctoral students serve as mentors for first-year doctoral students.

The ILLC PhD training policy is characterized by an exemplary openness to feedback and flexibility. The general training program and the working conditions of the doctoral students are evaluated annually by the PhD Program eValuation Committee (PVC). The PVC provides feedback to the ILLC management in terms of a written report which is made available on the PhD program webpage and discussed with the regular staff members. Furthermore, there are regular meetings of the PhD Council with the PhD program director and the director of the institutes, and twice-yearly plenary PhD assemblies to discuss general issues of the PhD program. The above-mentioned buddy system is an example of a new measure that emerged from feedback by doctoral students. To support networking among the doctoral students, the PhD Council and the PhD Social Committee organize social activities with financial support provided by ILLC.

In addition to these feedback mechanisms, the ILLC carefully monitors the success of the PhD program in terms of both the average duration of the completion period and the dropout rate. During the evaluation period the average duration decreased and is now at a very healthy level: the median completion time is about 4.5 years, and approximately 80% of the doctoral students graduate within 5 years or less. The dropout rate is low, at a level that the committee members consider comparable to that of other programs with which they are familiar.

From the scientific perspective, the quality of the PhD projects is very high. Prestigious dissertation awards and best student paper awards at top conferences, as well the large number of papers coauthored by doctoral students that are published in highly ranked venues, provide evidence for the scientific excellence. The high quality of the PhD projects was confirmed in the discussions during the poster session of the site visit.

The PhD program has an excellent placement record, with ILLC alumni currently working at research strong institutions both within and outside academia, including at UvA, ETH Zürich, Tsinghua University, and LMU Munich, as well as Google, TNO, Microsoft and Apple.

The committee appreciates the financial support (travel and training budget) provided by the faculties and ILLC to minimize the financial differences between doctoral candidates with different sources of funding.

Overall, the evaluation committee rates the PhD program as very successful. The numerous measures for high quality training, supervision and feedback loops for both individual PhD projects and the general PhD program are reasonable and very well thought-out.

The committee has just a few recommendations and comments. It encourages the ILLC to rethink the procedure for scheduling the formal annual evaluation meetings of the doctoral students with their supervisors, so as to ensure that these formal meetings happen in the designated time frame.

Another observation made during the site visit concerns social contacts and scientific networking among the doctoral students. Related to the challenges raised in Sections 3.4 and 3.6, the growth of the ILLC and the increase in doctoral students with offices in different buildings and at different locations in Amsterdam make networking between doctoral students of different groups more difficult. Although the committee recognizes the value of the social activities, PhD assemblies and other events organized by ILLC for all doctoral students, it seems that not all of the doctoral students take advantage of these options for networking. The committee recommends thinking about further initiatives to foster collaborations and social cohesion.

3.9 Conclusions and recommendations

The ILLC, with its interdisciplinary approach and commitment to research excellence, continues to be a leading international hub for the study of information through formal and computational methods. The institute consistently produces high-impact research, as evidenced by its strong research output, high citation impact, notable grant success, and the broad influence of its academic contributions.

During the evaluation period, the ILLC undertook a remarkable array of noteworthy outreach activities, drawing on its extensive expertise and addressing timely issues such as the impact of generative AI. The institute engages with a wide range of local, national, and international stakeholders through a combination of long-term projects, collaborations, recurring initiatives, and short-term activities.

While the ILLC faces challenges, including the threat of funding cuts and internal cohesiveness issues stemming from its expansion across multiple locations, it remains well-positioned for future success due to its strong international reputation and its unique interdisciplinary focus. Furthermore, the committee recognizes the ILLC's commitment to Open Science and its inclusive academic culture as significant strengths. The support provided to PhD candidates through the institute's PhD program also stands out as a notable positive aspect of the academic environment.

Nevertheless, the committee has identified several recommendations that it believes will enable the ILLC to build on its successes and further strengthen its position. These are to:

- Develop specific targets and measurable success indicators to effectively assess the outcomes of strategic goals during the next evaluation period.
- Initiate an internal dialogue to better align and coordinate societal outreach activities with the institute's goals. Formulate a clear policy on interactions with the private sector and industry, offering structured guidance for researchers engaging in such partnerships, including contract negotiation, ethical considerations, and maintaining scientific openness.
- Establish a mechanism to regularly review the structure of research units, ensuring they align with the institute's evolving research focus, and consider merging or dividing units to enhance cohesion.

- Implement targeted measures and incentives to integrate the three interdisciplinary themes (Learning and Reasoning, Language and Communication, and Technology and Society) into research. Examples include internal seed grants and cross-area thesis supervision.
- Advocate for structural support from the University Board to unify the ILLC's working spaces at the FNWI locations, as well as to ensure basic funding for the ILLC's labs in the Humanities Labs. In the meantime, enhance efforts to foster connections through initiatives like the ILLC Colloquia, current affairs talks, and social activities, while exploring additional measures.
- Continue initiatives to improve diversity, especially female representation at all academic levels but particularly in senior roles; and define clear, actionable diversity goals.

Appendix A - Program of the site visit

December 1 2024	
19:00	Dinner committee

December 2, 2024	
08:45 – 09:00	Arrival at Science Park SP107, welcome
09:00 – 10:30	Discussion of procedures with independent secretary
10:30 – 11:30	Introduction and meeting with Management ILLC (MTK)
11:45 – 12:45	Three flash talks by ILLC researchers
13:00 – 14:00	Lunch at Restaurant Polder
14:15 – 15:15	Meeting with PhD candidates
15:15 – 16:00	Closed session: Discussion
16:15 – 17:30	Poster session, informal discussion with staff and PhD candidates, drinks

December 3, 2024	
08:45 – 09:00	Arrival
09:00 – 10:00	Meeting with unit leaders and the MoL director
10:00 – 10:15	Break
10:15 – 11:15	Meeting with postdocs and junior UDs
11.15 -11.30	Presentation by the SignLab director
11:15 – 12:30	Closed session: Discussion
12:30 – 13:45	Lunch with deans
14:00 – 14:45	Meeting with MTK
14:45 – 16:30	Closed session: Discussion, preparation of preliminary results
16:30 – 18:00	Presentation of preliminary results

Appendix B - Quantitative data

B.1 Research staff 2018-2023

		2018	2019	2020	2021	2022	2023
Full professors	FGw	5.1	5.0	5.0	3.9	3.9	4.0
	FNWI	4.4	4.5	5.4	5.5	6.2	7.2
	ILLC	9.5	9.5	10.4	9.4	10.1	11.2
Associate professors	FGw	3.7	3.3	3.7	4.1	3.7	3.0
	FNWI	6.2	7.5	7.2	8.6	8.8	7.6
	ILLC	9.9	10.8	10.8	12.7	12.5	10.6
Assistant professors	FGw	9.3	10.5	10.2	11.0	13.0	15.4
	FNWI	6.5	7.1	7.7	7.5	8.7	10.7
	ILLC	15.8	17.6	17.9	18.5	21.7	26.1
Post Docs	FGw	10.7	10.8	9.6	8.7	7.5	8.2
	FNWI	15.1	10.7	10.9	12.0	14.8	16.0
	ILLC	25.8	21.5	20.5	20.7	22.3	24.2
PhD Candidates	FGw	16.0	15.1	13.4	12.2	9.6	14.2
	FNWI	25.9	30.4	31.2	29.3	32.6	35.4
	ILLC	41.9	45.5	44.6	41.5	42.2	49.6
Research support staff	FGw	2.6	3.8	7.9	6.5	4.2	2.9
	FNWI	0.7	0.0	1.5	2.3	0.2	2.1
	ILLC	3.3	3.8	9.4	8.8	4.4	5.0
Total research staff		**106.2**	**108.7**	**113.6**	**111.6**	**113.2**	**126.7**
Visiting fellows	FGw	0.4	1.0	0.7	0.4	2.4	1.2
	FNWI	2.7	3.2	3.1	4.1	5.6	8.4
	ILLC	3.1	4.2	3.8	4.5	8.0	9.6
Teaching staff	FGw	1.1	1.8	1.8	2.1	1.4	1.2
	FNWI	0.1	0.0	0.3	0.2	0.9	0.7
	ILLC	1.2	1.8	2.1	2.3	2.3	1.9
Support staff (ILLC office)	ILLC	5.4	5.6	5.6	5.9	5.9	5.0
Total staff		**115.9**	**120.3**	**125.1**	**124.3**	**129.4**	**143.2**

B.2 Funding (in fte) and expenditure (in k€)

	2018		2019		2020		2021		2022		2023	
	fte	%	fte	%	fte	%	fte	%	fte	%	fte	%
Funding												
Direct funding	46.2	43%	47.0	42%	47.4	40%	50.5	42%	58.2	46%	61.5	43%
Research grants	38.9	36%	34.7	31%	36.8	31%	34.8	29%	32.7	26%	38.5	27%
Contract research	14.4	13%	20.8	18%	25.4	22%	20.6	17%	12.7	10%	12.7	9%
other	9.4	8%	10.0	9%	7.7	7%	14.4	12%	23.7	18%	29.5	21%
Total funding	**109.1**		**112.5**		**117.3**		**120.3**		**127.4**		**142.2**	
Expenditure	K€	%	K€	%	K€	%	K€	%	K€	%	K€	%
Personal costs	5,901	69%	6,277	69%	6,879	69%	6,771	70%	6,354	70%	7,826	72%
Other costs	2,690	31%	2,839	31%	2,930	31%	2,883	30%	2,679	30%	3,032	28%
Total expenditure	**8,590**		**9,115**		**9,909**		**9,654**		**9,051**		**10,858**	

B.3 PhD enrolment and success rate

Starting year	N	Within 4 yr	Within ≤ 4.5 yr	Within ≤ 5 yr	total	Not yet finished	Discon-tinued
2015	13	2 (15%)	5 (38%)	7 (54%)	9 (69%)	0 (0%)	4 (31%)
2016	16	2 (12%)	8 (50%)	10 (62%)	13 (81%)	0 (0%)	3 (19%)
2017	8	6 (75%)	6 (75%)	7 (87%)	8 (100%)	0 (0%)	0 (0%)
2018	11	4 (36%)	7 (64%)	9 (82%)	9 (82%)	0 (0%)	2 (18%)
2019	15	6 (40%)	9 (60%)	12 (80%)	12 (80%)	1 (7%)	2 (13%)
Total	**63**	**20 (32%)**	**35 (55%)**	**45 (71%)**	**51 (81%)**	**1 (1%)**	**11 (17%)**