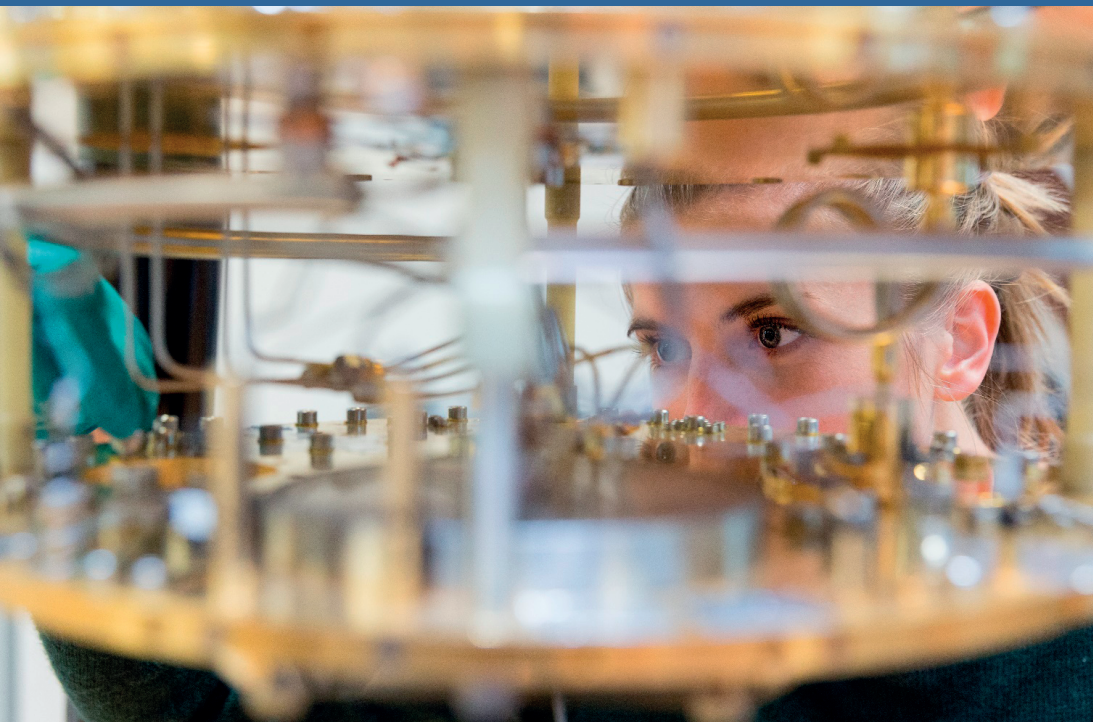


QUANTUM DELTA NL
MIDTERM REVIEW
2021-2023

COMMITTEE REPORT



MARCH 2024

QUANTUM DELTA NL
MIDTERM REVIEW
2021-2023

COMMITTEE REPORT

“Following a highly successful start-up phase, it's time to focus and professionalise for scaling up”

MARCH, 2024

Title:

Quantum Delta NL Midterm Review (2021-2023), Committee Report

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SUMMARY

The Midterm Review Committee assessed the effectiveness of Quantum Delta NL (QDNL) in governing and managing the programme, evaluated the performance of the eight programme lines, and reflected on the (draft) strategy and plans for the third phase of the programme. This review covers activities in the period 9 April 2021 to December 31, 2023. This Committee Report is approved by all Committee members.

QDNL aspires to become a global hub for quantum technology, drawing top talent and fostering the birth of future quantum hardware and software providers. The programme spans education, research, technology, entrepreneurship, and society, featuring eight lines of action, including catalyst programs, action lines, and investment in cleanroom infrastructure.

The review praises QDNL's ambitious nature and its recognition on an international level, highlighting the significant progress made with limited resources. The dedication of the staff and the innovative culture within QDNL have been instrumental in its achievements. Areas identified for improvement include enhancing financial transparency, setting realistic and shared goals, professionalising the tracking of progress and key performance indicators (KPIs), and reconsidering the approach to infrastructure development, particularly regarding cleanroom facilities.

Specific recommendations include ensuring financial transparency with partners, professionalising the management of financial data and KPIs, conducting a thorough analysis for the need for cleanroom facilities, developing a digital House of Quantum, and integrating photonics into the future Quantum agenda.

The review also suggests QDNL adopt a clear governance structure to streamline decision-making processes, focus on delineating roles within the Executive Board, recruit and train professionals from non-technical backgrounds to diversify expertise, and implement a bi-annual internal audit or review for organisational agility.

Strategic focus is advised to prevent resource dilution, with recommendations to make strategic choices, ensure access to existing quantum computers for the research community, and integrate photonics into the quantum technology landscape.

Commercialisation strategies should be improved to engage end-users more effectively, adopting proactive sales strategies and developing a commercial portfolio that balances scientific uncertainty with sales needs. Intellectual property strategy and human capital management, particularly in terms of diversity and inclusion, are highlighted as areas needing attention.

Internationalisation efforts are praiseworthy, with the suggestion to establish more concrete agreements and collaborations. Lastly, technology acceleration should be enhanced through better collaboration across programme lines, focusing on innovation speed and commercialisation pathways.

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PREFACE

The Midterm Review Committee was assigned the responsibility of conducting this evaluation. Its mandate specifically entailed assessing Quantum Delta NL's (QDNL) effectiveness in governing and managing the programme, evaluating the performance across the eight programme lines, and reviewing the (draft) strategy and plans for the programme's third phase.

The organisation of the site visit was outstanding, and we wish to express our sincere gratitude for the professional, friendly, and welcoming reception we encountered.

During the visit, we engaged in comprehensive discussions with management, staff, and external stakeholders, fostering an open and constructive atmosphere. The hub visits, marked by enthusiastic presentations on various topics, provided invaluable insights and were a highlight of our assessment process.

Despite being tasked with a critical evaluation, it's important to acknowledge that, although we identified areas for improvement and further development, we were thoroughly impressed by the progress and achievements made within just two years.

I am grateful to the Committee members for their meticulous and thoughtful work, and the positive environment they helped foster. It is gratifying to report that the final conclusions have received unanimous support from all Committee members. Lastly, I would like to express our collective appreciation to our process consultant, Sven Laudy, for his exemplary preparation and support, which kept us focused and on track.

Sabrina Maniscalco
Committee Chair

1. MIDTERM REVIEW COMMITTEE AND REVIEW PROCEDURES

1.1 MIDTERM REVIEW SCOPE

The Quantum Delta NL (QDNL) programme is a seven-year initiative within the Netherlands, commencing in 2021, dedicated to translating quantum technology into economic value and nurturing a robust Dutch ecosystem for quantum technology. The majority of its funding is sourced from the Dutch National Growth Fund (NGF). As the programme has surpassed the two-year mark, a midterm evaluation is imperative.

The Midterm Review Committee (referred to as the Committee) has been tasked with conducting this evaluation. Specifically, its mandate includes assessing the effectiveness of QDNL in governing and managing the programme, evaluating the performance of the eight programme lines, and reflecting on the (draft) strategy and plans for the third phase of the programme. The Committee is requested to offer its written conclusions as well as recommendations based on considerations and arguments. This review covers activities in the period 9 April 2021 to December 31, 2023.

In accordance with the Terms of Reference (ToR) that have been agreed upon between QDNL, the Ministry of Economic Affairs and Climate Policy and the NGF advisory committee, the Committee's tasks were to assess the a) quality of execution, b) societal relevance and c) strategy of the programme – both at the level of the eight individual programme lines and on the level of the programme as a whole. The review is conducted utilising information provided by QDNL and through interviews with both QDNL members and stakeholders. In its evaluation

of these three criteria, the Committee took care to include the following specific aspects, as described in the ToR: Execution, Human capital, Technology acceleration, Commercialisation, Ecosystem and community building, Internationalisation, and Strategy and future outlook.

Following this, the Committee was to make recommendations for the future.

1.2 COMMITTEE COMPOSITION

The members of the Committee were:

- **Prof. dr. S. (Sabrina) Maniscalco**, Committee Chair, Professor of Quantum Information, Computing, and Logic at the University of Helsinki, co-founder and CEO of Algorithmiq Ltd., Finland
- **Prof. dr. ing. D.H.A. (Dave) Blank**, Co-chair, Emeritus Distinguished Professor at the University of Twente, The Netherlands
- **Dr. J. (Jaya) Baloo**, Chief Security Officer at Rapid7, USA
- **Dr. C. (Catherine) Lefebvre**, Vice President Global Policy & Partnerships at PASQAL and Senior Advisor Open, Quantum Institute at GESDA, USA
- **Prof. dr. C.M (Charles) Marcus**, Professor of Physics, Boeing Johnson Endowed Chair, University of Washington, Seattle, USA

A short curriculum vitae of each Committee member is included in Appendix A.

Ir. Sven Laudy of Quicken Management Consultants was appointed as an independent and qualified process consultant to the Committee.

1.3 IMPARTIALITY

All Committee members signed a statement of impartiality and confidentiality to ensure that they would assess the quality of the QDNL programme in an impartial and independent way. Committee members reported any existing personal or working relationships between Committee members and members of the programmes under review before the interviews took place. The Committee discussed these relationships at the first Committee meeting. The Committee concluded that there exist no unacceptable relations or dependencies that could lead to bias in the review.

1.4 DATA PROVIDED TO THE COMMITTEE

The Committee received the following detailed documentation:

- Self-evaluation report of the programme under review, including all the information required by the Terms of Reference, with appendices,
- Birch's Ecosystem update on the Dutch quantum ecosystem,
- Additional requested information regarding the distribution of funding to the Hubs.

These documents together with the interviews during site visit formed the Committee's key basis for the review.

1.5 COMMITTEE PROCEDURES

The Committee followed the Terms of Reference (ToR) that has been set up for this review. On January 12, 2024 the process consultant of the Committee briefed the Committee on the ToR, as well as the programme of the site visit and the review strategy of the Committee in an online meeting with the Committee. Prior to the site visit, two assessors were asked to evaluate each programme line. These assessors independently formed a preliminary assessment for each programme line.

The Committee noted that, based on the materials supplied by QDNL, a comprehensive quantitative assessment of the programme lines was not feasible. The provided Key Performance Indicators (KPIs) are generic and lack the specificity required for assessing each programme. This issue was communicated to the QDNL Board on January 22, as it was essential to raise it in advance to the site visit, aligning with the Committee's primary task as outlined in the Terms of Reference, which is to evaluate the programme lines.

At the start of the site visit, the Committee discussed the preliminary assessments. For each interview, the Committee prepared a number of comments and questions. All Committee members were actively involved in the interviews. After each interview, the Committee discussed comments and recommendations. The Committee interviewed the QDNL Board, the Supervisory Board and the Ministry of Economic Affairs (EZK) as well as members of the eight programme lines, and external stakeholders. Interviews took place on February 6 to 9 2023 at House of Quantum in Delft and at each of the five hubs that were visited individually, with one member from the MTR review committee assigned to each hub. The comprehensive interview schedule is provided in Appendix B. The Committee shared preliminary general impressions with QDNL and the Taskforce Phase 3 on the concluding day of the visit.

After the site visit, the Committee finalised the report through email and video conferences. Final assessments are based on documentation provided by QDNL, preliminary assessments and interviews. Following approval by all Committee members, QDNL received a copy of the first version with the invitation to correct factual errors. In response, the Committee discussed these comments, made several modifications to the text and then presented the final report to the QDNL Board. This was printed after formal acceptance.

The structure of the report deviates from the Terms of Reference (ToR) as the self-evaluation report did not adhere to this outline, making it impractical to follow the specified format in our reporting.

The Midterm Review Committee requests QDNL not to selectively "cherry-pick" from our advice, but rather to use the report in its entirety for accountability purposes.

2 REVIEW QDNL PROGRAMME (OVERALL-LEVEL)

INTRODUCTION

Aligned with the goals of the Dutch National Growth Fund, QDNL is established to foster enduring economic impact for the Netherlands. This is pursued through a comprehensive ecosystem approach encapsulated by the following ambition, as stated in the self-evaluation report: “Quantum Delta NL is the place where the world's top talent is drawn to and where the entrepreneurial climate is so fertile that the quantum hardware and software providers of the future are born here. The ambition is that in ten years’ time Quantum Delta NL will grow into a vibrant and international hotspot where world-leading science, technology and talent come together and emerge.”

The QDNL programme covers the entire knowledge chain from education to research and from technology to entrepreneurship and society. The programme comprises eight programme lines: three catalyst or CAT-programmes, four action lines (ALs) and an investment programme in the national cleanroom infrastructure (CRP) operated by the organisation NanoLabNL.

REMARKS AND RECOMMENDATIONS

2.1 A HIGHLY AMBITIOUS PROJECT

The Quantum Delta project is highly ambitious and has gained international recognition for setting a standard and inspiring other countries. The Committee is impressed with QDNL's accomplishments over the past two years, achieved with limited resources, especially in

terms of time and personnel. A broad range of activities has been successfully carried out, showing significant progress, results, and milestones. The dedication and expertise of the staff are crucial for meeting the project's goals. Additionally, the Committee values the innovative and dynamic culture at QDNL, reflected in its organisation and physical space, which contributes to its distinct brand. QDNL's pioneering work in new quantum technologies and approaches is internationally recognised. Projects like ELSA and the approach to internationalisation are noted for their innovative thinking and ability to address emerging needs.

In the following sections we describe two general areas where there is scope for improvement, and give recommendations on how to achieve it.

2.2 ALIGNMENT NEEDS SHARED VISION, GOALS

The success of every endeavour where many individuals and institutions need to cooperate and work together to achieve a challenging task always relies on the ability of the leadership to achieve a shared vision and realistic but ambitious goals. We think that further steps are needed to strengthen the position of QDNL with respect to this task. In the following we elaborate on suggested actions.

(Financial) transparency

Transparency stands as a key principle in the culture manifesto embraced by QDNL. During our site visit, the Committee encountered data that prompted concerns regarding this principle. A particular point of attention is the non-transparent manner in which funds are allocated among the hubs and cooperating institutes. And especially since some of the hubs acquire 12x as much funding from QDNL than other hubs and one collaborating institute gets as much as 20% of the total amount

distributed so far, this unbalanced distribution of funds may be perceived as unfair. While the Committee does not explicitly deem the current division of funds as unfair, the lack of clarity surrounding the allocation process warrants attention to eliminate any perceptions of inequity among partners.

Additionally, the Committee's findings during the site visit revealed that, although financial data is accessible from various sources shared among the hubs, the rationale behind fund allocation is not sufficiently articulated or communicated, for example, to the hubs themselves. This issue also touches on the broader perception of inclusivity among the hubs within the country, which is further discussed in the report's section on hubs.

To address these concerns, the Committee strongly recommends enhancing financial transparency with all collaborative partners [1]. This includes providing a clear explanation of funding mechanisms, detailed breakdowns of financial allocations, and ensuring effective communication and sharing of this information. The call for greater transparency extends to all aspects of operations, encompassing communication practices and decision-making processes.

Progress towards goals and Key Performance Indicators

Based on the information provided, it is not possible to give an in-depth assessment of the progress in achieving some of the key goals. For example, collecting data such as publications with authors from more than one hub, percentage of grants secured by women scientists vs number of applications, external funding obtained (highlighting the inter-hubs consortia), etc., would allow to monitor the progress across the years.

Overall, the reported data suggest that the implementation of the programme and its components is well underway, with QDNL achieving significant progress in nearly all planned actions. This is evidenced by

the fact that most major milestones have either been met or are on track.

Regarding knowledge growth, the Netherlands has demonstrated considerable advancements, though it has been surpassed by other countries in recent years, as detailed in the Birch update report.

The report's presentation of progress lacks consistency, with the Key Performance Indicators (KPIs) being too broad and not sufficiently detailed for an accurate evaluation of the programme (lines). Furthermore, these KPIs are not established as measurable or SMART (Specific, Measurable, Achievable, Relevant, Time-bound).

Additionally, some numerical data in the report seem improvised and not meticulously considered, e.g. in table 9, as seen in the use of approximate and rounded figures ("100's") without documented evidence or measurement". Statements in the report indicating that some numbers are "very rough estimations and not based on factual information" reinforce this concern.

Clarification is also needed regarding QDNL's direct contributions to reported achievements, such as the number of spin-off companies generated, as well as the contributions of partners like TNO to QDNL's successes.

The Committee strongly recommends either professionalising or outsourcing the tracking of numbers, KPIs, and milestones to ensure they are SMART and can effectively guide programme evaluation and internal decision-making processes [2].

Furthermore, for the purpose of monitoring QDNL's progress (both for review and internal guidance), it is advisable to report these SMART KPIs in a manner that not only reflects their current status (whether they are on schedule, ahead, or behind, with reasons) but also outlines the actions being taken to address any delays. This approach should

enable us to present a concise yet comprehensive overview of the progress in just a few pages.

Build / don't build

Cleanroom – New vs. Improvement, Necessity in Delft

The Committee is deliberating on the necessity of constructing new cleanrooms versus enhancing the existing facilities. Especially after visits to the hubs, the prevailing view is that the current facilities are adequate, and efforts should be focused on upgrading the existing cleanrooms. There's a concern adding additional capacity jeopardises the current cleanrooms. Moreover, the objective should not solely be to centralise resources in Delft but to encourage collaboration across various hubs. However, during the concluding meeting with the Executive Board, it was conveyed that, from both TNO and TU Delft's perspectives, there is a genuine need for additional space. While the intention isn't to necessarily construct a new cleanroom, the current facilities no longer suffice, partially due to electricity capacity reaching its limits. Furthermore, the Committee has been informed that the cleanroom needs a massive overhaul and with the Faculty of Applied Sciences (TU Delft) moving to Campus Zuid the entire playing field is changing.

The Committee recommends a thorough evaluation of the need for new or improved cleanroom facilities and the reasoning behind it [3]. It also emphasises the importance of maintaining transparency and clear communication with all partners regarding these plans.

HoQ – fund allocation

The Committee has expressed concerns about the allocation of funds to the originally planned new HoQ main Building in Delft (and not the other HoQ initiatives and activities), potentially depleting resources that could benefit other initiatives, particularly CATs, Quantum Inspire, and

various demonstrators and labs. There is a perception among the hubs that HoQ may be over-resourced. While the Committee does not necessarily agree with this perception, it underscores the importance of transparently detailing the distribution of funds, including those allocated to HoQ.

The Committee recognises the importance of physical spaces to meet and gather all actors of the ecosystem. The Committee also recommends exploring the creation of an immersive virtual and online House of Quantum to complement the physical space, thereby integrating both online and offline experiences [4].

Furthermore, in terms of investment priorities, the Committee advises a shift away from physical infrastructure towards investing more in human capital, talent development, and digital platforms.

Photonics – include in future Quantum agenda

The Committee observed that several research laboratories and startups are developing photonics quantum devices, potentially integral to quantum computing and simulation services. Recognising that QDNL is exploring various platforms due to the uncertain future of the predominant quantum computing physical platform, the question arises: should Photonics be included in these offerings and, consequently, receive future funding? It was noted during the site visits that although a funding application was submitted, it was not successful.

The Committee acknowledges several advantages to supporting photonics. Firstly, it would foster greater collaboration, making the photonics sector feel more integrated within the broader Quantum Delta ecosystem. Additionally, supporting photonics could allow QDNL to obtain funding earmarked for the Quantum Chips Act, leveraging the Netherlands' strong capabilities in this field.

Conversations with the Ministry of EZK revealed an emphasis on promoting international cooperation, with a recognition of photonics' unique position straddling both traditional and quantum data domains.

The sector expresses a desire for greater recognition and support within this transitional space.

Importantly, during the site visits, there was no indication from scientists that the field was perceived as lacking in scientific rigor. On the contrary, it is evident from the research activities and the infrastructure that photonics for quantum technologies is an area of excellence in the Netherlands.

In conclusion, the Committee recommends Photonics are made an integral part of the future agenda for quantum computing and simulations – and with this also creating the opportunity to receive funding from the internal calls – in order for photonics to capitalise on its potential and ensure its full integration into the quantum technology landscape [5].

List of recommendations

In summary, the Committee recommends QDNL to¹:

- [1] Ensure maximum financial transparency with all partners, detailing fund distribution mechanisms, providing clear explanations of financial figures, and effectively communicating and sharing this information;
- [2] Professionalise (or consider outsourcing) the management of financial data, KPIs, and milestones, ensuring they are Specific, Measurable, Achievable, Relevant, and Time-bound (SMART);
- [3] Conduct a thorough analysis of the need for cleanroom facilities and the reasoning behind these aspirations;
- [4] Explore the development of a digital House of Quantum to complement physical interactions, integrating both online and offline experiences;

¹ The list of recommendations is limited to the Committee's most crucial observations.

- [5] Integrate Photonics into the future Quantum agenda to support its development and integration into broader initiatives.

2.3 GOVERNANCE

Discrete hierarchy needed – unidirectional, no more multiple hats

It has been observed that the Executive Board (EB) is currently overwhelmed, a situation corroborated through various interviews. Suggestions for mitigation included prioritisation and taking days off; however, the Committee believes that deeper, structural changes in governance are necessary. The confusion largely stems from the dual roles the Executive Board members and other leading members hold, both executive and operational, which is compounded when they participate directly in programme execution.

This dual-role scenario, while understandable and effective in the entrepreneurial and startup phases of QDNL, is less suitable as the organisation transitions into a phase of growth and requires a more professional governance structure.

During the interviews, some individuals stated that the organisational chart “could me more clear”, yet maintained it was still functional in practice. The Committee, however, strongly disagrees with the notion that the chart functions effectively. The investigation uncovered numerous instances of unclear organisational structure and governance. A notable concern is the disconnect between programme lines claiming near autonomy and the Supervisory Board's view that decisions are centralised within the EB, likening QDNL's operation to a corporate model.

Therefore, a strong recommendation is made for QDNL to establish a clear governance structure and hierarchy [6], specifically:

- Illustrate the organisational structure accurately to reflect the actual workflow;
- Clearly define and display the hierarchy, eliminating bidirectional arrows in the diagram to underscore distinct responsibilities;
- Clarify the relationship between the Strategy Board and the Executive Board, which is currently poorly defined;
- Implement a framework such as RACI (Responsible, Accountable, Consulted, Informed) to delineate roles and responsibilities throughout the organisation;
- Eliminate overlapping roles ("multiple hats");
- Once the governance structure is clearly defined, begin the process of delegation.

EB Board – CEO, COO, Chief Scientist, CFO, cHRO

As QDNL transitions into a new phase, moving beyond its pioneering stage, it faces the need to make critical strategic decisions. This pivotal period demands decisive leadership, underscoring the importance of clearly defined leadership roles within the Executive Board (EB). To support this evolution, a focused review and potential restructuring of the EB to enhance professionalism is recommended [7]. Although the current composition of the EB is largely effective, with competent individuals in place (with the exception of dedicated finance and HR roles), adjusting the distribution of responsibilities could enhance board functionality. Specifically, distinguishing between roles focused on external engagement (such as vision and networking) and those concentrated on internal management (such as operational control and coordination) is recommended. Additionally, the introduction of dedicated Financial and HR positions to the Board is essential.

Moreover, it's crucial to approach the selection process with utmost diligence, ensuring involvement and input from all five hubs and the advisory board to foster a comprehensive and inclusive selection process.

Hire more, cooperate more

The Committee emphasises the need for QDNL to place a stronger emphasis on entrepreneurship in its forthcoming phase, necessitating an expansion of expertise beyond its current scope. To achieve this, the recommendation is to diversify the team by hiring professionals from non-technical backgrounds, such as sales and legal (lawyers), and to collaborate with business schools to enhance a business-centric approach [8]. Specifically, for sales expertise, partnerships with institutions like Erasmus University Rotterdam or similar business schools could be beneficial. For legal support, particularly in areas like intellectual property and patents, collaboration with universities such as Leiden University is advised.

Addressing the need for improved cooperation, both internally and externally, the Committee has noted feedback regarding the lack of industry representation within the supervisory board. It is advised that QDNL considers this feedback seriously and explores the possibility of establishing an industrial advisory board to enhance industry connections. On the topic of internal collaboration, it is suggested that efforts be made to refine the vision and ensure it aligns with the programme lines and hubs. Additionally, exploring ways to strengthen the ties between programme lines is advised. Facilitating easy and efficient interaction among team members is crucial, and organising structures to support this is suggested.

In summary, alongside recruiting and training a more diverse team, it is recommended to increase multidisciplinary efforts and approaches. This involves integrating legal, business, and sales expertise with technical skills to enhance use case development and improve the matching process with companies [9].

Enhance agility through regular internal audits/reviews

For the purpose of fostering a more agile and adaptable organisation, it is recommended that QDNL conducts an internal audit or review semi-annually [10].

List of recommendations

In summary, the Committee recommends QDNL to²:

- [6] Establish a clear governance structure and hierarchy to streamline decision-making processes;
- [7] Focus on the internal organisation of the Executive Board, delineating roles such as HR, Finance, CEO, and Managing Director to enhance operational efficiency;
- [8] Recruit professionals from non-technical backgrounds, including sales and legal, and foster partnerships with business schools.
- [9] Increase multidisciplinary efforts and approaches to integrating legal, business, and sales expertise with technical skills to enhance use case development and improve the matching process with companies;
- [10] Implement a bi-annual internal audit or review to ensure ongoing organisational agility and responsiveness.

2.4 OTHER REMARKS

Strategy / focus

QDNL engages in a wide array of activities, necessitating a focused approach to prevent the dilution of limited resources. It is recommended to develop a plan for making strategic choices [11]. Additionally, building a robust European ecosystem requires specialisation rather than attempting to excel in all areas. In particular, while investing on a national quantum computing infrastructure is seen as strategically important and helps with training a workforce on a potentially disruptive new technology, it is unrealistic to compete with current quantum computing hardware offerings, such as those of IBM,

² The list of recommendations is limited to the Committee's most crucial observations.

Quantinuum, and others. At the same time it is essential for researchers and quantum software developers to be able to use existing quantum devices in order to advance in the field. QDNL cannot simply wait until national quantum computers are developed, since it may take several years. The Committee therefore recommends that, while continuing to support the national quantum hardware development, access to existing utility-scale quantum computers is guaranteed to the scientific community.

Hub visits feedback

The Committee was greatly inspired by the visits to the hubs, which seemed to be well-received by the hubs themselves (refer to Appendix B for the detailed visit schedule). However, there was a notable sentiment among the hubs, excluding Delft and Amsterdam, of feeling underappreciated. This was articulated as a perception that their efforts often seem insufficient, regardless of the extent of their contributions. Despite numerous meetings, including monthly coordination sessions with hub coordinators, communication meetings, business development meetings, and even a rebranding initiative, these efforts have not fully translated into genuine engagement or buy-in from the hubs.

The Committee speculates that a lack of financial transparency and uncertainties around equitable funding distribution could be partially responsible for the sense of frustration and a feeling of being overlooked. Additionally, the Committee found it challenging to assess the contribution to and the funding distribution among the hubs, as this information was initially absent from the self-evaluation report. However, it was promptly provided to the Committee upon their first request.

Clarification on roles and responsibilities was also found wanting within the hubs, with an organisational chart (organogram) expected but missing. This ties back to earlier concerns regarding governance within QDNL. The hubs have also expressed a need for better documentation

practices, such as taking minutes and sharing data and tools (e.g. QDNL intranet).

To address these issues, the Committee recommends enhancing alignment among the hubs through improved financial and organisational transparency [12]. It also urges the Executive Board to explore strategies for increasing the hubs' engagement and support for QDNL, essentially turning them into strong advocates of the organisation. For Eindhoven, specifically, there is a suggestion to make their educational materials available online.

Commercialisation and IP-strategy

In terms of progress on long-term economic impact, the most striking number is the difference between the foreseen investments by the sector using quantum technologies (estimated €100M in 2024) and the actual number in 2023, that is close-to-zero. This reflects partly the current status of QT, wherein only very few corporations or end-users are preparing to become quantum-ready and start to invest in this technology. However, it is important to make an in-depth assessment of the reasons why at national level this is very far from happening. Initially, the focus of Phases 1 and 2 was on developing technology and platforms, whereas Phase 3 is shifting towards the critical importance of end-user engagement. The QDNL Board acknowledges the need for increased engagement with end-users and is exploring strategies to enhance outreach, such as leveraging scientists attending conferences. However, the Committee believes that while attending conferences is valuable, it is not effective in establishing connections with companies, as they typically do not attend these events.

It is recommended to improve engagement with end-users [13], and the Committee proposes several strategies:

1. Enhance matchmaking: facilitate connections between academia and companies, e.g. Eurofiber/Gala, by integrating companies into the quantum network;
2. Adopt a proactive sales approach: Instead of passively waiting for companies to approach, adopt a more assertive sales strategy (in a mindful way), involving professional sales personnel to actively promote quantum technologies;
3. Develop a commercial portfolio: Strike a balance between the uncertainty of science and the need for sales by crafting a compelling narrative about quantum technologies without overpromising;
4. Support direct industry engagement: Actively assist companies that engage with QDNL outside of academic channels, as these companies often find it more challenging to establish connections and receive support.

During site visits, interactions with various startup companies revealed the existence of connections with venture capitalists, though startups perceive these relationships as skewed due to high demands for equity, for example in collaborations where IP is owned by TNO.

On the topic of IP strategy, QDNL has appointed a dedicated individual responsible for managing IP strategy. Plans to introduce IP awareness courses and a "best idea" award are underway, actions that are highly regarded by the Committee.

Human capital

Attracting and retaining talent is identified as a crucial challenge for the upcoming period, a concern acknowledged by both QDNL and the Ministry of Economic Affairs and Climate Policy (EZK). The Committee particularly emphasises the importance of cultivating a diverse workforce as a cornerstone for success. QDNL is encouraged to improve its efforts in achieving a better gender balance and a more varied mix of backgrounds, including science and engineering as well as non-scientific

and non-engineering disciplines (e.g. business, legal, marketing, social sciences). This diversity in disciplines should be well aligned with the needs (and anticipated needs) of the CATs and the national industry. That is especially true for the visitor programme that would gain at being more targeted on filling specific gaps of talent/expertise.

Additionally, the Committee appreciates QDNL's adoption of the Netherlands Organisation for Scientific Research (NWO) Diversity, Equity, and Inclusivity (DEI) policies, and values the commitment to these principles. It is recommended to QDNL to clearly communicate its adherence to the NWO DEI policies to all stakeholders, consistently apply these principles, and regularly review and discuss their implementation within a diverse representation from the QDNL community [14].

In terms of recruitment, the Committee values the existing practices of inclusive assessment and the blind submission approach. However, it notes that more proactive measures may be needed to ensure diversity from the outset of the recruitment process. The current policy, where, in cases of equally qualified candidates, preference is given to female candidates, is a step in the right direction, but additional strategies and criteria could further enhance and rigorously systematise diversity efforts.

To gauge the effectiveness of these diversity initiatives, the Committee recommends that QDNL diligently monitor and analyse diversity statistics [15]. This will provide insight into the success of implemented measures and identify areas for improvement.

Internationalisation

QDNL has positioned the Netherlands as a robust, supportive, and appealing ecosystem for quantum collaboration, and the Committee would say that is definitely a success! Moreover, QDNL has made significant progress in advancing its international strategy, marked by

the signing of Memorandums of Understanding (MOUs) with strategic countries and initiating a trilateral programme with Germany and France. The Committee is particularly impressed with the Netherlands' pioneering efforts in establishing these international alliances.

The internationalisation effort is evident across all CATs and ALs, with a dedicated team of five members working towards making QDNL a one-stop shop for both research and startup collaborations. This team's efforts have successfully made QDNL accessible and known both within the academic world as from industry.

However, the Committee acknowledges challenges faced by the team, notably in managing the capacity to follow up on all leads. It remains uncertain if the current ecosystem can fully integrate these opportunities. To address capacity issues, the team prioritises leads, ensuring all requests receive attention, albeit with varying response times based on priority. The Committee recognises that the next phase is to go beyond the thought leadership and the MoUs and concretely establish agreements and activate them in a way that is sustainable and relevant to the national industry. To achieve this economical security, priorities and clear KPIs will be needed.

The Committee wishes to highlight that QDNL's internationalisation initiatives are recognised and cited as exemplary on the global stage, reflecting the exceptional achievements in this area. The Committee also encourages to compare with similar international ecosystems (e.g. UK, Quebec, Nordics) and exchange best practices.

In closing, the Committee wishes to emphasise the exemplary performance of the team responsible for "Internationalisation" at QDNL. Their efforts extend far beyond merely attending high-profile events or dinners, contrary to the misconception that might be present in some parts of the QDNL organisation. Instead, their focus is on forging meaningful and productive international partnerships and collaborations, which is the true essence of their role.

Technology Acceleration

As highlighted in the self-assessment report, accelerating technology development and establishing a cohesive technology roadmap necessitates a revised governance model for the CATs, emphasising the Netherlands' unique selling points and the path to commercialisation. Areas needing focus include the disparity in patent filings between startups and universities, as indicated in slide 26 of the Birch report; the limited capital acquisition by startups, with only two having completed Series A funding; and the objective to increase the annual number of patents from 35 in 2023 to 60 in 2024, as detailed on page 73 of the self-assessment report.

The Committee perceives technology acceleration as being fragmented, primarily occurring within individual programme lines, leading to questions about who is responsible for driving this effort across QDNL and what the overarching strategy is.

To address these concerns, the Committee recommends fostering collaboration across programme lines, a practice that appears to be currently underutilised [16]. Encouraging teams to work together could accelerate progress, an element that may be presently lacking. This requires a clear, strategic focus on collaboration, innovation speed, and commercialisation pathways.

List of recommendations

In summary, the Committee recommends QDNL to³:

- [11] Develop a comprehensive plan for strategic decision-making to guide future directions and priorities;

³ The list of recommendations is limited to the Committee's most crucial observations.

- [12] Enhance hub alignment through financial and organisational transparency, and strategise on securing their buy-in and engagement;
- [13] Enhance engagement with end-users, for example, by implementing the suggestions made by the Committee;
- [14] Review and refine the current Diversity, Equity, and Inclusion (DEI) policy with input from a diverse group, ensuring clear communication and adherence to this policy across the organisation;
- [15] Gauge the effectiveness of these diversity initiatives, by diligently monitoring and analysing diversity statistics;
- [16] Encourage cross-collaboration among the various programme lines to foster technology acceleration and innovation.

3 REVIEW OF THE PROGRAMME LINES

3.1 CAT-1: QUANTUM COMPUTING & SIMULATION

INTRODUCTION

For phases 1 and 2 of the QDNL programme, CAT-1 aims to achieve the primary objective of developing Quantum Inspire 2.0. This quantum computing cloud platform grants access to three distinct types of quantum processors, each boasting superior qubit capabilities compared to QI 1.0. QI 1.0 featured a 2-qubit Si spin qubit processor, a 5-qubit superconducting processor, and an emulator with vector state simulations. Quantum Inspire 2.0 aspires to offer enhanced functionality, incorporating a more robust programming language, an advanced emulator, and features supporting the execution of hybrid algorithms. This becomes crucial in the NISQ (Noisy Intermediate-Scale Quantum) era, where only shallow circuits can be effectively executed. The ambition for phase 3 is that by 2028 QI is able to perform calculations with 100+ qubit processors (version 3.0).

CAT-1 consists of four work packages: 1) Quantum hardware, 2) Control electronics, 3) Integration, and 4) Use case development.

REMARKS AND RECOMMENDATIONS

The primary objective of CAT-1 is to achieve quantum computing capabilities exceeding 100 qubits, an undoubtedly ambitious target. While this "blue sky" goal is greatly valued and should remain as the ultimate aim, it's essential to establish a more attainable target by the end of 2028. The Committee suggests defining a realistic, specific, and

measurable goal for this timeframe to ensure clear direction and focus [17].

CAT-1 serves as a magnet to attract talent and train the workforce, marking its presence with significant achievements such as Qblox and Orange Quantum Systems. The Committee also recommends incorporating photonics into the range of Quantum Inspire modalities [18]. This would allow the integration of the strong expertise found in the various hubs in photonic quantum computing as well as photonic components. Although this multi-modality approach may slow down progress, it enhances the programme's resilience to volatility, a strategic choice that the Committee acknowledges and values.

Furthermore, it is recommended to focus on training as the primary mission of Quantum Inspire and use/purchase access to external commercial devices for commercial end-user applications [19].

The Committee has observed a strong passion for research within CAT-1, with a primary focus on academic pursuits and solving quantum problems. However, there's a noticeable gap in addressing end-user issues, which are more industry-oriented. To bridge this gap, the Committee recommends CAT-1 to proactively enhance end-user engagement. The emphasis should be on providing valuable, consultative support to clients, rather than solely on quantum capabilities [20]. The underlying message should convey CAT-1's commitment to solving clients' immediate problems, with the assurance that they will be the first to benefit from quantum computing advancements. This approach would require implementing clients' solutions on external commercial quantum devices, rather than on Quantum Inspire testbeds that are not ready to accommodate implementation (yet). By adopting this approach, CAT-1 could attract a broader range of companies, including key industry players, thereby fostering a thriving ecosystem. Incorporating non-quantum specialists is essential for this approach [21].

Regarding campus and ecosystem development, CAT-1 views these aspects as secondary, considering them time-consuming and distracting from their core objectives. Again, the involvement of non-quantum specialists in these areas is suggested to ensure that CAT-1 can concentrate on its primary goals.

The Committee observes a notable absence of synergy between the technology development and application-focused work packages. It is recommended that special emphasis be placed on fostering truly multidisciplinary projects [22]. Such initiatives should encourage collaboration across various hubs, facilitating the integration of diverse expertise to enhance the overall effectiveness and innovation within the ecosystem.

Quantum Inspire represents an ambitious endeavour, yet questions about its business model persist. The Committee recognises the development of a free public access version as crucial for cultivating an ecosystem and promoting talent and awareness, though it's not yet operational.

During the site visit, it was reported that CAT-1 enjoys considerable autonomy in decision making. See also the comments on decision making in the QDNL-overall section of this report.

In summary, the Committee recommends CAT-1 to⁴:

- [17] Identify realistic and specific objectives for CAT-1 to achieve by 2028, ensuring these goals are measurable and achievable within the set timeframe;
- [18] Integrate photonics as another modality of Quantum Inspire;
- [19] Focus on training as the primary mission of Quantum Inspire and use/purchase access to external commercial devices for commercial end-user applications;

⁴ The list of recommendations is limited to the Committee's most crucial observations.

- [20] Enhance end-user engagement by offering solutions beyond quantum computing, thereby keeping companies engaged and expanding its ecosystem;
- [21] Involve non-quantum specialists to ensure CAT-1 remains focused on its core objectives while building a supportive community around its initiatives;
- [22] Place special emphasis on encouraging multidisciplinary projects that leverage expertise from various fields to foster innovation and collaboration.

3.2 CAT-2: NATIONAL QUANTUM NETWORK

INTRODUCTION

CAT-2 sets the groundwork for the forthcoming generation of digital infrastructure in the Netherlands. This involves the establishment of a physical network comprised of fiber-optic connections and hardware. This network serves as the foundation for the future quantum network. Multiple physical quantum networks will facilitate various capabilities, including absolutely secure communication and interconnection of different quantum systems. On an international scale, connections will be established through fiber-optic and satellite links to link up with other quantum networks and systems.

This CAT consists of three work packages: 1) R&D quantum network, 2) Staging quantum network, and 3) Industry support & roll-out.

REMARKS AND RECOMMENDATIONS

Regarding the Quantum network, QDNL is recognised as a pioneering entity in Europe. The Committee observed numerous activities within

CAT-2, leading to some difficulty in identifying the programme's core focus. It was concluded that CAT-2 could benefit from a more concentrated direction.

Despite facing several challenges, notably in attracting international talent, the CAT-2 team demonstrated a resolute commitment to overcoming these obstacles during the interviews. Increasing user engagement is identified as another significant challenge for the upcoming period, a concern the CAT-2 team is acutely aware of and prepared to address.

The Committee noted concerns regarding governance, specifically the dual roles held by a board member within the CAT programme and CAT-2 members juggling multiple responsibilities both inside and outside the programme. This situation poses potential conflicts of interest that require careful management, echoing broader governance issues highlighted elsewhere in this report.

CAT-2 seems to have complete autonomy in their decision making, a point also discussed in the context of QDNL's overall governance. While this autonomy is viewed positively in terms of technical leadership, it raises concerns regarding its integration with other project lines and activities within the hub. The Committee's perspective on this matter is therefore ambivalent, acknowledging the benefits for technical innovation, but recognising potential challenges in ensuring coherence with the organisation's other initiatives.

The substantial overlap between CAT-2's activities and those of the Quantum Internet Alliance (QIA) is viewed positively, offering opportunities for synergy.

The Committee endorses CAT-2's initiative to engage with internet and telecom communities such as Nlnet Labs (Isac/Ripe) in phase 3, a strategy already in the planning stages for CAT-2. This approach is anticipated to enrich the programme's network and collaborative prospects [23]. Furthermore, it is recommended to focus not solely on

linking quantum computers to create a fully quantum network, but also on attracting more early adopters to establish a broader testing community [24].

In summary, the Committee recommends CAT-2 to⁵:

[23] Proceed with plans to engage with telecom communities, such as Nlnet Labs (Isac/Ripe), in phase 3, leveraging these connections to enhance the programme's reach and impact;

[24] Focus on attracting more early adopters to establish a broader testing community.

3.3 CAT-3: QUANTUM SENSING APPLICATIONS

INTRODUCTION

The CAT-3 aims to stimulate the creation of a dynamic Dutch ecosystem for quantum sensing, fostering collaboration between companies and knowledge institutes across the entire Technology Readiness Level (TRL) scale. The CAT-3 strategy unfolds through three strategic axes: establishing testbeds centred around three core technologies, advancing user-oriented application lines, and executing an open strategy to actively involve a broader community.

CAT-3 consists of three work packages: 1) Testbed ATOM (Ultracold quantum sensors), 2) Testbed SPIN (Spin based sensors), and 3) Testbed MECA (Mechanical oscillators).

REMARKS AND RECOMMENDATIONS

⁵ The list of recommendations is limited to the Committee's most crucial observations.

CAT-3 encompasses three distinct work packages, yet clarity on their progress is lacking amidst rapid international and national developments. For CAT-3's future, fostering an industry-oriented mindset is crucial—understanding the rationale behind starting a company and bridging academic knowledge with business acumen is essential.

The Committee recommends establishing connections with business schools, an element perceived as a significant gap at present [25]. This could alternatively be integrated into training or mentoring programmes, positioning the House of Quantum (HoQ) as the go-to resource for entrepreneurial guidance, rather than relying on professors who may not have the necessary expertise in entrepreneurship. The Committee recommends exploring the feasibility of introducing entrepreneurship-focused activities within QDNL [26].

The Committee values the breadth of entrepreneurial experience over the sheer number of startups, suggesting this metric could serve as a Key Performance Indicator (KPI).

A practical suggestion is participation in the annual Slush conference in Helsinki, a pivotal event for startups, where QDNL and its students could gain exposure and networking opportunities.

The Committee acknowledges the unique Dutch tradition of Quantum PhD graduates starting businesses, a phenomenon unparalleled globally.

In summary, the Committee recommends CAT-3 to⁶:

[25] Forge partnerships with business schools to fill the current void in entrepreneurial education and support within the quantum community;

⁶ The list of recommendations is limited to the Committee's most crucial observations.

- [26] Explore the possibility of QDNL facilitating entrepreneurship-focused activities to nurture the next generation of quantum entrepreneurs.

3.4 AL-1: RESEARCH & INNOVATION

INTRODUCTION

The AL-1 action line aims to support fundamental research as the foundation for new innovations within the Dutch quantum ecosystem. The budget is allocated through annual open calls, inviting submissions from all Dutch quantum researchers to strengthen and broaden the foundation of CAT programmes. The expectation is that fundamental research from AL-1 will contribute to technology development within the CATs.

NWO oversees the annual 'quantum call,' distinct for its focus on supporting CAT programmes. Proposals undergo evaluation by a dedicated committee of experts established by NWO, fostering international knowledge exchange through collaboration with the European Quantum Flagship and QuantERA.

The call also encourages young talent, including PhD and postdoctoral students, with a focus on daring, practical quantum technology. QDNL actively promotes inclusion, urging young talent, women, and minority groups to apply. Given the multidisciplinary nature of quantum research and its societal impact, QDNL emphasises engagement with researchers from diverse fields, including the humanities. The research projects encompass quantum computing, networking, sensing, simulation, algorithms, and post-quantum cryptography, often linked to broader European initiatives.

REMARKS AND RECOMMENDATIONS

In terms of strategy, given the low maturity of the technology, this Action Line is core to the success of QDNL and should now and for the near future fuel the rest of the activities. The Committee advises on more actively communicating any strategic shifts undertaken, as this reflects both bravery and foresight. Concerning progress, there's a noticeable shortfall in the number of PhD students engaged.

Extending the scope of the initial funding to include QuantERA was important for international cooperation, and should be continued.

To enhance QDNL's visibility, the Committee recommends the following measures for acknowledging QDNL's contribution [27]:

- Implement a policy of "Count every paper": Document every publication funded through QDNL on your website. This not only simplifies annual reporting and progress tracking but also enhances visibility.
- Beyond documentation, consider what additional services QDNL could offer to exceed client expectations and foster delight.

Interactions among projects and hubs are currently assessed through qualitative feedback. Introducing a quantitative indicator, such as the number of joint publications, would provide a more objective measure of collaboration and progress and is recommended [28].

Improvements in communication between Action Line 1 and CAT leads have recently been prioritised. A clearer outline of the specific enhancements anticipated from the various CAT programmes is recommended [29].

In relation to Figure 8 in the self-evaluation report, the suggestion is to enrich the graph with data on proposals submitted versus those funded, offering a clearer view of success rates. Additionally, we recommend to

monitor the success of proposals lead by women PIs, and the inter-hub collaborative proposals [30].

In summary, the Committee recommends AL-1 to⁷:

- [27] Enhance QDNL's visibility by promoting the acknowledgment of QDNL affiliation in all relevant outputs;
- [28] Adopt a measurable indicator of collaboration and progress, to quantitatively assess the effectiveness of interdisciplinary efforts;
- [29] Provide detailed expectations for improvements across different CAT programmes, ensuring clarity in objectives and outcomes;
- [30] Implement a dedicated strategy to monitor, support, promote and enhance participation of women scientists, with a special eye on the highest-level leadership positions.

3.5 AL-2: QUANTUM ECOSYSTEM

INTRODUCTION

AL-2 is dedicated to establishing the necessary facilities and conditions to facilitate the envisioned expansion of the Dutch quantum business ecosystem. Its overarching ambition is to cultivate a seamless and barrier-free environment. AL-2 places a specific emphasis on the development of physical shared facilities, including the House of Quantum (HoQ), fostering international partnerships, providing subsidies for Small and Medium-sized Enterprises (SMEs), supporting field labs and hubs, facilitating startup capital, and offering assistance in crafting effective intellectual property (IP) strategies.

⁷ The list of recommendations is limited to the Committee's most crucial observations.

AL-2 consists of five work packages: 1) Q3T, IP and Tech Transfer, 2) Startup Development (Infinity and QDNL Participations), 3) SME and Fieldlab Programme, 4) International Strategy, and 5) Campus Development.

REMARKS AND RECOMMENDATIONS

The objectives of AL-2, which include creating IP awareness, encouraging IP creation, and offering guidance on optimal IP utilisation, are recognised as crucial and of societal importance.

During discussions, the Committee identified significant startup potential hindered by prolonged processes (up to 2.5 years) due to complex interactions between universities and tech transfer offices concerning IP. Challenges include a lack of urgency from universities, intricate agreements, issues related to royalties, tooling transfer, access to facilities, and licensing agreements. Additionally, a cultural aspect exists where academia prefers retaining projects internally, coupled with alumni loyalty to their professors.

To address these challenges, the Committee recommends establishing a dedicated team of QDNL legal experts to navigate legal matters with universities [31]. This approach serves dual purposes: facilitating commercialisation within technical universities (aligning with KPIs) and advancing QDNL's vision for a barrier-free ecosystem.

Capital acquisition is identified as another hurdle. The Committee recommends addressing this challenge fundamentally by ensuring that mentoring encompasses entrepreneurship alongside quantum expertise from the start [32]. Furthermore, QDNL's connection to business schools appears insufficient. Strengthening ties with institutions like Erasmus University Rotterdam and incorporating sales professionals into the team are recommended to create a balanced team [33].

Access to facilities, especially cleanrooms, poses a challenge, with startups in some cases prioritised last. The Committee recommends establishing dedicated access for companies and considering appropriate pricing strategies [34].

Regarding Work Package 4, the misalignment between EU call timings and the QDNL programme schedule limits co-funding opportunities. The Committee suggests ensuring that Phase 3 plans are synchronised with major EU calls.

The Work Package 3 is well reported with quantitative data, which is appreciated by the Committee. The Committee thinks it should be not too difficult to set SMART goals and tangible KPIs for other parts of this Action Line.

In summary, the Committee recommends AL-2 to⁸:

- [31] Establish a specialised team of QDNL legal professionals to streamline interactions with universities regarding IP issues;
- [32] Refocus mentoring efforts to include essential business skills alongside quantum technologies from the beginning;
- [33] Enhance connections with business schools like Erasmus University Rotterdam and recruit sales experts to form a comprehensive team, mirroring the approach recommended for the legal team;
- [34] Create dedicated facility access for startups and companies, with a suitable pricing model to encourage their innovation and growth.

⁸ The list of recommendations is limited to the Committee's most crucial observations.

3.6 AL-3: HUMAN CAPITAL

INTRODUCTION

The objective of AL-3 is to establish a sustainable knowledge ecosystem for quantum top talent across all levels of education, ranging from scientific education to primary education, achieved through targeted one-off incentives. The overarching ambition of the Quantum Delta Netherlands (QDNL) initiative is to foster a robust knowledge ecosystem of quantum top talent across various educational levels. This talented pool serves as the driving force behind QDNL, gaining momentum akin to a powerful flywheel.

AL-3 consists of five work packages: 1) Strengthening the existing university knowledge base, 2) Linking higher vocational and secondary education to the university knowledge base, 3) Creating additional opportunities for top talent (QDNL Top Talent Programme), 4) Establishing a visitor programme and the possibility of sabbaticals (QDNL Visitor Programme), and 5) Generating interest among the youngest generation of schoolchildren.

REMARKS AND RECOMMENDATIONS

The sustainability of AL-3 beyond 2028 presents a significant challenge, which the group is acutely aware of. One proactive strategy could involve initiating partnerships with or fostering a startup company dedicated to sustaining the project's outcomes.

AL-3 recognises the difficulty in defining clear measures of success and KPIs. The Committee recommends the creation of recordable and reusable educational content (made available online), such as programmes for high schools [35]. This material should be translated

into multiple languages to enhance accessibility and scalability. Employing an influencer to promote the content and tracking its usage could further amplify its impact.

This diversity in disciplines should be well aligned with the needs (and anticipated needs) of the CATs and the national industry. That is especially true for the visitor programme that would gain at being more targeted on filling specific gaps of talent/expertise [36].

The societal relevance of AL-3's programme cannot be overstated, given the pressing need for tech-people both now and in the future, as the current number is that only two out of five kids choose SEM-related education paths (Although the opinions within the Committee differ whether that number is actually not that bad at all). Despite this, the Committee thinks Quantum is an attractive way to interest kids to other STEM-like skills. This perspective should be used in engagements with policymakers.

The Committee notices that connections to classical institutions seem low. The Q-labs and Talent and Learning Centers developed by QDNL transcend these institutions. The Committee has the idea that QDNL is bypassing the existing national educational programmes and wonders if they could not better connect with existing educational systems. It is recommended to challenge the assumption that the current educational system could not be used for this [37].

Engagement with the Ministry of Education is essential, especially considering the ministry's extensive list of learning priorities. The Committee believes that intensified advocacy efforts are necessary to incorporate Quantum education into national curricula [38].

Furthermore, the Quantum Quest initiative is highly praised and seen as a model worth continuing. AL-3's focus could also expand to include entrepreneurship, not by creating tools in-house but by linking up with business schools, as noted in the QDNL section of this report.

In summary, the Committee recommends AL-3 to⁹:

- [35] Develop and disseminate recordable, reusable content tailored for educational purposes, and monitor its utilisation;
- [36] Be targeted in various programmes (including the visitor programme) to align with the (anticipated) needs of the national industry and the CAT activities;
- [37] Re-evaluate the premise that existing educational structures are ill-suited for Quantum education, exploring ways to integrate effectively;
- [38] Intensify efforts to advocate for the inclusion of Quantum technology in national educational curricula, highlighting its potential to enrich STEM learning.

3.7 AL-4: SOCIETAL IMPACT (ELSA)

INTRODUCTION

AL-4 plays a crucial role in advancing the deployment of quantum technology and its applications for the betterment of society. In pursuit of this goal, the establishment of the Centre for Quantum & Society has been instrumental. Collaborating closely with both businesses and civil society organisations, the centre is dedicated to eliminating ethical, legal, and societal barriers associated with the integration of quantum technology. Moreover, it aims to pinpoint applications of quantum technology that hold significant societal impact. This mission is achieved through the utilisation of Ethical, Legal, and Societal Aspects (ELSA) tools, which are under continuous development. These tools are crafted based on cutting-edge research across various disciplines, ensuring a

⁹ The list of recommendations is limited to the Committee's most crucial observations.

comprehensive and effective approach to addressing the multifaceted challenges associated with quantum technology deployment.

AL-4 consists of four work packages: 1) Centre for Quantum and Society, 2) Responsible research and tool development, 3) International thought leadership, and 4) Academic research and development.

REMARKS AND RECOMMENDATIONS

The Committee views AL-4 as a standout Action Line, noting its significant contributions to human capital and talent development. QDNL's pioneering efforts in societal innovation, exemplified by the creation of the CQS, EQTA, ELSA tools (such as the ELSA card set), and the QDNL Culture Manifesto, set a benchmark for other countries to aspire to.

A primary objective is to establish a sustainable business model by 2027. One of the reported challenges is the scarcity of practical use cases, making it challenging to go beyond the anticipation mode and concretely demonstrate impact. Furthermore, engaging companies has proven difficult, partly due to issues around securitisation.

Given these challenges, the Committee believes it is crucial to broaden the interaction with other CATs, which harbours direct connections to companies, and suggests exploring ways to enhance these relationships.

The Committee acknowledges the existing direct connections with CAT-2 and appreciates the involvement of stakeholders such as Eurofiber, Innovation Quarter, and the Port of Rotterdam. This collaboration with major companies and government entities, especially in adopting the EQTA tools, is commendable.

Despite existing cross-links, AL-4 operates somewhat siloed. The Committee recommends a comprehensive review of how cross-

collaboration can be intensified, with a special emphasis on engaging companies and developing use cases [39].

The KPI's of this AL are more elaborated than the other action lines, which is appreciated.

In summary, the Committee recommends AL-4 to¹⁰:

[39] Review of how cross-collaboration with other programme lines can be intensified, with a special emphasis on engaging companies and developing use cases.

3.8 CRP: CLEANROOM PROGRAMME

INTRODUCTION

The primary aim of the cleanroom programme is to ensure the timely establishment of essential infrastructure. This encompasses a meticulous oversight of investment plans throughout all phases, including the development of requirements packages, tendering, awarding contracts, order placement, delivery, hook-up, acceptance, and commissioning. The investment trajectory for each device is a comprehensive process that may span up to 12 months.

Within the NanoLabNL community, comprised of both scientific and private users, there is a continuous and collaborative effort to build and share fundamental knowledge. The cleanroom investment programme, integrated into the QDNL initiative, plays a crucial role in updating key

¹⁰ The list of recommendations is limited to the Committee's most crucial observations.

equipment. NanoLabNL stands as a pivotal foundation upon which other action lines and CAT-programmes within this proposal can thrive.

The budget allocated to this programme is part of a distinct grant application submitted to the Ministry of Economic Affairs and Climate Policy by the NanoLabNL Foundation, in consultation with QDNL.

REMARKS AND RECOMMENDATIONS

The self-evaluation report states that 6 out of 32 tools are in operation, a statistic that raises concerns. During the Committee's consultation it appears that 6 tools are fully up and running (currently 9) and that of the 29 committed devices, 15 have been installed. The Committee acknowledges that ordering, delivering, installing and then fully testing is time-consuming. However, it is still important that no valuable time is lost. It is crucial to present a comprehensive view, and therefore it is recommended to also show other performance indicators such as the utilisation rate – they are available – and the average wait time between reserving and usage the equipment [40].

The Committee notes that only 20% of the capacity is allowed to be allocated for economic activities due to governmental regulations. This restriction is viewed as limiting and outdated. Dialogue with the Ministry of Economic Affairs and Climate Policy (EZK) is deemed necessary. A successful legitimate workaround implemented in Eindhoven was identified, and it is suggested that the Cleanroom Programme consider adopting similar strategies.

Given the Netherlands' advantageous position for testing and prototyping, characterised by its accessibility, reliability, and excellent reputation, there's a strong case for expanding the cleanroom's role. Exploring the potential to offer cleanroom services to both individuals and companies interested in such activities is recommended [41].

In summary, the Committee recommends CRP to¹¹:

- [40] Include a broader range of performance indicators to offer a more detailed view of operations;
- [41] Explore the feasibility of transforming the cleanroom into a service for individuals and companies engaged in cleanroom activities, thereby enhancing its value and utility.

¹¹ The list of recommendations is limited to the Committee's most crucial observations.

CONCLUSION FOLLOWING A HIGHLY SUCCESSFUL START-UP PHASE, IT'S TIME TO FOCUS AND PROFESSIONALISE FOR SCALING UP

As QDNL transitions from its highly successful startup phase, characterised by the dedication of its Executive Board and the expertise of its team and the Hubs, it stands on the cusp of a promising future. The foundation laid by its initial achievements is solid, yet the path forward demands further professionalisation in several key areas.

To scale effectively, QDNL is encouraged to enhance (financial) transparency across the organisation, including its hubs, ensuring governance structures are clearly defined with unambiguous roles and leadership. The development and implementation of SMART KPIs will provide measurable targets that align with QDNL's ambitious goals. Furthermore, the incorporation of non-technical roles within the organisation and the pursuit of multidisciplinary collaboration with entrepreneurial institutes and business schools will enrich QDNL's ecosystem, fostering innovation and broadening its impact. The recommended strategy to 'hire more and cooperate more' underscores the necessity of expanding QDNL's talent pool and fostering partnerships that drive forward its mission.

A focused strategy, clear on priorities and objectives, will guide QDNL through the complexities of commercialisation and intellectual property strategy, ensuring that innovations are effectively protected and leveraged. Human capital remains QDNL's most significant asset, with an ongoing commitment to attracting, developing, and retaining a diverse and skilled workforce essential for sustained success.

QDNL's Action Lines and CAT-programmes are very promising, yet there is room for growth, particularly in enhancing cross-collaboration and end-user engagement. These initiatives are not just projects but are the

lifeblood of QDNL's influence and contribution to the quantum technology landscape.

The Committee, while requested to adopting a critical stance, does so with pride in QDNL's progress and with the intention of refining what is already a remarkable journey. The critiques offered are meant to sharpen focus, encourage adaptation, and inspire continued excellence.

With these recommendations, the Committee looks to QDNL's future with confidence, anticipating a trajectory that not only continues its current momentum but also expands its horizons, making what is good even better. The path ahead is bright, filled with the promise of innovation, collaboration, and ground-breaking achievements in the realm of quantum technology.

APPENDIX A CURRICULA VITAE OF THE COMMITTEE MEMBERS

Prof. dr. S. (Sabrina) Maniscalco, Committee Chair, Professor of Quantum Information, Computing, and Logic at the University of Helsinki, co-founder and CEO of Algorithmiq Ltd., Finland, studied Physics at the University of Palermo in Italy and was awarded a PhD degree from the same university. Her doctoral research focused on quantum mechanics and information theory, laying the foundation for her future contributions to the field. After completing her PhD, Maniscalco held various postdoctoral positions in Europe, where she expanded her research on quantum dynamics and non-Markovian processes in open quantum systems. Since then, Sabrina Maniscalco has held professorships at several prestigious institutions. She is currently a Professor at the University of Helsinki, Finland, and holds a joint appointment at Heriot-Watt University in Edinburgh, Scotland. Her roles include leading research groups dedicated to quantum physics and information technology, significantly contributing to advancements in the understanding and application of quantum systems. Her honors include being named a Fellow of the Learned Society of Wales, recognition for her outstanding contributions to the scientific understanding of quantum mechanics, and numerous awards for her research in quantum information science. She has also been an influential advocate for women in physics, promoting diversity and inclusion within the scientific community. In addition to her academic and research accomplishments, Maniscalco has served on several editorial boards of scientific journals and review committees, further impacting the field through her leadership in peer review and publication processes. Her research interests encompass quantum information, decoherence, and the development of quantum technologies, with a particular focus on quantum communication and computation.

Prof. dr. ing. D.H.A. (Dave) Blank, Co-chair, is Distinguished Emeritus Professor at the University of Twente and advisor on research of the governing board of Saxion University of Applied Sciences. He received his PhD in Physics in 1991 from the University of Twente and continued to work in different professorships in applied physics, chemistry, and material science. In 1998 he worked as a visiting scientist at the Laboratory of Advance Materials at Stanford University. From 2007 – 2016 he was Scientific Director of MESA+ Institute for Nanotechnology. Furthermore, he was Chairman of the Executive Board of NanoNextNL, a national programme on nanotechnology, member of the Advisory Council for Science, Technology and Innovation Policy (AWTI) of the Dutch government and appointed as Captain of Science in the Topteam High Tech Systems and Materials of the Department of Economic Affairs. He is one of the initiators of the quantum- and nanotech route of the Dutch science agenda on societal challenges. He is member of the investment commission of East Netherlands Development Agency and co-founder of three start-up companies.

Dr. H.C. (Jaya) Baloo is the Chief Security Officer of Rapid7 and has been working in the field of information security with a focus on secure network architecture for over 20 years. She is the former CISO of Avast, and prior to that was CISO at KPN, the largest telecommunications carrier in the Netherlands. Jaya serves on boards of the NL's National Cyber Security Centre, TIIN Capital, the NOS, and was the former Vice Chair of the EU Quantum flagship. She is also on the faculty at Singularity University. Jaya is recognized as a top 100 global CISO and ranks among the top 100 security influencers worldwide. In 2019, she was selected as one of the 50 most inspiring women in the Netherlands by Inspiring Fifty. In 2022 she received an honorary doctorate from the University of Twente for her contributions to the field of Cybersecurity.

Dr. C. (Catherine) Lefebvre is Vice President Global Policy and Partnerships at PASQAL, a full-stack quantum computing company. She is also Senior Advisor for the Open Quantum Institute at GESDA. She has

years of experience in building strategic relationships as well as research & innovation partnerships in global quantum and artificial intelligence ecosystems. Catherine is convenor of the European Committee for Standardization Working Group on Quantum Computing (CEN/CLC JTC 22 WG3), as well as co-chair of the IEEE Working Group on Quantum Computing Architecture (P3120). She previously worked as Innovation Ambassador US & Canada at M Squared Lasers, Scientific Advisor in quantum technology for the Quebec Government (MEIE), Scientific Liaison Officer in artificial intelligence for the National Bank of Canada and for the startup ElementAI (acquired by ServiceNow). Catherine has a background in research and holds a PhD in molecular physics and theoretical quantum chemistry from Université Paris-Sud and Université Laval. She then pursued research as postdoctoral fellow and research associate for almost a decade, at the Université de Sherbrooke, the Canadian Space Agency and the Institut National de la Recherche Scientifique.

Prof. dr. C.M (Charles) Marcus completed his undergraduate studies at Stanford University (1980-84) and earned a Ph.D. in Physics from Harvard in 1990. He served as an IBM postdoctoral fellow at Harvard until 1992, then joined the Physics faculties at Stanford (1992-2000) and Harvard (2000-2011), where he was also Director of the Harvard Center for Nanoscale Systems (2006-2011). In 2012, Marcus moved to the Niels Bohr Institute, University of Copenhagen, as Villum Kann Rasmussen Professor and Director of the Center for Quantum Devices. In April 2023, he joined the University of Washington as the Boeing Johnson Endowed Chair in Materials Science and Engineering, and Physics. Marcus is a Fellow of the American Physical Society, the American Association for the Advancement of Science, and a member of the US National Academy of Sciences. He received the Danish Academy of Natural Sciences' Industry Prize in 1999 and in 2020 was the first non-Dane to receive the H.C. Ørsted Gold Medal. His research focuses on experimental condensed matter physics, quantum coherent electronics, quantum matter, and qubits. He aims to explore large-scale

interconnected quantum systems for understanding complex quantum materials and applications in quantum information.

Ir. S (Sven) Laudy, senior process consultant of the committee, earned his MSc in Industrial Engineering and Management Science in 2001, specialising in organisational behaviour, and focusing on the design and group dynamics of autonomous workgroups. Since 2001, Sven has operated from his consultancy, Quicken Organisatie Adviseurs B.V., where he contributes expertise to strategy and organisational matters in the (manufacturing) industry. Additionally, since 2007, he has served as a process facilitator/secretary for Higher Education institutions, overseeing more than 15 research assessments for technical universities and universities of applied sciences. Beyond the typical support tasks, including reporting and writing the final report, Sven serves as the process facilitator. As the right hand of the chair, he vigilantly oversees the main goals of review and guides the entire (preparation) process of the committee. In this role, Sven assumes operational responsibilities from the chair, allowing both them and other committee members to focus entirely on content. His emphasis is on thorough committee preparation, believing it consistently leads to more in-depth final reports. Sven favours the use of appreciative inquiry in conducting research assessments. His professional interests span engineering disciplines, economics & business administration, behavioural sciences, and the natural sciences. He also has a keen interest in exploring the interaction between science and the engagement of stakeholders from the business and industrial sectors.

APPENDIX B SITE VISIT PROGRAMME

DAY 0 – Tuesday February 6, 2024		
<i>Time</i>	<i>Activity</i>	<i>Participants</i>
17.00 [Hotel]	Arrival of committee and welcome	Committee + QDNL Board + Erik van de Burgwal (Ministry of Economic Affairs)
17.30 – 21.30 [Hotel]	Working diner: kick-off and preparation of interviews	Committee (private)

DAY 1 – Wednesday February 7, 2024		
<i>Time</i>	<i>Activity</i>	<i>Participants</i>
8.30 – 9.00	Preparation of interviews	Committee (private)
9.00 – 10.00	Interview QDNL Board	Christa Hooijer (chair QDNL Board) Freeke Heijman Jesse Robbers Philippe Bouyer Pieter de Witte
10.00 – 10.15	Reflection	Committee (private)
10.15 – 10.45	Interview CAT-1 Programme	Richard Versluis (lead CAT-1) Vedran Dunjko Servaas Kokkelmans
10.45 – 11.15	Reflection + Break	Committee (private)
11.15 – 11.45	Interview CAT-2 Programme	Jesse Robbers (lead CAT-2) Ronald Hanson Alexander Scheltinga
11.45 – 12.00	Reflection	Committee (private)
12.00 – 12.30	Interview Action Line 2	Freeke Heijman (lead AL-2) Ton van 't Noordende Hugo Gelevert
12.30 – 12.45	Reflection	Committee (private)
12.45 – 13.30	Lunch with external stakeholders: startups and (young) entrepreneurs (in HoQ)	Daan Kuitenbrouwer, Delft Circuits Dimitri van Esch, Quantum Gateway Foundation Garrelt Alberts, Orange Quantum System Ido Niesen, Fermioniq Johannes Jobst, QuantaMap

		Max Kouwenhoven, Onnes Technologies
13.30 – 14.00	Interview Action Line 1	Servaas Kokkelmans (lead AL-1) Emma Winkels
14.00 – 14.15	Reflection	Committee (private)
14.15 – 14.45	Cleanroom Programme	Guus Rijnders (lead) Pieter Telleman
14.45 – 15.00	Reflection	Committee (private)
15.00 – 15.30	Interview Action Line 3	Miriam Blaauboer (lead AL-3) Wieteke de Boer Jan Aarts
15.30 – 16.00	Reflection + Break	Committee (private)
16.00 – 16.30	Interview Ministry of Economic Affairs and Climate Policy	Jeroen Heijs Erik van de Burgwal Jhalak Gupta
16.30 – 16.45	Reflection	Committee (private)
16.45 – 17.15	Interview Action Line 4	Victor Land (lead AL-4) Joris van Hoboken Deborah Nas
17.15 – 17.30	Reflection	Committee (private)
18.00	Refreshing at hotel	Committee (private)
19.00 <i>[Restaurant City Centre/ Hotel]</i>	Working dinner: discussing and writing preliminary judgments	Committee (private)
21.30	Closure	

DAY 2 – Thursday February 8, 2024		
<i>Time</i>	<i>Activity / Assessors</i>	<i>Participants</i>
08.00 – 10.00	Travel time to Hub	Individual committee members
10.00 – 11.15	Experience QDNL Hubs (Labs/ Walking Tour and meet and greet with (junior) researchers <i>HUB Delft – Charles Marcus</i> <i>HUB Eindhoven – Jaya Baloo</i> <i>HUB Leiden – Dave Blank</i> <i>HUB Twente – Sabrina</i> <i>Maniscalco</i> <i>HUB Amsterdam – Catherine</i> <i>Lefebvre</i>	Individual committee members in the hubs See Programme Hub Visits
11.15 – 11.30	Reflection + Break	Individual committee members [Possibly plenary Conference call Committee]
11.30 – 12.00	Interview with hub on (cross)- collaboration in and between the hubs	Individual committee members in the Hub See Programme Hub Visits
12.00 – 14.00	Reflection + Break + Travel back to Delft	Committee Individual committee members
14.00 – 14.30	Reflection	Committee (private)
14.30 – 15.00	Interview Supervisory Board	Carlo Beenakker (chair SB) Cis Marring Kareljan Schoutens
15.00 – 15.15	Reflection	
15.15 – 15.45	Interview CAT-3 Programme	Philippe Bouyer (lead CAT-3, until 31-12-23) Clara Osorio Tamayo (lead from 01- 01-24)
15.45 – 16.00	Reflection	Committee (private)
16.00 – 16.30	Interview on topic Technology Acceleration	Philippe Bouyer Clara Osorio Tamayo Jesse Robbers (will join online) Richard Versluis
16.30 – 16.45	Reflection	Committee (private)

16.45 – 17.15	Interview on topic Startup Development and IP Strategy	Freeke Heijman Ton van 't Noordende Pieter de Witte Guido Paola
17.15 – 17.30	Reflection	Committee (private)
17.30 – 18.00	Prepare first observations based on notes/ bullet-points secretary	Individual committee members
18.00	Refreshing at hotel	Committee (private)
19.30 <i>[Restaurant City Centre/ Hotel]</i>	Working dinner: discussing and writing preliminary judgments	Committee (private)
21.30	Closure	

DAY 3 – Friday February 9, 2024

<i>Time</i>	<i>Activity / Assessors</i>	<i>Participants</i>
8.30 – 9.00	Interview on topic Internationalisation	Ulrich Mans Freeke Heijman Jesse Robbers Mayra van Houts
9.00 – 9.15	Reflection	Committee (private)
9.15 – 10.45	Discuss first observations committee members	Committee (private)
10.45 – 11.00	Break	
11.00 – 11.30	Prepare Concluding meeting with QDNL Board	Committee (private)
11.30 – 12.00	Concluding meeting with QDNL Board: 1) fact check, 2) open questions, and 3) sharing first conclusions	Christa Hooijer Freeke Heijman Jesse Robbers Philippe Bouyer Pieter de Witte
12.00 – 13.30	Writing preliminary judgments (including lunch)	Committee (private)
13.30 – 14.00	Oral presentation on first impression by committee + consultation (dialogue with Taskforce)	QDNL Board, plus: Job Nijs (Taskforce) Marco Beijersbergen (Taskforce) Thijs Brem (Secretary MTR-report)
14.00 – 14.30	Closure	Refreshments with Committee and QDNL

Programme for the 5 Hub Visits on 8 February 2024 as part of the Mid-Term Review QDNL

- The 5 MTR Committee members will all visit one hub on Thursday 8 February 2024.
- Purpose is to experience the Hubs and to assess the collaboration within the QDNL ecosystem, in and across the Hubs.

HUB Delft		
<i>Committee Member:</i>	Charles Marcus	
<i>Hosts:</i>	Lieven Vandersypen (QuTech), David Sayago Hilera (Quantum Delft)	
<i>Time</i>	<i>Activity</i>	<i>Participants</i>
10.00 – 11.15	- Welcome at QuTech building - Visit to Kavli Nanolab - Visit to HectoQubit set-up - Talk with young entrepreneurs	- Lieven Vandersypen (host) - Mathilde Lemang, Pieter Telleman - Leo di Carlo, Niels Bultink, Marco Matters - Anne-Marije Zwerver, Nico Hendrickx, Alberto Tosato, Stephan Philips
11.15 – 11.30	Break	
11.30 – 12.00	Interview on collaboration within QDNL ecosystem	- Lieven Vandersypen (QuTech) - Kees Eijkel (QuTech) - Josepha van Kollenburg (Quantum Delft) - Shahar Graf (QDNL HoQ) - Theo Lodewijkx (TNO, Spark programme)

HUB Eindhoven		
<i>Committee Member:</i>	Jaya Baloo	
<i>Host:</i>	Wieteke de Boer	
<i>Time</i>	<i>Activity</i>	<i>Participants</i>
10.00 – 11.15	- Welcome at Flux building - Lab tour (q-communication, CAT2) - Introduction Qubit building - Eindhoven involvement in QDNL lines - TLC Gameroom experience - Quantum computing plus lab tour	- Wieteke de Boer - Chigo Okonkwo + student - Servaas Kokkelmans - Gijs Hijmans, Sharon Dolmans - Mohammad Moradi + students - Servaas Kokkelmans
11.15 – 11.30	Break	Eindhoven winners AL-1 Call are present: Aida Todri-Sanial, Oliver Tse, Idelfonso Tafur Monroy, Kathryn Hövelmanns, Oded Raz. Also: Erwin Kessels (NanoLab), Sharon Dolmans and Naomie Verstraeten.
11.30 – 12.00	Interview on collaboration within QDNL ecosystem	- Wieteke de Boer (TU/e, AL-2, AL-3) - Servaas Kokkelmans (TU/e, AL-1, CAT-1) - Mohammad Moradi (Fontys, AL-3) - Sharon Dolmans (TU/e, AL-4) - Gijs Hijmans (TU/e, AL-2, CAT-2, Q3T) - Naomie Verstraeten (BrainPort Dev.)

HUB Leiden		
<i>Committee Member:</i>	Dave Blank	
<i>Hosts:</i>	Jan Aarts, Michelle Willebrands	
<i>Time</i>	<i>Activity</i>	<i>Participants</i>
10.00 – 11.15	- Welcome at Leiden; short presentations (Leiden, ELSA and Quantum games) - Visit to Quantum Rules! facilities - Visit to quantum sensing startup QuantaMap, plus lab visit - Show LiS and student tandem project	- Jan Aarts, Julia Cramer, Evert van Nieuwenburg - Michiel Thijssen - Kaveh Lahabi - Gunter Helms, - Casper Rose
11.15 – 11.30	Break	
11.30 – 12.00	Interview on collaboration within QDNL ecosystem	- Jan Aarts (scientific director, hub coordinator) - Vedran Dunjko (Lead aQa) - Cintia Perugachi (talent & education) - Max Kouwenhoven (local SMEs) - Michelle Willebrands (community manager) - Tim Stegwee (business developer, Q3T)

HUB Twente		
<i>Committee Member:</i>	Sabrina Maniscalco	
<i>Host:</i>	Lennart de Vreede	
<i>Time</i>	<i>Activity</i>	<i>Participants</i>
09.00 – 10.15	- Welcome and NanoLab tour - Visit to Student lab - Visit to Photonics lab	- Lennart de Vreede - Alexander Brinkman - Pepijn Pinkse
10.15 – 10.30	Break	
10.30 – 11.00	Interview on collaboration within QDNL ecosystem	- Cas Damen (Saxion, AL-3, TLC) - Guus Rijnders (UT, NanoLabNL) - Lennart de Vreede (UT, Q3T, community) - Marike Boertien (UT, AL-2, MinacNed) - Pepijn Pinkse (UT, Startup QuiX) - Timo Meinders (UT, AL-2, MESA)

HUB Amsterdam		
<i>Committee Member:</i>	Catherine Lefebvre	
<i>Hosts:</i>	Christian Schaffner, Vania López Díaz	
<i>Time</i>	<i>Activity</i>	<i>Participants</i>
10.00 – 11.15	- Welcome at Startup Village - Introductory talk - Showcasing startups (Fermioniq, Quantum Gateway Foundation, QuiX) - Quantum.Amsterdam Experience - Visit Lab42 (hinting at LabQ building)	- Christian Schaffner - Ilse Geurts - Vania Lopez Diaz - Richard Van Harderwijk - Koen Groenland - Giada La Gala - Joris van Hoboken
11.15 – 11.30	Break	
11.30 – 12.00	Interview on collaboration within QDNL ecosystem	- Christian Schaffner (Q.A, QuSoft) - Ilse Geurts (HvA, TLC) - Koen Groenland (Q.A, workshops, masterclasses) - Richard van Harderwijk (Q.A, Q3T,QAL) - Vania López Díaz (Q.A, Events & communications)



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