

Report on the Digital Life Norway egenvurdering seminar

Lysaker, June 12-13, 2019



1. Purpose and structure of the report

The aim of this report is to summarise the discussions that took place during a two-day **egenvurdering** seminar of and by the Centre for Digital Life Norway (DLN). The event took place on June 12-13, 2019 on the premises of the Research Council of Norway (RCN) in Lysaker.

Digital Life Norway started operations in spring 2016 and its current funding period is set to end in early 2021 (cf. Figure 1.1). In spring of 2019, RCN initiated a process to capture learnings from the present funding period and to develop ideas that could guide a future DLN 2.0. The *egenvurdering* seminar in Lysaker (the seminar, henceforth) constitutes one out of three inputs to this process, the others being a position paper by DLN's governing board and a high-level dialogue with the universities that are DLN project owners.

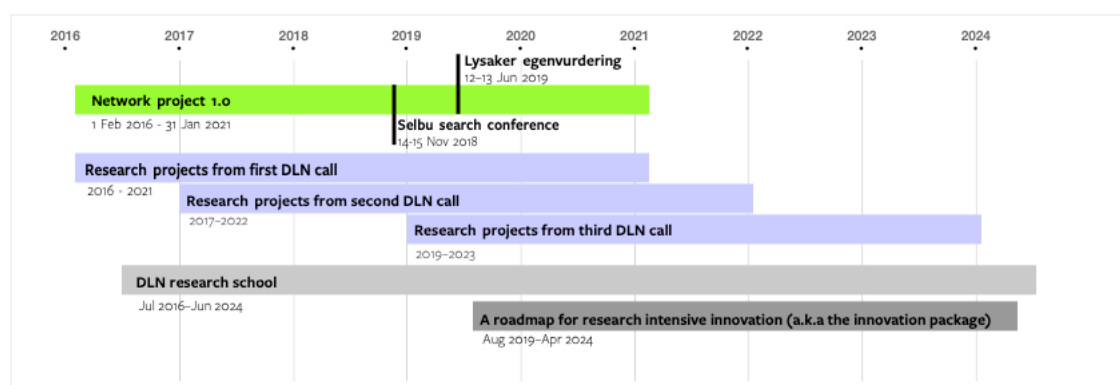


Figure 1.1: RCN funding timeline for the current DLN setup.

The seminar was jointly prepared by DLN and RCN, supported by the consultancy *Mobilize AS* who helped to shape the programme (cf. Appendix A), facilitated the seminar, and drafted an initial version of this report. The participants in the seminar (cf. Appendix B) are representative of DLN's constituency, namely the research projects, young researchers, the centre management and workgroups, DLN's board, RCN, and invited external experts.

The reader is advised to keep in mind that the main purpose of this seminar was to facilitate open and creative discussions among various stakeholders on **directions for the future of DLN**. The report captures important lessons that were drawn during the event and presents the many ideas for a future DLN 2.0 that emerged in the discussions among the participants. However, these discussions have not ended up in a single, consensual proposal. People left the seminar still thinking. This is why the report doesn't offer any specific recommendations.

The report first describes the present setup of DLN (p. 2). It then summarises the input provided by international experts at the beginning of the seminar (p. 5). Then lessons from stock taking is presented in form of a SWOT analysis (p. 5) and the definition of crucial dilemmas in the present organisational setup (p. 7). The strategic implications of stock taking are presented next (p. 10), followed by concrete suggestions for a future DLN 2.0 (p. 11). A timeline for the process ahead concludes the report (p. 14).

2. The present vision and setup for DLN

The Centre for Digital Life Norway is a national centre for biotechnology research, innovation and education. According to the strategy document "Digital Life – convergence for innovation", its mission is to create economic, societal and environmental value from biotechnology research and innovation in Norway by

advancing interdisciplinary research between the life sciences/biotechnology and other STEM fields with a focus on harnessing the advances afforded by digitalisation. All of the centre’s activities are grounded in the principles of responsible research and innovation (RRI).

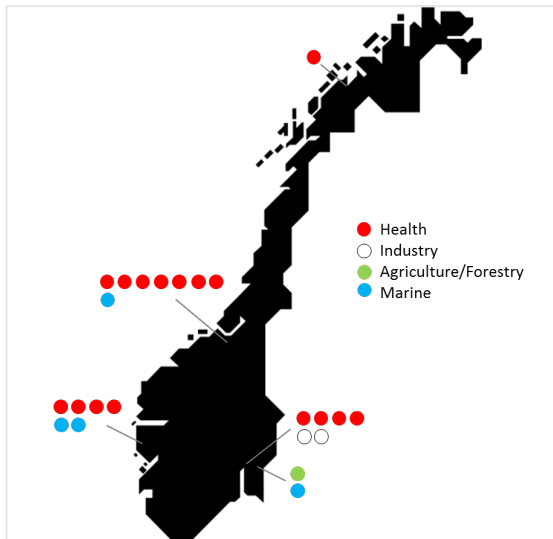


Figure 2.1: Sectoral and geographic distribution of the DLN-funded research projects

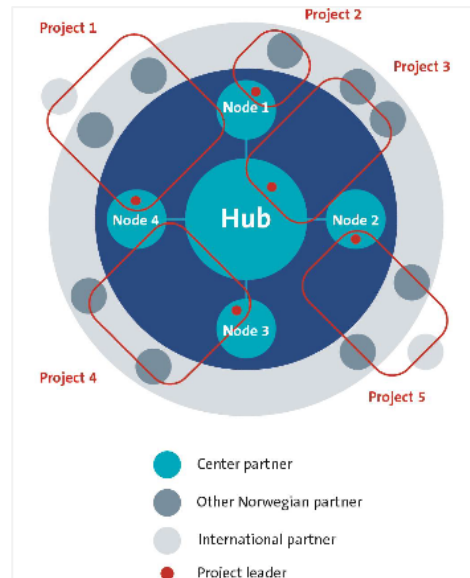


Figure 2.2: The institutional setup of DLN.

The centre is led by NTNU in close collaboration with UiO and UiB (the hub). Host institutions of Digital Life research projects from outside the hub universities are called nodes and are integrated into the centre’s governance structure as such (SINTEF, NMBU, OUH, UiT, cf. Figure 2.2).

The centre’s research portfolio consists of **17 research projects** (cf. Figure 2.1) that have been funded by RCN under a dedicated DLN call that has been issued three times so far. They are joined by some **15 partner projects** which are associated to DLN without being funded under a DLN call.

In addition, a **network project (NP)** has been funded for a five-year period to help the research projects succeed with the DLN mission. The NP consists of five working groups: 1) governance and responsible research and innovation; 2) innovation; 3) career development; 4) data and infrastructure; and 5) communication. In practice, the centre is a matrix organization that combines functional roles in the network project with human resource responsibilities within different units of the hub universities. Read more about the history and setup of the centre on the website: www.digitallifenorway.org/

3. Organisation of the seminar

The seminar design needed to satisfy two affordances: 1) to thematically cover the most significant aspects that are specific to the DLN setup and experience; and 2) to offer a progression from taking stock of the current state to sketching out desirable directions for a future DLN 2.0.

The preparation committee identified the four topics listed below as being of strategic importance to DLN.

1. The research conducted in DLN, with focus on the Digital Life concept, fostering multi-, inter- and transdisciplinarity, and maintaining the current momentum in the transformation of Norwegian biotechnology research.
2. The broader focus of the centre, which includes innovation, RRI, data and infrastructure support, career development and outreach of the centre.
3. Collaboration and leadership, focusing on the centre structure, the network project, governance and the leadership possibilities for investing in common goals, culture and ambition.
4. Collaboration between DLN and RCN, i.e. the call processes for funding Digital Life research projects, the call process for funding the DLN network project post 2021, the decision-making process on the input from the *egenvurdering* process and other general input during Fall 2019.

The participants were divided into four groups and each group was assigned to one of the topics. Each group was composed so that it was representative of the diversity of the invited participants. Inevitably there was a degree of overlap between the four topics (cf. Figure 3.1). Plenary sessions were included after each breakout session to share and discuss the topics that surfaced in the group debates.

To insure progression from capturing lessons to developing ideas for future directions, the seminar drew on the concept of the *search conference*. As Figure 3.2 shows, a search conference follows a funnel design.¹

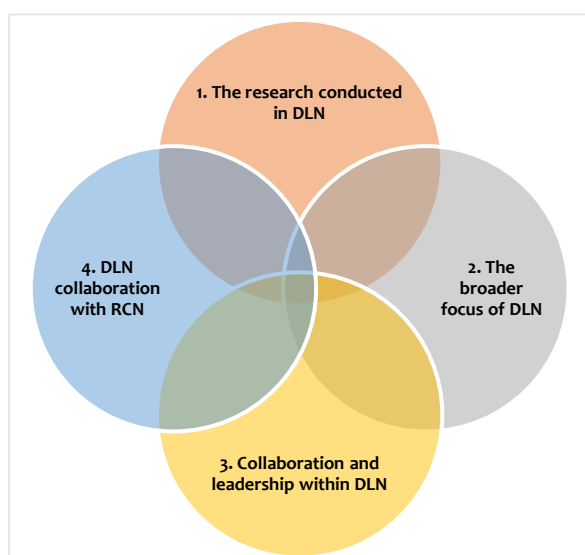


Figure 3.1: Groups and their topics

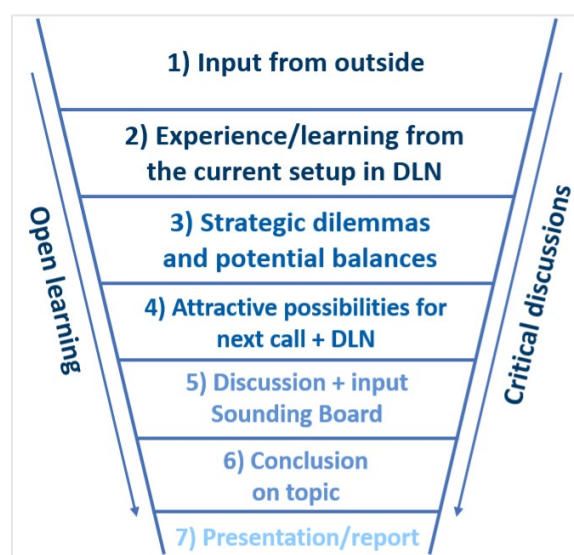


Figure 3.2: Progression of the session topics

In addition to these elements, the seminar featured short input presentations by three international experts, two of whom are members of the DLN scientific advisory board. On day two of the seminar, a ‘sounding board’ was convened by another set of invited experts to help sharpen the ideas developed by the different groups.

¹ Importantly, DLN organised a search conference in November, 2018 in Selbu to establish working plans for the current funding period. This *Selbu* search-conference and the *Lysaker egenvurdering* are two distinct undertakings pursuing different objectives.

4. Invited reflections by three international experts

In her presentation, Ulrike Felt, SAB member and professor of science and technology studies at Vienna University, shared her concern that DLN is in the crosshair of many, maybe too many, **competing expectations**, not all of which are mutually compatible or can be satisfied at the same time. Priority setting is of quintessential importance. Felt also questioned the perceived need for speed – faster results, shorter time to market, etc. The implied **acceleration** works against scientists’ ability to perform excellent research, and to do so in a societally responsible way. Today, science is expected to produce innovations in the service of planetary sustainability, but if the operating model of contemporary science isn’t sustainable itself, such ambitions become illusory.

Dominique Chu, SAB member and senior lecturer at Kent University’s School of Computing, reminded the audience that systems biology heavily borrows from systems thinking and reductionism developed in physics. Chu argued that the affordances of **physical reductionism** for studying **biological systems** need to be investigated, not assumed, in Digital Life research. He also sees the current implementation of RRI at risk of being perceived a ‘service’ that overburdened biotechnology researchers acquire from humanities and social science researchers, without having time to engaging with its assumptions, let alone practicing it themselves.

Finally, Daniel Vonder Mühl of ETH Zurich, presented some lessons from his experience as executive director of Systems-X – a now defunct systems biology collaboration between the major Swiss universities. Doing effective interdisciplinarity requires **project consortia of a critical mass**, defined by Vonder Mühl as a ratio of at least two junior researchers per workgroup leader. Systems-X made an impact on interdisciplinary training of early career scientists. Trying to quantify the initiative’s success through bibliometric analysis of the scientific output produced results that resisted clear interpretation.

The statements above by the external experts helped set the tone for the rest of the seminar.

5. SWOT analysis of status quo

Following this input, the participants split into the four thematic groups, where they were asked to produce a SWOT analysis of their groups’ respective topics (cf. Appendix C for details). Back in the plenum, the four groups presented their SWOT analyses. The subsequent discussion informs the aggregated SWOT presented in Figure 5.1. It reflects how the participants understand the strategic status of DLN at this point.

<p><u>Strengths:</u></p> <ul style="list-style-type: none"> • Building a transformative setup (structure and start-up) • Establishing a community • The research school 	<p><u>Weaknesses:</u></p> <ul style="list-style-type: none"> • More structure than culture • The centre is fragmented without a shared sense of responsibility • For many senior researchers, their DLN project is just one among many other projects
<p><u>Opportunities:</u></p> <ul style="list-style-type: none"> • More buy in from the owner universities’ top management • More horizontal collaboration between the research projects • A clearer vision for DLN 	<p><u>Threats:</u></p> <ul style="list-style-type: none"> • Inadequate, one dimensional evaluation metrics • Shifting political priorities • Short term orientation

Strengths. Firstly, the centre has succeeded in establishing a **functioning organisational structure** supported by a team of six coordinators; secondly, the centre has become a group of people working towards common goals within supporting organisational structures – a **united community**. Lastly, there has been substantial **engagement of early career researchers** through the numerous events hosted by DLN as well as the courses, and community, offered through the research school.

Weaknesses. There was strong agreement that DLN at this point is **more a common organisational structure rather than a research and innovation culture**. Even though a community has formed around meeting points and activities, a shared culture of de facto

Figure 5.1: Aggregated SWOT

transdisciplinarity and responsiveness to societal concerns, needs and expectations (i.e. RRI) is not yet in place. In many instances, **societal challenges** serve as **rhetorical strategy** to legitimate funding claims rather than actually being the core objective of research. It is not uncommon for research projects to divide research tasks along disciplinary lines and package them into autonomous work packages, with limited interaction between them. Further, while the Centre exists for the benefit of the research projects and to support them in their endeavours of disciplinary convergence, it is not yet a centre carried by the research projects. A sense of **shared responsibility** for the centre is missing. Many of the senior scientists involved in DLN have several research projects outside of the centre that also demand their time. These are weaknesses the participants identified as needing to be addressed on the road ahead.

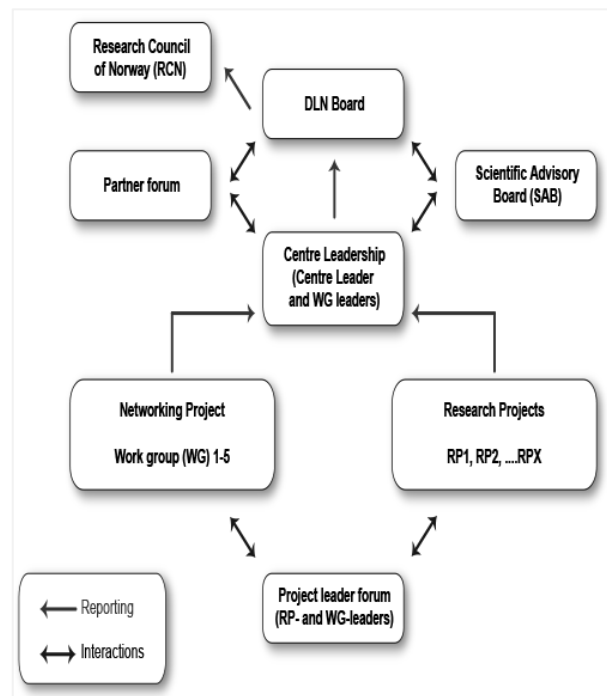


Figure 5.2: Coordination structure of DLN

Opportunities. There was a consensus that more buy-in from the **institutional owners of DLN** (i.e. top management of the hub and node universities) affords as of yet unrealised opportunities. This concerns the interplay between the centre’s activities and other ‘digital life’ oriented research initiatives at the universities; active promotion of DLN’s vision and its activities; and the discussions around the Centre’s future.

The centre would also benefit from more integration and **cross-collaboration** on the level of projects and researchers. As Figure 5.2, illustrates, such relations are designed into the organisation of DLN, but not sufficiently enacted in practice.

Threats. The established evaluation regime of scientific productivity – publications, citations, H-index, money spent etc. – does not adequately capture the type of impact envisaged by a convergence initiative like DLN (cf. Daniel Vonder Mühl’s input). There is a need for a comprehensive understanding of what the centre’s outputs and results are, and how they are to be adequately assessed. If these **broader impact metrics** are not developed, shared and understood by the centre’s owners and stakeholders, there is a real threat that the centre’s activities will be described using conventional metrics. These will not only misrepresent the centre’s activities, they will also work against researchers’ engagement in the centre. Further, if the owners and stakeholders of the centre have too many, or too quickly **shifting political agendas** (cf. Ulrike Felt’s input), it can comprise a significant threat to the development of the centre. DLN is established as a long-term investment. However, there is a continued need for support and understanding for getting the best out of this investment. A **short-term orientation** is therefore perceived as another threat – how quickly can you realize crossdisciplinarity in action, how soon can you demonstrate a change in the culture of the research community regarding RRI and Norwegian biotechnology, how fast can you deliver innovations and value creations etc. This attitude will make it more difficult to preserve the long-term perspective that is necessary for the development of the centre.

6. Strategic dilemmas and how to balance them in the future

In the second breakout session, based on the same four topics, the groups were asked to identify key strategic dilemmas that the centre must work with – i.e. opposite concerns that must be balanced, such as ‘operation vs. development’. Further, the groups were asked to illustrate how the identified dilemmas are currently balanced as well as whether the balance should be shifted in the near future (illustrated by the dotted arrows). In the following, the results from this group session will be presented to give insight into some of the main dilemmas the centre will have to handle.

6.1. Key dilemmas for the research conducted in DLN

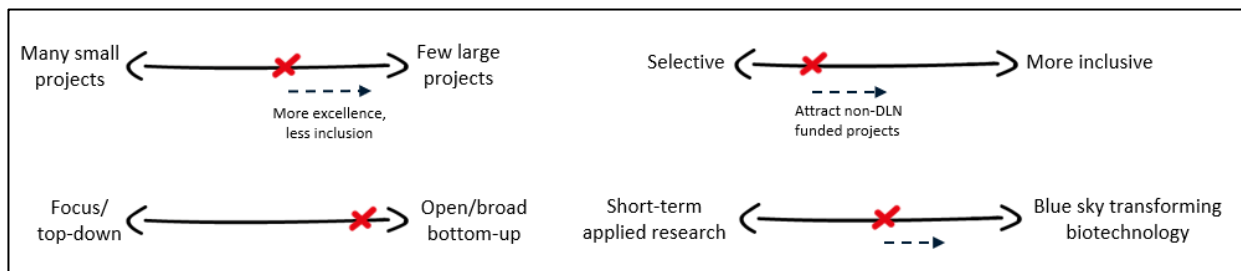


Figure 6.1: Group 1 key dilemmas

*The red crosses indicate the current balances that the groups identified for the respective dilemmas – the dotted arrows indicate the need for a shift in the current balance

The first dilemma, identified by the group dealing with the research conducted in DLN (cf. Figure 6.1), concerns the number of projects **funded** by RCN under the DLN initiative, i.e. not partner projects. Should the (funding) cake be cut into many small slices, thus bringing in more funded research projects into DLN, or should there only be a few, hefty slices? More, but smaller projects would make the centre more inclusive toward the many topics being researched by the Norwegian biotechnology community; larger, but necessarily fewer, projects can take on risks inherent in breakthrough science that a small project cannot afford. At the current moment, the balance is located in between the two poles. In the future this balance should be shifted towards an increasing prioritisation – to the right (cf. Figure 6.1).

But as the next dilemma illustrates, the concern of how DLN research funding should be distributed is different from the question of which projects should be **associated** with the centre in order to benefit from its community and services. The group identified a need for being more inclusive in terms of attracting non-DLN funded projects (i.e. partner projects). To this day the network project has primarily focused on DLN funded projects. The group considered this to be a natural consequence of the start-up phase of the centre. For the next version of the centre – DLN 2.0 – more emphasis should be put on developing a wider community than is the case with the current focus on DLN-funded research projects. Hence, DLN ought to be more than a funding stream.

Thus far the centre has not had any control over which project applications have been funded under the three DLN calls that RCN has processed to date, other than a consultative opinion during the call formulation process. The experts invited by RCN to evaluate the grant proposals were asked to assess whether a particular proposal falls under the umbrella of the Digital Life concept, but there is no hard list of what is or is not DLN research. This has resulted in a thematically broad research portfolio that invites questions like ‘why would a project developing novel fish feed and a neuroscience project on mental health benefit from being in a centre together?’ The group thus saw a dilemma between more top-down steering of the portfolio

composition and investigator-initiated theme setting, but did not want to rebalance the status quo in favour of more top-down steering. Instead it identified the need for coordination work and a sense of common direction to manage this diversity, which would be even more important if dilemma one and two were to be rebalanced towards more diversity and inclusion.

Lastly, the group identified a dilemma between short-term applied research and ‘blue sky’ transformative biotechnology. In conjunction with the first dilemma, the current balance is struck in between the two concerns. But there is a clear need for DLN to come closer to a more radical, long-term prioritisation if the network truly wishes to pursue its vision of **innovation through convergence**.

6.2. Key dilemmas for the broader focus of the Centre

The group working with the broader focus of the centre (cf. Figure 6.2) identified a dilemma between having a clear identity and scale, i.e. striving to be inclusive to more projects (dilemma 1 and 2 strongly overlap). Up until this point, much energy has been directed towards building the structure and a shared identity, and there is still more work ahead on this front (i.e. the previously mentioned need for a joint vision). But the balance should now be shifted towards integrating more researchers and research environments in the activities of the centre.

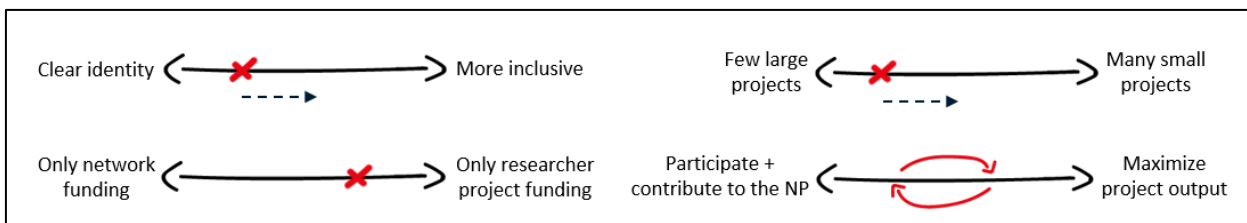


Figure 6.2: Group 2 key dilemmas

Next (bottom left), the group identified a dilemma between DLN as a (network) structure and DLN as a funding stream for research. Should RCN only fund the structural part of DLN, i.e. the network project with its workgroups and coordinators, who would then invite research projects in as partners (i.e. a centre consisting only of partner projects, on the research side, plus the network project on the structure side)? Or should RCN only understand DLN as a specialized funding call? As the primary function of the centre is to work as a facilitator for the creation of inter-, trans- and multidisciplinary research, the group found it natural for the current balance to be placed towards a focus on funding research projects. Accordingly, the group did not find a need for shifting this balance in the future.

Lastly, the group saw a dilemma between researchers investing and being active in the centre, vs. focusing on maximising one’s own project output. Unlike the other answers, the balance needed for handling this dilemma was considered more of an oscillation between contributing to the centre while also focusing on the individual projects.

6.3. Key dilemmas for collaboration and leadership

The leadership and collaboration group (cf. Figure 6.3) firstly identified the dilemma that capturing the attention of publics and stakeholders for the DLN vision entails the risk of overselling one’s ambitions. Especially in the start-up phase of the centre, there has been a need for *overselling* the centre’s ambitions to attract attention and convey the sense of a radical experiment taking place. This balance needs to be shifted more towards the middle, as impact on the ground will make promises less relevant as a way to legitimate the centre’s existence.

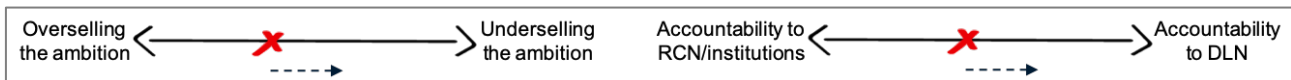


Figure 6.3: Group 3 key dilemmas

Secondly, the group construed accountability relations as a strategic dilemma. Presently, the research projects report to RCN as their funder and comply with the formal rules of their host institutions; formal accountability to the network project and the centre as a whole is minimal and identification also tilts more toward one's own university than the centre. The universities are to some degree in competition with each other and would want more, rather than less, exclusive ownership over initiatives. Yet this ought not to stand in the way of the accountability balance shifting more towards the centre as an inter-university entity.

6.4. Key dilemmas for the collaboration with the Research Council

In the fourth group, working on the topic of collaboration with RCN (cf. Figure 6.4), a key dilemma revolved around selling a radical vision as opposed to focusing on 'sober' information for daily operations. The group found the current balance erring on the side of selling a radical vision and recommends rebalancing toward the 'sober' side when describing the centre's purpose.

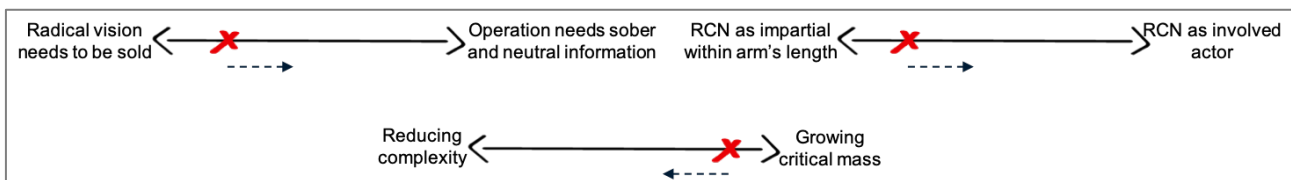


Figure 6.4: Group 4 key dilemmas

What is the appropriate measure of distance between RCN and DLN? Currently RCN enacts its traditional role of research funder vis-à-vis DLN: it prepares the funding calls and convenes experts for peer-review; the research projects and the network project file annual progress reports to RCN; and RCN has an observer seat on the DLN board. However, it might be valuable to include RCN more actively as a stakeholder in the development of the centre. For this reason, the operating distance between should be shortened between DLN and RCN (cf. Figure 6.4, top right).

Lastly, the group identified a dilemma between establishing a core identity and building up a critical mass. Without a doubt, the strategic objective of the centre in the start-up phase has been the creation of critical mass and the establishment of a platform for solid and trustful collaboration. However, in the next phase of DLN the balance must be shifted towards more attention to the core identity and a reduction of the organisational complexity inherent in the current setup.

6.5. Main dilemmas for DLN 2.0

As a brief conclusion to the chapter concerning strategic dilemmas, two main dilemmas for the centre will be highlighted (cf. Figure 6.5). First, across the four groups an important strategic dilemma was identified between being more inclusive and embracing more small projects vs. focusing the portfolio more narrowly to achieve a higher degree of impact in the future. These are both legitimate concerns as the ambition is to expand the centre by including an increasing number of projects and partner institutions in the centre. However, if the centre wishes to foster radical advances within the field of biotechnology, a more prioritised focus might be necessary to achieve breakthrough as well as impact within the research environments.

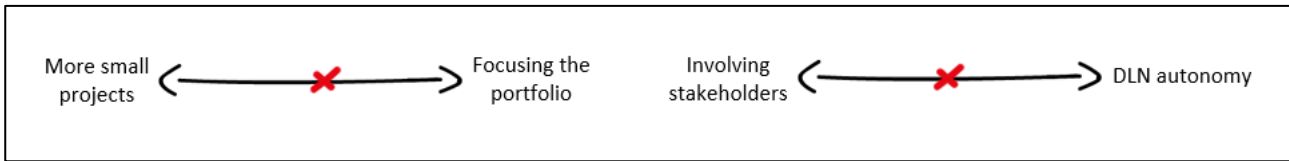


Figure 6.5: Main dilemmas for DLN 2.0

Behind this dilemma are different theories of change.

- Change theory 1: the centre effects the desired transformations in the Norwegian biotechnology community through creating a small lighthouse exemplar that can then be replicated and imitated by other environments to create the desired change at a larger scale.
- Change theory 2: a large centre is capable of driving large scale change and therefore needs to include as many projects as possible.

Second, there is a tension between bottom-up autonomy of an investigator-led research portfolio and a closer integration of DLN's key stakeholders to advance the transformative agenda – hub and node research institutions, as well as the RCN. Too close an involvement by these stakeholders could undermine the centre's integrity and erode the motivation of its core members. But without a degree of involvement, the centre would lack the necessary institutional support for its transformation vision. Attention must therefore be paid that stakeholder inclusion is advanced, but that they are kept at a *short arm's* length to preserve operational independence and scientific autonomy.

7. Strategic considerations for a future DLN 2.0

By the morning of the seminar's second day, some key insights transpired that the participants felt were crucial for an eventual DLN 2.0.

- **The digital life concept remains highly relevant.** DLN is built on the assumption that science is better equipped to respond to contemporary societal challenges, if researchers increasingly collaborate across disciplinary boundaries – convergence for innovation, that is. In DLN this convergence zone is created at the intersection of biotechnology and digitalisation. Both terms describe broad areas of investigation. When the foundations for DLN were laid in 2014, digitalisation was only just emerging as an area of strategic concern; it was uncertain at that point how this concern would develop. After 28 months of operation of DLN, the participants consider digitalisation to be of ongoing strategic relevance for biotechnology research and innovation for the foreseeable future.
- **DLN can only work with a strong vision.** Working toward changing business as usual in the biotechnology research and innovation community is an audacious objective. Working across institutions, disciplines, and locations requires a substantial degree of coordination. These are both challenges that good organization structures cannot tackle without the support of a shared, guiding vision.
- **Reaching DLN's ambitions requires a gearshift.** The affirmation that the digital life concept remains highly relevant could invite the premature conclusion that a future funding period of the centre should be premised on incremental learning of the present setup. Far from it, the participants saw a need for a **gearshift** and elaborated a series of proposals concerning how a future DLN 2.0 should pursue its ambitions. They are described below. The metaphor of 'gearshift' implies a change in intensity and not a restart or a radical change in direction. The participants were adamant that DLN 1.0 has achieved many things that should be built on in the future.

Having reached a consensus on these premises, the participants returned to group work to develop ideas how such a gear shift could look like. After a first breakout session, the groups received feedback from external guests who were invited to act as a sounding board, before returning for a second iteration to improve their suggestions. As indicated earlier in this report, the resulting ideas should not be read as a unified, mutually agreed-on proposal. They are diverse and creative ideas that are grounded in DLN's present experience. They will hopefully serve as an **authoritative source of inspiration**.

8. Ingredients for a future DLN 2.0

The ideas for how a future DLN 2.0 could master the desired gearshift cover three areas. Firstly, how can we **realise** real **convergence**? Secondly, how can we **grow** the DLN **community** in a sustainable way? And finally, how can the DLN model **foster** real **change** in the world? The following describes each of these areas and lists proposed action items the participants brainstormed. These areas are overlapping and are not in a hierarchical relationship to one another.

8.1. How can we realise real convergence?

Convergence for responsible innovation. Today, the research funding system postulates that RRI, transdisciplinarity and innovation are concerns that research projects have to take on board. However, there have been no structural changes to facilitate this. For instance, the way research proposals are assessed does not take into consideration the transformative ambitions of a Digital Life type of research project; like any conventional research project, they are assessed *ex ante*, with scientific merit being evaluated separately from aspects like responsible innovation – the latter is *de facto* treated as an add-on. The challenge is how transdisciplinarity and responsible innovation can become fully integrated design elements of a scientific investigation strategy.

Many of today's societal challenges are too vast to be meaningfully tackled through individual projects. It becomes increasingly important to find and exploit synergies across projects (i.e. collaboration), as well as to synthesise and harness existing knowledge across disciplinary fields (i.e. interdisciplinary knowledge management). It might therefore be insufficient to only focus on the research project as engine of convergence of responsible innovation; these other areas might also require financial support.

Concrete initiatives to foster convergence for responsible innovation are:

- The establishment of internships in industry, as well as between different academic research environments. This is an initiative that could easily be funded directly by DLN.
- Foster more reflexivity about the terminology and concepts we use as they might not be understood by other scientific fields in the same way. This can thwart collaboration across domains.
- More thought should be given to the end-user when new projects are conceived and designed.
- Create and get input from sounding boards at regular time intervals.
- Develop new research agendas not only from the perspective of scientific problems, but actively seek engage with how the research contributes to the public good. This is an area where collaboration with the social science field could be productive.

8.2. How can we grow the DLN community in a sustainable way?

During the two days of the seminar, participants repeatedly used the notion of **club** to think about the boundaries and purposes of the DLN community. A club has members who abide by the club's rules. A club

is exclusive in nature, which bestows status on its members, as long as the club attracts outsiders who want to become members in turn. Because of its clear boundaries, a club has a substantial capacity to coordinate its members to pursue common strategic objectives.

Yet the participants also made it clear that while they desired certain aspects of a club – attracting outsiders, coordination capacity – they also didn't want DLN to be too an exclusive a community. Many perceived **reaching critical mass** as the enabling lever to exert a **real** impact on the Norwegian biotechnology sector.

- As a community for change, DLN should not only consist of research projects funded by the RCN under the DLN program; as is presently the case with the DLN partner projects, those funded by other sources should also be able to join. Moreover, projects of different technology readiness levels should join, including those supported by the RCN's BIA funding call. The basis for inclusion should be evaluation criteria for how well a project fits into DLN's area of operation. The centre should also be proactive in inviting interesting projects to become members by identifying 'blank spots' in the current portfolio by maintaining contact with interested (and interesting) parties who did not obtain funding, and by having an ongoing dialogue with the partner institutions (university management).
- Members should be able to see added value in being part of the DLN 2.0 club, e.g. by benefiting from the various services offered by the network project. One proof that there is added value in being a DLN member would be when the members recruit new members themselves.
- The club could also be strengthened internally with more cross-project collaboration, regardless of how the respective projects are funded.
- An expanded club would require more **active buy-in** from the partner institutions (i.e. research performing organisations) who would need to take responsibility for the broader transformation of the Norwegian biotechnology area.

Further action points include:

- Arranging a project leader conference deciding on the next phase of the research school – going into more detail on courses, activities etc.
- The value added through inclusion should be clearly displayed. For example, signature projects should be relayed throughout the centre. Incentives, activities, seed funds, meeting places etc. could be also developed and put in place to promote this agenda.
- It could be worth considering charging a membership fee for being part of the centre, thus slowly increasing the independence of the centre from external funding parties.
- PIs could be asked to regularly produce "wish-lists".

8.3. How can the DLN model foster change in the real world?

The Centre for Digital Life Norway is a unique experiment in Norwegian science policy; it is tasked with inducing **structural transformations in the Norwegian biotechnology sector** that would enable the latter to address pressing societal challenges. The participants found that this transformation imperative sets DLN apart from funding instruments like '*Senter for forskningsdrevet innovasjon*' or '*Senter for fremragende forskning*' – SFI and SFF, respectively – who pursue goals associated with the more traditional objectives of

public funding of research and innovation, such as economic diversification and competitiveness through scientific advance within existing policy and market structures.²

The objectives for RCN funding the DLN experiment therefore goes beyond funding cutting edge science and innovation activities; DLN should foster transformation in the entire Norwegian biotechnology sector and enable it to produce sustainable, bio-based solutions for addressing grand societal challenges, such as climate change. This is why the network project was put together originally. This transformation mission should enable DLN to create economic, societal and environmental value. The participants did not find it obvious how to give meaning to this value creation statement, for it covers huge grounds, all the way from finding sustainable solutions to **preventing humanity from overstepping the nine planetary boundaries**³ to creating new product innovations for the market. Yet they found it important that DLN cultivates the ability to ask questions like ‘what is of value’ and to learn from the ensuing discussion. There are different legitimate perceptions of what is of value and how we create it; productively engaging with such discrepancies is important for learning.

The discussions as to how DLN can produce real world change can be summarised in a three-step process.

1. The centre is a learning platform to build transformation competence through its experimental setup; strengthening this competence is key for DLN 2.0
2. The centre builds a stakeholder community among researchers as well as through strong anchoring in its owner institutions. The stakeholder group consists of the researchers from the transdisciplinary DLN community, the research performing organisations that own DLN (the hub – NTNU, UiO and UiB) as well as those that host research projects (nodes – NMBU, SINTEF, OUH and UiT), but also the RCN (e.g. the new portfolio board), and other actors in the innovation system. Transformation expertise flows from the Centre to its stakeholders.
3. The stakeholder community learns from DLN’s transition experiment and produces the type of research and innovation activities that can effectively tackle societal challenges.

Because of the strategic importance for DLN 2.0 to become an effective producer and communicator of **transition expertise**, some participants suggested that the centre could be understood in terms of a **Senter for fremragende transformasjon – SFT**. SFT could become a future funding instrument of RCN, with DLN 2.0 blazing the trail. The participants concretised several aspects of an SFT.

- **An SFT would fund** not only transdisciplinary research projects, but also activities necessary to build and put into practice transition expertise. Said transition expertise requires ongoing learning processes inside the centre – a **community of learners** – and the skills required to effectively transmit and facilitate the implementation of lessons learned. Many research performing and funding organisations do not possess such expertise. An SFT should yield knowledge on what works in practice.
- An SFT is as interested in good proposals as it is in assessing **real world impact**. A fallacy of *ex ante* evaluation of funding proposals is that it leads to many promises whose plausibility of implementation is insufficiently assessed. There must be better assessments of the environments’

² Cf. Raising the Ambition Level in Norwegian Innovation Policy. (Report commissioned by RCN, May 2019). <https://www.forskningsradet.no/contentassets/9adfcaff0c4a48538c208024abd12b99/technopolis-naringsrettede-virkemidler.pdf/>

³ <https://www.stockholmresilience.org/research/planetary-boundaries/planetary-boundaries/about-the-research/the-nine-planetary-boundaries.html>

actual ability to produce value and create impact. The question is how to include this in the *ex ante* assessment.

- An SFT scheme would imply close collaboration between the centre and RCN, i.e. the dilemma between RCN inclusion and DLN autonomy must be rebalanced. Whereas the RCN has primarily been in charge of providing funds on a project-by-project basis, the focus must be broadened. Over time, and in close collaboration between DLN and RCN, DLN could slowly take over the responsibility of handing out funds for select activities. While this surely opens a whole new range of dilemmas, funds would be allocated directly from an organisation with its finger on the pulse and with impact and sectoral transformation as its *raison d'être*. In this way DLN will also have much more autonomy to build the research, education and innovation project portfolio that it believes will have the maximum transformative effect on the biotechnology sector.

In many ways, RCN could consider DLN 2.0 an SFT pilot, especially in regards to its own role as a transformation agent in society.

9. Next steps

During the seminar, the participants also developed a suggested time plan for the next steps (cf. Figure 9.1).

- The egenvurdering seminar and the present report are the first steps toward a think tank on DLN 2.0.
- During fall 2019 it will become important to get the DLN Board actively involved in the process and involve some of the key institutions that are part of the network. It could be relevant to complete the egenvurdering with an external evaluation of the network project.
- Later in the process, the RCN should also be involved in a broader discussion concerning the future concept of DLN as an SFT.

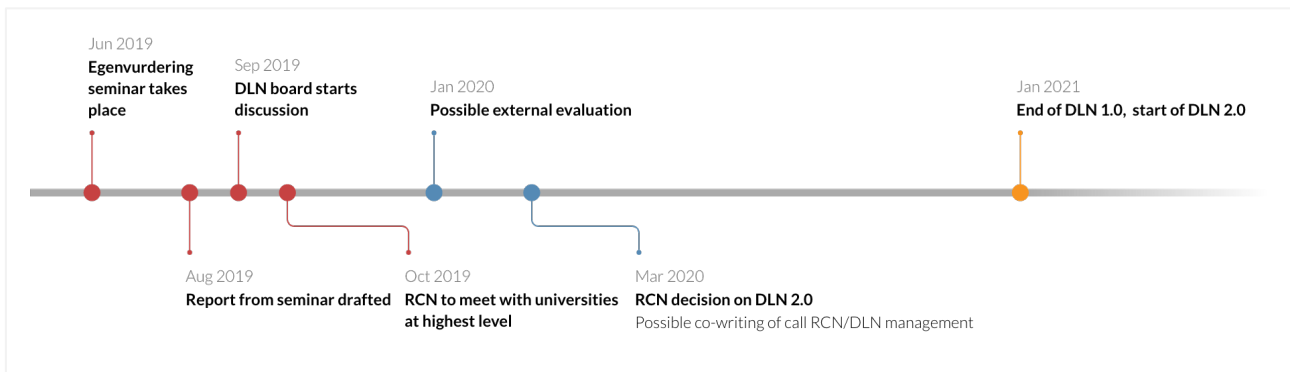


Figure 9.1: Timeline of process toward DLN 2.0 as imagined during the egenvurdering seminar.

10. Appendices

10.1. Appendix A – Program

SEMINAR on the next phase of Digital Life Norway, June 12-13


Day 1

10.00 Introduction by the Research Council of Norway and Digital Life Norway (DLN)	13.00 Learning from the current setup/Selbu report (starting with walk & talk)
10.10 Process and purpose of the seminar	14.15 Presentations in plenary
10.15 In the groups – Expectations for the next days	15.00 Group work – Key dilemmas
10.30 Sharing expectations in plenary	16.00 Coffee break
10.45 Input from the "expert group" – Ulrike Felt (Univ. Vienna, AU), Daniel Vonder Mühl (ETHZ, CH) & Dominique Chu (Univ. Kent, UK)	16.20 Presentations and discussion in plenary
11.30 Group discussion	17.00 Brainstorming possibilities (to be concluded on day 2)
11.45 Questions and dialogue with Ulrike, Daniel & Dominique	18.00 Leisure time
12.15 Lunch	19.00 Dinner

Day 2

08.30 Group work – What are the possibilities for DLN?	13.00 Group work – What did we gain from the discussions?
09.30 Presentations in plenary	13.45 Presentations in plenary
10.30 Group work – Adjustments from plenary input	14.15 Coffee break
10.45 Coffee break	14.30 Group work – Final conclusion on topics
11.05 Presentations for and work with Sounding Board	15.10 Final presentations
11.45 Open discussion in plenary	15.40 Next step and the Research Council
12.00 Lunch	15.50 Closing remarks from the "expert group"

Venue: The Research Council of Norway, Drammensveien 288, 0283 Oslo (near Lysaker train station)



10.2. Appendix B – List of participants

Name	Position	Organisation
Research Council of Norway		
Jacob Edward Wang	Special Adviser	RCN
Øystein Rønning	Special Adviser	RCN
Steinar Bergseth	Special Adviser	RCN
Elisabeth Gulbrandsen	Special Adviser	RCN
DLN Board		
Finn Eirik Johansen	Professor	UiO, DLN board president
Tor Grande	Vice Dean for Research	NTNU
Gerd Nilsen	Senior project manager	Thermo Fisher Scientific
External Expert Group		
Dominique Chu	Senior Lecturer	University of Kent
Ulrike Feldt	Professor	University of Vienna
Daniel Vonder Mühl	Executive Director Personalized Health and Related Technologies	ETHZ
Sounding Board		
Astrid Langeland	Special Adviser	Innovasjon Norge
Alessandra Luzzi	Associate Professor	Handelshøyskolen BI
Dagny Stuedahl	Professor	OsloMet
Centre Management		
Trygve Brautaset	Professor	NTNU, DLN centre leader
Raffael Himmelsbach	Senior adviser	NTNU, interim centre coordinator
Network Project (WG1-5)		
Roger Strand	Professor	UiB, Leader WG1/RRI
Arnolod Frigessi	Professor	UiO, Leader WG2 innovation
Alexandra Patriksson	Senior adviser	UiO, WG2 coordinator
Hilde Z. Kolstad	Senior adviser	UiO, WG5 communication
Inge Jonassen	Professor	UiB, head of WG4 infrastructure
Rune Kleppe	Senior Adviser	UiB, WG4 coordinator
Olav Haraldseth	Professor	NTNU, Leader WG3 and DLN research school
Research projects		
Jon Olav Vik	Associate Professor	NMBU, DigiSal
John Sigurd Svendsen	Professor	UiT, DigiBiotics
Anja Røyne	Associate Professor	UiO, BioZement
Anders Goksøyr	Professor	UiB, dCod 1.0
Marianne Fyhn	Associate Professor	UiO, DigiBrain
Young researchers		
Emil Karlsen	PhD Candidate	NTNU, BioZement
Marta Eide	Postdoc	UiB, dCod
Maria Hesjedal	PhD Candidate	NTNU, 3DLife

10.3. Appendix C: SWOT analyses produced by the breakout groups

Group 1: research conducted in DLN

<p><u>Strengths:</u></p> <ul style="list-style-type: none"> • Bottom-up • Broad • Transdisciplinarity • RRI • Enabling research that would not have happened in another setting 	<p><u>Weaknesses:</u></p> <ul style="list-style-type: none"> • Career paths – time • Lack of focus • Institutional anchoring • [Missing] Industry connection • Small projects/funding size
<p><u>Opportunities:</u></p> <ul style="list-style-type: none"> • New instruments • New evaluation processes • Engaging institutions • RRI + Innovation • Interdisciplinary career paths • Opportunities to address societal challenges in a broader context • More buy-in • More high-risk 	<p><u>Threats:</u></p> <ul style="list-style-type: none"> • Metrics [that are not appropriate for] transdisciplinarity • Career paths • RRI • Evaluation criteria • [Recent] Reorganisation of RCN

Group 2: The broader focus of the centre

<p><u>Strengths:</u></p> <ul style="list-style-type: none"> • National meeting hub • Innovation in the research & innovation eco-system • Critical mass • NP + DLN = more than the sum of its parts 	<p><u>Weaknesses:</u></p> <ul style="list-style-type: none"> • Weak international perspective • The various perspectives are not integrated well enough • Lack of knowledge on how to monetize and manage IPR connected to data & model analysis • Innovation not living up to industry expectations
<p><u>Opportunities:</u></p> <ul style="list-style-type: none"> • Utilize domain experts even more efficiently • Capitalize on synergistic effects • Dissemination of best practices & sharing 	<p><u>Threats:</u></p> <ul style="list-style-type: none"> • Failure to communicate the added value of the centre in perfect metrics • Poor ownership in home institutions

Group 3: Collaboration and leadership

<p><u>Strengths:</u></p> <ul style="list-style-type: none"> • Strengthened transdisciplinary research • National aspect – collaboration between institutions • Research school – fosters interaction between projects 	<p><u>Weaknesses:</u></p> <ul style="list-style-type: none"> • Dichotomy of accountability – DLN vs RCN • Short-term funding = short-term thinking • Complexity of the organization
<p><u>Opportunities:</u></p> <ul style="list-style-type: none"> • Accountability to DLN empowers DLN to fulfil its goals • Research school interaction should be expanded to PIs 	<p><u>Threats:</u></p> <ul style="list-style-type: none"> • Lack of redundancy makes the DLN organization vulnerable to staff fluctuation • Defocus of excellence • Loss of funding due to change in interest of society

Group 4: Collaboration with RCN

<p><u>Strengths:</u></p> <ul style="list-style-type: none"> • The DLN architecture 	<p><u>Weaknesses:</u></p>
<p><u>Opportunities:</u></p> <ul style="list-style-type: none"> • Institutions – RCN • Youth – identity building among the ‘young’ and involvement in research activities • Collaborative activities between research activities 	<p><u>Threats:</u></p> <ul style="list-style-type: none"> • Organized irresponsibility • The political economy of ‘excellence’ and ‘big science’

Figure 10.1: SWOT analyses produced by the four breakout groups