

New department structure for the Faculty of Engineering Science and Technology (IVT) – basis of discussion

To: Dean

Copy to:

From: Working group for new department structure

Signature:

Introduction

The Dean has (as preparation for the fusion work) appointed a working group to prepare different models of how the existing IVT departments can be grouped into larger units. The working group presents five different models based on academic affiliations. The models comprise only the portion of the IVT faculty to be included in the new faculty of engineering science and technology. Merger partners in Gjøvik, Ålesund and Trondheim have been informed on this matter, but have not participated in the process so far. The working group's report is intended to provide input and a basis for discussion in the ongoing process to restructure the entire faculty of engineering science. The models presented here do not provide guidelines on how the academic environments of the merger partners should be accommodated.

The NTNU Board adopted the new faculty structure on 15 February 2016. A new faculty of engineering science and technology will be established, based on the following organizational units:

- IVT faculty, with the exception of the Department for Product Design
- Parts of the Faculty of Technology (formerly HIST)
- Parts of the technology activities in Gjøvik and Ålesund

The Rector will determine which parts of the merger partners' technology activities will join the faculty of engineering science on 1 March 2016.

The Rector has decided to appoint a group to assess the departmental structure for each of the eight faculties, as well as a group for Gjøvik and a group for Ålesund. The faculty assessment groups will be chaired by the Dean and shall submit alternative proposals by 15 May 2016.

The assessment group is receiving the present report as input for its work. All the models are up for reconsideration, and will also be expanded to include the entire new faculty of engineering science. The assessment group will oversee the process for hearings and participation.

Comment [IN1]: or possibly *endorsed* or *approved*, as is most appropriate

The working group's mandate

The mandate for the IVT working group was to establish two to four alternative models for a revised departmental structure for the new faculty of engineering science, based on academic affiliation.

The points of departure for the group will be:

- A vision for the IVT faculty in 2020, based on results from the management meeting in Oppdal.
 - The criteria that have been the basis for the Rector's assessment of organizational structure (academic identity, academic synergy, leadership, participation and co-determination, along with strategic capability and financial room for manoeuvre)
- Plans that have been prepared for the future organization of laboratories in five areas.

Comment [IN2]: or possibly *gathering or conference*

As far as possible, the existing academic groups should be retained. The academic groups' departmental affiliation may be considered, however.

The group's alternative models must be justified based on academic affiliation. The group shall not rank the models, but shall carry out a SWOT analysis for each model that will serve as the basis for discussion. The report of the working group must undergo a thorough consultation round with the academic units (departments/divisions) that will be included in the new IVT faculty.

The complete mandate can be found in Appendix 1.

Alternative models for departmental structure

The key plans for the merger involve a reassessment of departmental structure.

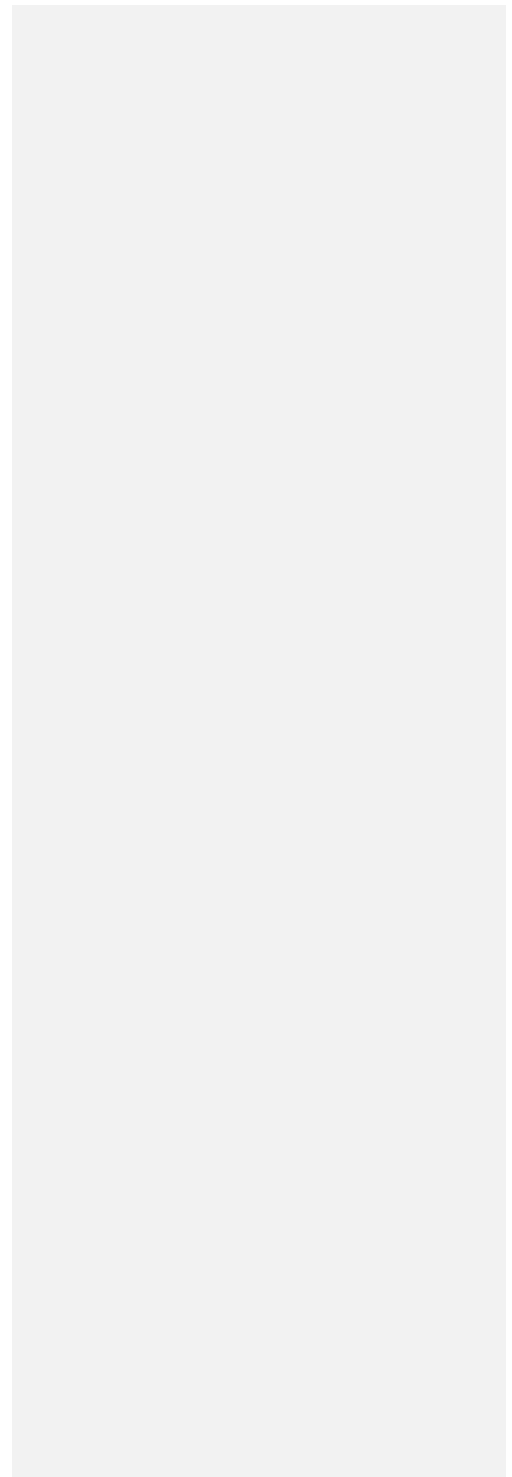
The faculty's management group has discussed a framework for departmental structure both in a dedicated management seminar and at management meetings. The group has arrived at a recommendation for grouping disciplines into larger units of approximately 150-200 employees per department. This creates high-impact departments with good strategic capability and provides a better basis for interdisciplinary collaboration. More efficient management and local administration with a greater degree of local autonomy are additional outcomes.

NTNU has high ambitions for ensuring quality in research, education and innovation. Key programmes, such as NTNU Research Excellence and NTNU Teaching Excellence, give clear guidelines with regard to future development. As part of this team, the IVT faculty has formed its own vision. Successfully meeting these ambitions requires strong departments with sufficient financial freedom to develop and implement good local strategies.

The working group is presenting five different models for discussion. The organization's ability to meet the goals that have been set—both the merger goals and IVT's own goals—is a prerequisite for selecting a model. In addition, the criteria that form the basis for the selection of a faculty structure must be emphasized.

All the models have been developed based on academic affiliation.

Departmental structure is indicated by columns showing the proposed new departments. The first two columns show the current IVT departments with their academic groups. The academic groups involved are indicated in blue. The number of employees for different job categories is shown at the bottom of the chart (based on figures at the 2015/2016 turn of the year). The terms used for each new department shall not be construed as proposals for final department names. Each of the five models is presented with a brief description.



Model A - No splitting of departments

Department/ Academic group

Institutt	Faggruppe	Energi og prosesseteknikk	Marin Teknikk	Geofag	Bygg og miljø	Konstruksjonsteknikk	Maskinteknikk
IGB	Geologi						
	Inggeol og bergmek						
	Minprod og HMS						
	Instituttnivå						
IPT	Geofysikk						
	Reservoartek/etrofysikk						
	Brønntek/produksjonssystem						
	Instituttnivå						
IMT	Marine Konstruksjoner						
	Marine Systemer						
	Instituttnivå						
EPT	EKB						
	IndEcol						
	Termisk energi						
	Strømningsteknikk						
	Industriell prosesseteknikk						
	Instituttnivå						
BAT	Bygg- og anleggsteknikk						
	Geoteknikk						
	Marin byggeteknikk						
	Veg, transport og geomatikk						
	Instituttnivå						
IVM	Vann og avløp						
	Vassdragsteknikk						
	Instituttnivå						
KT	Betong						
	Biomekanikk						
	Konstruksjonsmekanikk						
	Simlab						
	Instituttnivå						
IPM	DAM						
	Materialer						
	Instituttnivå						
IPK	RAMS						
	Produksjonssystemer						
	Produksjonsledelse						
	Prosjekt- og kvalitetsledelse						
	Instituttnivå						
Faste vitenskapelige stillinger		36,9	25,5	33,5	47,5	28,02	32,1
Professor II		2	3,29	6	2,4	1,23	3,8
Rekrutteringsstillinger		105,25	82,28	68,7	90,3	62,35	77,7
Tekn/adm stillinger		33,65	29,4	30,7	31,6	20,41	30,95
Sum		177,8	140,47	138,9	171,8	112,01	144,55

Comment [IN3]: In the Faggruppe column, *Instituttnivå* = Department level

Comment [IN4]: Refers to first two column heading titles.

Permanent faculty positions

Adjunct Professor

Recruitment positions

Tech/admin positions

Total

Comment [IN5]: Refer to positions named above.

Model A is brings together related academic environments without splitting departments. The model has six departments, chosen from classic engineering disciplines. Emphasis was placed on departments being roughly the same size in terms of number of employees. This option suggests the sharing of one building by two departments.

Model B - Engineering disciplines as departments

Institutt	Faggruppe	Marin Teknikk	Geofag	Bygg og miljø	Maskin- teknikk
IGB	Geologi				
	Inggeol og bergmek				
	Minprod og HMS				
	Instituttnivå				
IPT	Geofysikk				
	Reservoartek/petrofysikk				
	Brønntek/produksjonssystem				
IMT	Marine Konstruksjoner				
	Marine Systemer				
	Instituttnivå				
EPT	EKB				
	IndEcol				
	Termisk energi				
	Strømningsmekanikk				
	Industriell prosessmekanikk				
	Instituttnivå				
BAT	Bygg- og anleggsteknikk				
	Geoteknikk				
	Marin byggtmekanikk				
	Veg, transport og geomatikk				
	Instituttnivå				
IVM	Vann og avløp				
	Vassdragsteknikk				
	Instituttnivå				
KT	Betong				
	Biomekanikk				
	Konstruksjonsmekanikk				
	Simlab				
	Instituttnivå				
IPM	DAM				
	Materialer				
	Instituttnivå				
IPK	RAMS				
	Produksjonssystemer				
	Produksjonsledelse				
	Prosjekt- og kvalitetsledelse				
	Instituttnivå				
Faste vitenskapelige stillinger		25,5	33,5	75,52	69
Professor II		3,29	6	3,63	5,8
Rekrutteringsstillinger		82,28	68,7	152,65	182,95
Tekn/adm stillinger		29,4	30,7	52,01	64,6
Sum		140,47	138,9	283,81	322,35

Model B groups departments by the classic divisions of the engineering disciplines. It provides four departments of varying size.

Model C - Consolidation of civil engineering into one department without extensive splitting of departments

Institutt	Faggruppe	Energi og prosessteknikk	Marin Teknikk	Geofag	Bygg og miljø	Maskin- teknikk
IGB	Geologi					
	Inggeol og bergmek					
	Minprod og HMS Instituttnivå					
IPT	Geofysikk					
	Reservoartek/petrofysikk					
	Brønntek/produksjonssyst					
IMT	Marine Konstruksjoner					
	Marine Systemer					
	Instituttnivå					
EPT	EKB					
	IndEcol					
	Termisk energi					
	Strømningsmeknikk					
	Industriell prosestetikk					
	Instituttnivå					
BAT	Bygg- og anleggsteknikk					
	Geoteknikk					
	Marin byggtteknikk					
	Veg, transport og geomatikk					
	Instituttnivå					
IVM	Vann og avløp					
	Vassdragsteknikk					
	Instituttnivå					
KT	Betong					
	Biomekanikk					
	Konstruksjonsmekanikk					
	Simlab					
	Instituttnivå					
IPM	DAM					
	Materialer					
	Instituttnivå					
IPK	RAMS					
	Produksjonssystemer					
	Produksjonsledelse					
	Prosjekt- og kvalitetsledelse					
	Instituttnivå					
Faste vitenskapelige stillinger		36,9	31,9	33,5	69,12	32,1
Professor II		2	3,29	6	3,63	3,8
Rekrutteringsstillinger		105,25	101,23	68,7	133,7	77,7
Tekn/adm stillinger		33,65	29,4	30,7	52,01	30,95
Sum		177,8	165,82	138,9	258,46	144,55

Model C consolidates civil and environmental engineering into one department. Marine civil engineering was moved to marine technology to balance the size of the new civil engineering department's academic group. Otherwise, the model is based on groupings from classic engineering disciplines, but energy and process engineering is retained as a separate department and not merged with mechanical engineering. There are five departments total.

Comment [IN6]: Not sure if this name is accurate.

Model D - Consolidation of the Perleport environment - strengthening of materials technology

Institutt	Faggruppe	Energi og prosessteknikk	Marin Teknikk	Geofag	Bygg og miljø	Maskin og konstruksjon
IGB	Geologi					
	Inggeol og bergmek					
	Minprod og HMS					
	Instituttnivå					
IPT	Geofysikk					
	Reservoartek/ petrofysikk					
	Brønntek/produksjonssyst					
IMT	Marine Konstruksjoner					
	Marine Systemer					
	Instituttnivå					
EPT	EKB					
	IndEcol					
	Termisk energi					
	Strømningsteknikk					
	Industriell prosesseteknikk					
	Instituttnivå					
BAT	Bygg- og anleggsteknikk					
	Geoteknikk					
	Marin byggteteknikk					
	Veg, transport og geomatikk					
	Instituttnivå					
IVM	Vann og avløp					
	Vassdragsteknikk					
	Instituttnivå					
KT	Betong					
	Biomekanikk					
	Konstruksjonsmekanikk					
	Simlab					
	Instituttnivå					
IPM	DAM					
	Materialer					
	Instituttnivå					
IPK	RAMS					
	Produksjonssystemer					
	Produksjonsledelse					
	Prosjekt- og kvalitetsledelse					
	Instituttnivå					
Faste vitenskapelige stillinger		36,9	31,9	33,5	41,1	60,12
Professor II		2	3,29	6	2,4	5,03
Rekrutteringsstillinger		105,25	101,23	68,7	71,35	140,05
Tekn/adm stillinger		33,65	29,4	30,7	31,6	51,36
Sum		177,8	165,82	138,9	146,45	256,56

Model D consolidates all activity at Perleporten into one department. This also results in the materials technology environments in IVT, including concrete technology, being gathered into one department. In total there are five departments.

This proposal means that EPT will continue as before, IMT is strengthened with the addition of marine civil engineering, IGB and IPT join to form a new Department of Geosciences, BAT and IVM merge, while marine civil engineering transfers to IMT and KT, and IPM and IPK consolidate into a new department of mechanical and structural engineering.

Model E - Consolidation of mechanics environment

Institutt	Faggruppe	Energi og prosessteknikk	Marin Teknikk	Geofag	Bygg og miljø	Mekanikk	Maskin- teknikk
IGB	Geologi						
	Inggeol og bergmek						
	Minprod og HMS						
	Instituttnivå						
IPT	Geofysikk						
	Reservoartek/etrofysikk						
	Brønntek/produksjonssyst						
	Instituttnivå						
IMT	Marine Konstruksjoner						
	Marine Systemer						
	Instituttnivå						
EPT	EKB						
	IndEcol						
	Termisk energi						
	Strømningsmek						
	Industriell prosestetikk						
	Instituttnivå						
BAT	Bygg- og anleggsteknikk						
	Geoteknikk						
	Marin byggtknikk						
	Veg, transport og geomatikk						
	Instituttnivå						
IVM	Vann og avløp						
	Vassdragsteknikk						
	Instituttnivå						
KT	Betong						
	Biomekanikk						
	Konstruksjonsmekanikk						
	Simlab						
	Instituttnivå						
IPM	DAM						
	Materialer						
	Instituttnivå						
IPK	RAMS						
	Produksjonssystemer						
	Produksjonsledelse						
	Prosjekt- og kvalitetsledelse						
	Instituttnivå						
Faste vitenskapelige stillinger		25,6	25,5	33,5	47,69	39,13	32,1
Professor II		1,4	3,29	6	2,83	1,4	3,8
Rekrutteringsstillinger		70	82,28	68,7	84,03	103,87	77,7
Tekn/adm stillinger		33,65	29,4	30,7	31,6	20,41	30,95
Sum		130,65	140,47	138,9	166,15	164,81	144,55

Model E consolidates the mechanics environment into one department by moving EPT's fluid mechanics and BAT's marine civil engineering academic groups to KT. The concrete academic group at KT moves to the civil and environmental engineering department.

Scope of organizational adaptation

The various models involve differing degrees of organizational adaptation. The degree of adaptation depends on the number of department mergers, the number of departments affected and how many academic groups are moved out of their current department. On this basis, the calculated change index is the sum of department mergers, departments affected and academic group separations. A high index implies greater organizational change. Table 1 shows the modification index of the five models.

Table 1: Extent of organizational change for the different models.

Organizational Change	Model A	Model B	Model C	Model D	Model E
Change Index	28	36	64	64	128
Department Mergers (s)	3	3	3	3	3
Departments affected (p)	6	8	7	7	7
Academic group separations (g)	0	0	1	1	3
Implementation Complexity	Moderate	Medium	High	High	Very high

$$\text{Change Index} = (s + 1) \times (p + 1) \times (g + 1)$$

SWOT analysis of the models

For each model, strengths and weaknesses are evaluated against:

- The criteria that are the basis for the Rector's assessment of the academic organizational structure:
 - Academic identity
 - Academic synergy
 - Leadership, participation and co-determination
 - Strategic capability and financial room for manoeuvre
- IVT's goals for education, research, contribution to society and organization (Appendix 2)
- Laboratory affiliation
- Rector's merger goals (Appendix 3)

Model A

Academic identity: Model A offers a better link to industry and study programmes than the current departmental structure.

Academic synergy may increase since academic groups meet in three new departments, thereby providing new opportunities for cooperation.

Comment [IN7]: NB I am not always certain when *faggruppe* should be rendered as *academic group* and when it refers to *research group*. I have used my judgment in selecting what seemed to make the most contextual sense, but this should be checked.

Leadership, participation and co-determination: The departments will be the size of today's largest department, EPT, which has academic groups spread across four different locations at Gløshaugen. This is a department size that we know works well. Departments of the size described in Model A will receive more professional and robust support functions, and have the ability to provide services we do not have today, such as EU support. Large departments will put increased demands on management, and may imply that new demands will be placed on department heads, academic group heads, and heads of office.

Strategic capability can be strengthened by increasing the robustness of large institutions' economic situation. Greater academic breadth reduces vulnerability and provides more legs to stand on when procuring BOA revenue in a fluctuating market. Greater academic breadth can be advantageous for departments' strategic processes, and increases resources for the implementation of strategies.

Education: The model facilitates the consolidation of departments that belong to the same master's programme, and it will facilitate better coordination of study programmes at Master's and Bachelor's levels. It may mean that the Bachelor's programme goals become easier to meet. The university colleges have made great strides with digital platforms/new teaching methods that NTNU must develop further in the new constellation.

Research: Strengthening the ability of affiliated industry and new research groups to come together in new departments can lead to new initiatives when research groups are able to find each other more easily.

Contribution to society may be enhanced by the departments' industry affiliations, which could also make it easier to develop the Bachelor's studies, perhaps especially within Construction and Production (Machine) studies.

Organization: Model A facilitates the development of a shared management culture and increased strategic capability. Large departments will provide strengthened local administration, e.g. in support functions.

Laboratory affiliation: The model may be a step towards realizing the aspirations of the lab report for a five-lab centre.

Rector's merger goals: This model is well suited to meet the goals.

Education: This model will improve the opportunities to coordinate and develop the study portfolio at Master's and Bachelor levels, perhaps especially within Construction and Production (Machine) studies. It will also provide increased and more coordinated opportunities to learn from the experiences of the university colleges on the use of digital technology in education.

Research: Larger departments increase the opportunities for reciprocal learning between academic groups, as well as the development of new research initiatives that can strengthen NTNU as a research actor in professional fields.

Visibility/ attractiveness: Larger environments may be more attractive as places to study and work, by virtue of their greater access to human- and financial resources.

Model B

Academic identity in this model is better linked to industry and study programmes than the current departmental structure.

Academic synergy is possible for academic groups, perhaps especially for academic groups based on generic subjects, such as Rock Mechanics and Geophysics, Structural Engineering (all disciplines) and Geotechnical Engineering, but also other academic groups that have close ties with study programmes, such as Design, Analysis and Manufacturing (DAM); Production Systems; Reliability, Availability, Maintainability and Safety (RAMS); and Materials.

Leadership, participation and co-determination will likely become more difficult than what we are used to, because two departments in particular will become larger. In addition, there are challenges in terms of localization: three of the departments are located in two or three different places. The proposal indeed requires thinking in new ways about department head and head of office roles. On the other hand, the model allows for a unified and larger management, so that support functions for such things as project financing, acquisitions and communications/marketing can become more professionalized, either at the departmental or faculty level.

Strategic capability: A sense of belonging by several industry guilds will enhance strategic capability. IMT has marketed itself as an industry department with great success. This model paves the way for the construction industries, and maybe even industry in general, to make the four departments instantly recognizable when it comes to their own enterprises. Strategic capability is also often connected to strength and size. It is worth taking into account that strategic capability has nevertheless proven to be very good for all the departments involved with the current departmental structure, and future prospects are good.

Education: This proposal provides for the Bachelor's degree programmes to be significantly more closely connected to the (Trondheim) departments, possibly making it easier to meet the Bachelor's programme goals. The size of the departments, however, will be very big and could grow even larger by including the engineering university colleges in one way or another. The university colleges have made great strides with digital platforms/new teaching methods that NTNU must further develop in the new constellation.

Research: Strengthening the ability of affiliated industry and new research groups to come together in new departments can lead to new initiatives when research groups are able to find each other more easily. The model is unlikely to be negative for any of the research groups, assuming that the merger process does not take attention away from research efforts.

Contribution to society may be enhanced by the departments' industry affiliations, which could also make it easier to develop the Bachelor's studies, perhaps especially within Construction and Production (Machine) studies.

Organization is this model's weakness. Two of the proposed departments, Civil and environmental engineering (284 employees) and Mechanical engineering (322 employees) will be substantially larger

than the goal of 150-200 employees. The location of the research groups will, at least for a while, be much like today. This is likely to limit cooperation between groups and challenge the current management structure and participation. On the other hand, large departments justify strengthened local administration, e.g. around support functions.

Laboratory affiliation will remain as is, but the model can be beneficial in terms of bringing together and developing more industry-related laboratories (laboratories in five areas).

As regards the *Rector's merger goals*, the model facilitates fulfilling the criteria. It is the actual implementation of the model, or the merger process, which may be challenging – but possible.

Model C

Academic identity: As for Models A and B. New in Model C is the transfer of the research group Marine Civil Engineering from BAT to the Department of Marine Technology. Academically speaking, these environments have a large degree of overlap in expertise and activities. On the other hand, Marine Civil Engineering has close relationships with Geotechnical and several of the current KT groups.

Academic synergy: As for Models A and B.

Leadership, participation and co-determination: Model A consists of six departments that are roughly equal in size, while Model B proposes two very large and two medium-sized departments. Model C is a hybrid with one very large department and four medium-sized departments. Individual faculty members in a large Construction Department will probably have a very limited degree of contact with their department head, while this will work differently in the other departments.

Strategic capability: As for Models A and B. But Model C may result in a difference in strategic capability among the five departments, since one of the departments is much larger than the others.

Education: As for Models A and B, but with a potential imbalance between the machine area and the other areas. For the majority of study programmes, there will now be one well-defined host department, and several departments will cooperate on MTPROD / MIPROD.

Research: As for Models A and B. Some academic environments in a large Construction department, not least in the current KT, have significant research activities that only involve the traditional construction industry to a limited degree, and instead tend to border on other departments or faculties.

Contribution to society: As for Models A and B.

Organization: Basically as for Models A and B, but Model C has four equal-sized departments plus one very large department. This means that the vast Department of Civil and Transport Engineering may possibly need to be organized differently than the other departments, for example by formalizing Level 4 in a different way than what is needed for the four smaller departments. Administrative services, such as for students, will possibly also vary from department to department.

Laboratory affiliation: As for Models A and B. A positive aspect of the Marine Civil Engineering research group moving from BAT to the Marine Department is that this group should be able to make use of lab facilities at Tyholt.

Rector's merger goals: As for Models A and B.

Visibility / attractiveness: As for Models A and B.

Merger Process: As for Model B for the Civil area, and Model A for the rest.

Model D

Academic identity: The structure is largely industry organized, but with a marked strengthening of the mechanical and materials engineering area. This area will be somewhat more generic in an **academic** sense than the other departments. Model D still provides good connections with industry. Maintaining EPT and consolidating the geosciences and the corresponding civil and environment seem sensible. At the same time Marine Civil Engineering and Marine Technology are closely linked academically and already have an established collaboration.

Academic synergy may increase as research groups meet in three new departments, together with a somewhat stronger marine engineering, which can generate new opportunities for cooperation. The potential academic synergy between most of KT and IPM and parts of IPK seems to be in place. The RAMS-group affiliation in this picture may perhaps be questioned.

Leadership, participation and co-determination: Four of the departments will have between 140 to 180 employees and thus be at a manageable level within the desired size template, while the new machine and construction department stands out as markedly larger with almost 260 employees. Department sizes are still more balanced than in Model B, for example. In any case, the model will result in a more strongly highlighted Level 4 and also head of office role.

Geographically, this structure will not entail greater challenges than what is handled smoothly today. Geographic challenges will also be addressed through the forthcoming campus consolidation and should not weigh heavily. Especially for the new mechanical and construction department, which the model envisages, a good geographical proximity exists between KT and IPM, both as regards offices and laboratories. As things stand now, IPK is located some distance away, but this should not weigh heavily.

Strategic capability: As with most models, the strategic capacity could be strengthened by establishing large departments with more robust finances and the ability to procure BOA revenue in a fluctuating market, reducing vulnerability. The model should be able to lead to greater academic breadth in department strategy processes, and greater resources to implement more substantial priorities, for example in relation to the EU. This should also apply to the ability to cultivate especially competent specialists with the opportunity to position themselves to participate in high-impact research, such as new Centres of Excellence (**CoE**). Stronger strategic capability should also increase their ability to

meet the social responsibility, for example by establishing the strength to recognize new initiatives as societal changes dictate. The outside world will always be dynamic.

Departments that are larger and more impactful can more easily distinguish themselves internationally, connect to academically interesting external environments, attract especially competent guest researchers and recruit the best candidates for academic positions.

Education: One goal will be to facilitate the consolidation of departments belonging to the same Master's programme, to improve coordination of the study programmes at Master's and Bachelor's levels. How the university colleges fit in must also be considered here.

The relationship between study programmes and departments in this model is considered "cleaner" than in the current structure, even though Civil and Environmental are divided among more departments than currently.

Research: Strengthening the ability of affiliated industry and new research groups to come together in new departments can lead to new initiatives when research groups are able to find each other more easily. The ability to establish strong research groups, and lifting disadvantaged groups as social responsibility indicates, among other functions, are largely dependent on strategic capability and strength, which this model improves.

Contribution to society may be enhanced by the departments' industry affiliations, which could also make it easier to further develop the Bachelor's studies, perhaps especially within Construction and Production (Machine) studies.

Organization: As with the other models, Model D can lay the groundwork for developing a common management culture and increased strategic capability. Large departments will provide strengthened local administration, e.g. for support functions.

Laboratory affiliation: Also this model would be a good step towards achieving the aspirations of the lab report, with five lab centres.

Rector's merger goals: This model is well suited to meet the goals.

Education: This model will improve the opportunities to coordinate and develop Master's -and Bachelor-level study portfolios.

Research: Larger departments increase the opportunities for mutual learning between research groups, as well as the development of new research initiatives that can strengthen NTNU as a research actor in professional disciplines.

Visibility / attractiveness: Larger environments may be more attractive as study and work places, through greater access to human and financial resources.

Model E

Academic identity is ensured in this model by closely related disciplines being grouped together in uniformly sized departments.

Academic synergy is strengthened through several of the new department structures, such as mechanics subjects, becoming more streamlined than in the current departmental structure. The same academic affiliation applies to geology and petroleum, where a merger will strengthen the disciplines. Bringing together mechanical engineering and construction and environment will also enable improved academic synergy.

Leadership, participation and co-determination will be challenging in the transitional phase due to several mergers of geographically dispersed environments (geosciences, building / environment, mechanics and mechanical engineering). The department sizes are moderate, and should not present any problems with respect to management and administrative services.

Strategic capability and financial room for manoeuvre: Strategic capability will be improved for departments that are currently relatively small (IPT, IGB, IVM, IPK and IPM) by bringing these in line with the size of IMT's current size. Bringing together disciplines will strengthen efforts with relevant industries and counteract economic fluctuations.

Education will largely follow the same study programme as previously (i.e. study programme extends across the department structure). By uniting the disciplines, course teachers with the same specialization can be located together and avoid subject overlaps.

Research will be strengthened through bringing together academic expertise rooted in the same discipline, but within a different **sector** (formerly department affiliation). The possibility to seek out research projects with others from related disciplines (but now in the same department) will increase.

Contribution to society will be strengthened by allowing subject areas/affiliated industries to meet in several consolidated departments.

Organization: Model E envisages equal-sized departments organized by discipline. This organizational structure could provide a relatively similar local administration with effective central support functions. The size is within the IVT target of 150-200 employees.

Laboratory association in Model E could pose problems in that several of the departments being merged have their own (and often the same) laboratories. The consequence of this is that a new laboratory would need to be built at what will become the host department, or the new departments will be fragmented.

Rector's merger goals:

Education: The model would gain strategic ability to invest in digital technology as part of the education because of its increased size. The study programme portfolio will also be strengthened since the new departments are closer to the current study programmes. All new departments could have the necessary finances to make use of support functions such as an education coordinator.

Comment [IN8]: Unsure of the correct term for this new division.

Research: This model contributes to strengthening the thematic priority areas, in particular energy, oceans and sustainability. The new departments could have finances available to support a research coordinator and possibly an EU coordinator.

Innovation: The model provides the possibility for departments to hire innovation consultants.

Visibility / attractiveness: The model provides the option of hiring a communications consultant.

Table 2 provides an overview of the strengths and weaknesses of the five models.

Table 2: Summary of the strengths and weaknesses of the different models.

Criterion/goal	Model A	Model B	Model C	Model D	Model E
Academic identity	+	++	+	+	+
Academic synergy	+	+	+	++	++
Leadership, participation	+	0	-	0	--
Strategic capability	+	++	++	++	+
Vision Education	+	++	+	0	+
Vision Research	+	+	0	+	+
Vision Contribution to society	+	++	++	+	+
Vision Organization	+	-	-	0	+
Laboratory affiliation	+	++	++	++	-
Merger goal Education	+	+	+	+	+
Merger goal Research	+	+	0	+	+
Merger goal Innovation	+	+	+	+	+
Merger goal Visibility	++	++	++	+	+

Process for participation and input

As already mentioned, the present report is a preliminary document for the Dean in the ongoing work with the departmental structure for the new faculty of engineering science.

Further work will be led by the Dean on the basis of a mandate from the Rector and will include the merger partners.

The Dean will place great emphasis on participation and input from the departments and their research groups in future work.

Departmental structure will be a topic at the forthcoming general meetings in each department, in connection with the dialogue meetings to be conducted in the period 22 February to 7 April.

IVT's management will include departmental structure on its agenda at its meetings in March, May and June 2016.

The NTNU Board will discuss departmental structure at its June meeting. The new departmental structure will be implemented starting 1 January 2017.

Comment [IN9]: Again, not certain of the correct term-board, administration?

Attachment 1

Departmental Structure – New Faculty of Engineering Science (new IVT)

The academic organizational group for the merger project has laid out two main models for faculty structure (narrow and broad structure). Both main models retain the current IVT faculty as a part of a new faculty of engineering science. In both main models, the applied technology disciplines at the university colleges will join the new faculty:

- Faculty of Engineering at HIST
- Faculty of Technology, Economics and Management at GUC
- Faculty of Technology and Science at HiALS
- Department of Maritime Technology and Operations at HiALS

Both main models also place the Faculty of Architecture and Fine Art (AB)—except for Fine Art—into the faculty of engineering science, but in some variation of a "broad structure", which will retain AB as a separate faculty.

In its faculty structure recommendations for the proposed faculty of engineering science, the existing IVT faculty advocates a narrow structure and the inclusion of the technology departments at the three university colleges as separate departments from each institution. In addition, the IVT faculty proposes that the AB-faculty (except for fine art), along with Electric Power Engineering and Engineering Cybernetics from the IME faculty, connect to form a new faculty. Should this be accepted, the new faculty will consist of more than 20 departments.

The merger project plans to develop a new departmental structure. It seems clear that the current IVT faculty with its 10 departments can unlikely continue in its current form. Management group discussions have been discussing a solution with departments of 150-200 employees.

The existing IVT faculty should prepare for the upcoming departmental restructuring process by already now studying various alternatives for a new structure with fewer departments and based on academic affinity. The assessment will form the basis for a process leading to a decision on the academic organizational structure for the new IVT. Final faculty structure and which areas the new IVT will cover are not yet known, and this uncertainty must be taken into account. In addition, the departmental organization will need to align itself with any guiding principles that may emerge.

The Dean is appointing a working group with the mandate to assess two to four alternative models for a revised departmental structure for the new engineering science faculty, based on academic affiliation. The group's points of departure will be:

- A vision for the IVT faculty in 2020, based on results from the management meeting in Oppdal (attached).

- The criteria that have been the basis for the Rector's assessment of organizational structure:
 - academic identity
 - academic synergy
 - leadership
 - participation and co-determination
 - strategic capability and financial room for manoeuvre
- Plans that have been prepared for the future organization of laboratories in five areas.

As far as possible, the existing academic groups should be retained. The academic groups' departmental affiliation may be considered, however.

The group's alternative models must be justified based on academic affiliation. The group shall not rank the models, but shall carry out a SWOT analysis for each model that will serve as the basis for discussion. The report of the working group must undergo a thorough consultation round with the academic units (departments/divisions) to be included in the new IVT faculty.

The working group is composed of the following members:

- Vice Dean Asbjørn Rolstadås (chair)
- Division Director Anne Rossvoll
- Head of Department Harald Ellingsen
- Head of Department Egil Tjøland
- Head of Department Torgeir Welo
- Head of Department Karl Vincent Høiseth
- A representative from LOSAM

When the faculty structure is determined, the group will add representatives from the other entities to be included in the new IVT.

The budget and organization committee acts as the steering committee for the evaluation work.

The group will submit its report by 1 May 2016.

Appendix 2

IVT's Vision

Vision: Education

National trendsetter for BSc and civil engineering in technology

- Strengthened and coordinated BSc
- Development of integrated study programmes of high quality
- BSc attains research affiliations
- Leader in innovative education
- Innovation and entrepreneurship included in study programme
- Expanded platform for collaboration with industry
- Increased recruitment for BSc among partners - increased admissions for IVT's MSc and PhD
- Improved application quality
- Sought after EVU – Master's in Technology established

Vision: Research

Focus on outstanding research is guiding star

- NTNU draws the best talent
- BOA increased to 600 million
- Involved in 25 SFF/SFI/FME
- 50 ongoing EU-projects
- Norwegian ERC champion in technology
- New partners strengthen research culture
- Strong engagement with EU commission as peer review and advisory group experts
- Achieve new international collaboration
- 1200 publishing points – with much of growth coming from new partners

Vision: Contribution to society

- Strengthened ability to compete in Norwegian business and management
- Contributor to a sustainable society
- Preferred supplier of new technology expertise
- Strengthened international position
- Contributor to increased national quality of BSc education
- Set agenda for political debate
- Successful innovation solutions

Vision: Organization

- Good strategic processes – new programme description in cooperation with trade and industry and administration, based on interdisciplinary collaboration with NTNU
- Primarily large departments (with approximately 150-200 employees)
- A well-developed shared management culture with a goal-based common direction
- Satisfied and ambitious colleagues
- Organizational entities with strategic will and capability
- Good infrastructure and general conditions (based on a mutually acceptable revenue distribution model)
- Organization committed to internationalization
- Two scientific career tracks

Appendix 3

Rector's merger goals

Education

The merger will enable NTNU to:

- develop knowledge of and methods for use of digital technology. We shall
 - harness the multi-campus concept to further develop the use of digital tools for collaboration, teaching, learning, assessment, and academic administration.
- coordinate and develop programs of study portfolio. We shall
 - first prioritize the portfolio for teacher/lecturer, technology, science, health and social affairs, finance and management, and continuing education (EVU). Cooperation, division of responsibility and concentration will be the basis for this work.

Research

The merger will enable NTNU to:

- further develop good structures for research collaboration throughout the organization. We shall
 - especially leverage thematic priorities in the areas of energy, oceans, climate and sustainable development, and health and welfare, and focus on enabling technologies of biotechnology, ICT, nanotechnology and advanced manufacturing technology.
- become a stronger research actor within professional disciplines. We shall
 - offer doctoral education throughout the breadth of the academic disciplines. Good utilization of the combined resources will ensure high quality.
 - implement NTNU's international action plan and publishing policies across the whole organization.

Innovation

The merger will enable NTNU to:

- develop its role as a collaborative partner for regional, national and international innovation. We shall
 - develop and operationalize a strategy for cooperation with working life.
 - stimulate the development of several innovative projects and activities run by students and staff.
 - strengthen the focus on research-based innovation through cooperation between clusters and consortia (SFI/FME).

Visibility / attractiveness

The merger will enable NTNU to:

- strengthen its attractiveness as a place of study and workplace. We shall
 - develop an active recruitment policy for all job categories.
 - work actively to maintain and improve the number of applicants.
 - work actively to ensure that society's awareness of NTNU increases.

A good merger process

- The merger process should be knowledge based and include good participation from students and staff. We shall
 - conduct a follow-up evaluation of the merger process.
 - provide an information base about the activities in order to assess quality.
 - have a well-functioning faculty and departmental structure and administrative organization in place starting 1 January 2017.
 - ensure that NTNU is technologically at the forefront in all areas of activity to support our technological profile.
 - streamline operations through the standardization, digitization and the reduction of redundant services.