Protocol for the monitoring and evaluation of the Applied Research Organisations in the Netherlands

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Introduction

This report presents the protocol for the monitoring and evaluation of the six Applied Research (TO2) institutions in the Netherlands. The protocol was developed by the Rathenau Institute in consultation with the Department of Knowledge & Innovation of the Ministry of Economic Affairs (as the process-managing ministry for theTO2 institutions), the TO2 institutions and the ministries with a content-managing role for the TO2 institutions.

The protocol is a follow-up to the ‘Vision on applied research’ presented by the Minister of Economic Affairs in 2013[1], in which the cabinet announced that the six TO2 institutions would be evaluated once every four years in a uniform and comparable manner. The policy objective is to obtain better insight into the delivered quality and realised impact of the TO2 institutions and thus improve the way in which these institutions are directed and controlled.[2] It is therefore important for the Ministry of Economic Affairs that the evaluation provides insight into the extent to which the six TO2 institutions fulfil their tasks within the set terms of reference as well as justification for government involvement.

The outcomes of the four-yearly evaluation based on this protocol have no direct bearing on the allocation of public funding to the TO2 institutions. Nor is the intention to make a ranking of these organisations in order of performance and results. The six TO2 institutions differ too much in terms of tasks, scale, scope and field of expertise to permit a mutual comparison and ranking.

The purpose of the protocol is to provide policymakers with relevant information in respect of the TO2 institutions. It also enables the TO2 institutions to account for their expenditure of public funds and to learn from the assessment of an independent evaluation committee.

A wider objective of the protocol is to give more insight into the significance of the TO2 institutions for research and technological development in the Netherlands, for the competitiveness of Dutch business & industry, and for finding solutions to societal challenges.

The protocol forms part of a process whereby the Ministry of Economic Affairs – in conformity with the Periodic Evaluation Survey Regulations – is seeking to set up an evaluation cycle that is aligned with the innovation contract cycles and the strategic plans of the TO2 institutions.

[1] Letter to Parliament of 5 July 2013, TK32637, no. 68.
[2] See also Letter to Parliament of 14 November 2014, TK32637, no. 155.

Contents

1 Basic principles

This chapter introduces and positions the protocol for the monitoring and evaluation of the TO2 institutions. It describes the basic principles underlying the design of the protocol.

1.1 The monitoring and evaluation protocol

The protocol describes the approach for the **annual monitoring** and **four-yearly evaluation** of the quality, impact and viability of the Applied Research Organisations (TO2 institutions) in the Netherlands. In addition, the protocol describes the approach for the **synthesis** of these TO2 institution evaluations.

As well as outlining what must be monitored and evaluated, the protocol also indicates how, by whom and when this must be done.

Each TO2 institution has its own unique origins. There are considerable differences between the institutions in terms of missions and objectives, business models, size, customers and users. The protocol therefore offers sufficient flexibility for customisation.

The TO2 institutions each have their own mix of the following principal tasks:

1. Development, application and dissemination of knowledge in order to resolve **societal challenges** and support **government tasks** and policy. Part of this research is carried out as a mandatory statutory task.
2. Development, absorption, application and dissemination of knowledge to strengthen the **innovativeness** and **competitiveness** of the Netherlands, particularly for the top sectors.
3. Management of **strategic research facilities,** including facilities that are unique in the Netherlands and facilities of an international character.

Text Box 1 The six TO2 institutions in 2015

Deltares

Deltares performs research in the field of water and subsurface. It was created in 2008 from a merger between GeoDelft, WL | Delft Hydraulics, parts of TNO Bouw en Ondergrond and parts of ‘Rijkswaterstaat’ (Directorate-General of Public Works and Water Management). The research is mainly focused on deltas, coastal regions and riverine areas. Deltares has five areas of expertise:[3] 1. Flood risk; 2. Adaptive Delta Planning; 3. Infrastructure; 4. Water and subsoil resources and 5. Environment.

Stichting DLO

Stichting DLO and Wageningen University jointly form the Wageningen University & Research Centre (WUR). Most DLO institutes are organised as part of one of the five WUR-wide Science Groups. Two DLO institutes do not fall within a Science Group.

1. Food & Biobased Research (part of the Agrotechnology & Food Sciences Group)
2. Central Veterinary Institute (CVI) and Wageningen Lifestock Research (WLR) (part of the Animal Sciences Group)[4]
3. LEI (part of the Social Sciences Group)

[3] See https://www.deltares.nl/nl/over-ons/onderzoeksplan/.
[4] These are basically two business units under the DLO institute Animal Science Group.

4. Alterra (part of the Environmental Sciences Group)
5. Plant Research International and Applied Plant Research (part of the Plant Sciences Group)[5]
6. IMARES (not part of a Science Group)
7. RIKILT (not part of a Science Group)

ECN

Energy Research Centre of the Netherlands conducts research in the field of: 1. Solar Energy; 2. Wind Energy; 3. Biomass; 4. Energy efficiency; 5. Engineering & materials and 6. Policy Studies.

MARIN

The Maritime Research Institute Netherlands performs research into hydrodynamics and maritime technology by means of simulations, model testing, full-scale measurements and training. MARIN provides services to the shipbuilding, shipping and offshore industries as well as governments.

NLR

The Netherlands Aerospace Centre performs research into the development of new and cost-effective aerospace technologies. The activities are aimed at Industry, Civil Aviation, Space and Defence.

TNO

The Netherlands Organisation for Applied Scientific Research TNO is organised as a portfolio organisation with two areas of expertise:[6]

- Technical Sciences
- Earth, Life & Social Sciences.

The research within these areas of expertise is divided into five clusters: Industry, Healthy Living, Defence, Safety & Security, Urbanisation and Energy.

1.2 Objectives and target audiences

The protocol has several target audiences and serves several purposes.

TO2 institutions and TO2 federation

The TO2 institutions and the TO2 federation can use the protocol to account to National Government – and indirectly to wider society – for the expenditure of public funds. In addition, the protocol aims to provide TO2 institutions and the TO2 federation with information on their performance and results to enable improvements where necessary.

National Government

The Ministry of Economic Affairs, in its capacity as process-managing ministry for the TO2 institutions, can use the protocol to account to Parliament for the expenditure of public funds on TO2 research (via the Government Contribution or otherwise). In addition, the ministries that are involved in the TO2 institutions in a process- or content-managing role can use the protocol to learn lessons with a view to improving their policies for the TO2 institutions and making these institutions more demand-driven.

Other stakeholders

The protocol also aims to provide information on the performance and significance of the TO2 institutions to a broad spectrum of parties. The TO2 institutions are not always prominently visible in debates about knowledge policy and discussions about the knowledge economy. The protocol can put the significance of the TO2 research for the Dutch economy into clearer perspective.

[5] The two institutions have merged into a single DLO institute.
[6] See https://www.tno.nl/nl/samenwerken/expertise/.

1.3 Three evaluation criteria

The TO2 institutions are assessed on the basis of three evaluation criteria:

1. Quality of research
2. Impact of research
3. Viability of the organisation

The criteria are explained in more detail in section 2.4

The individual evaluations of the TO2 institutions are combined into a synthesis, also focusing on the potential added value of collaboration within the TO2 federation context. This aspect is worked out in more detail in chapter 3.

1.4 Independence and quality of the evaluation

The independence and quality of the evaluation must be assured by means of:

- A clear division of roles between the various parties involved: the TO2 institutions and the TO2 federation; the process-managing ministry, the content-managing ministries, the evaluation committee and the evaluation agency.
- An independent broad-based **evaluation committee** with an international composition. This concerns an *extended peer review.* The members of the committee must include experts in the relevant research domain as well as experts in knowledge utilisation, research institute management, the Dutch context in which the TO2 institution operates and the evaluation of research/research organisations.
- An independent professional **evaluation agency** that supports the evaluation committee. The evaluation agency supplies the secretary for the evaluation committee and carries out evaluation research to supplement the self-evaluation reports and basic information received from the TO2 institutions.
- A **supervisory committee** for the six TO2 institution evaluations and the synthesis. This committee consists of representatives of the process-managing ministry and the content-managing ministries, supplemented with several external experts in the field of research evaluation and practitioners with experience in institute management.
- The responsibility for the procurement and performance of the evaluations must be so organised that the independence of the evaluation is not compromised.
- The assessment is based on a mix of quantitative and qualitative information sources and various evaluation methods. The combination of sources and methods contributes to the robustness of the findings and assessments.

1.5 Harmonisation with scope for customisation

One important reason for drawing up the protocol was the process-managing ministry's wish to harmonise the TO2 institution evaluation process. A harmonised evaluation approach can provide a more accurate picture of the quality, impact and viability of the TO2 research in the Netherlands.

However, it is equally important to recognise the differences between the TO2 institutions in terms of missions, tasks, strategies, target audiences, business models and research domains. Moreover, two of the six TO2 institutions (TNO and DLO) are much larger and broader in scope than the other four (the former Large Technological Institutions). This is why the harmonised approach must also allow for customisation.

These considerations led to the following choices:

- Quantitative basic information is monitored according to standard formats wherever possible.

- The protocol provides a basic set of qualitative indicators. Where necessary or appropriate, these can be supplemented with specific indicators and evaluation questions per TO2 institution in the Terms of Reference that are drawn up for the four-yearly evaluation.
- The evaluation agency will be instructed to carry out additional research for each TO2 institution evaluation, taking account of the TO2 institution’s specific nature.
- An adapted evaluation approach will be formulated for the two large TO2 institutions (TNO and DLO).

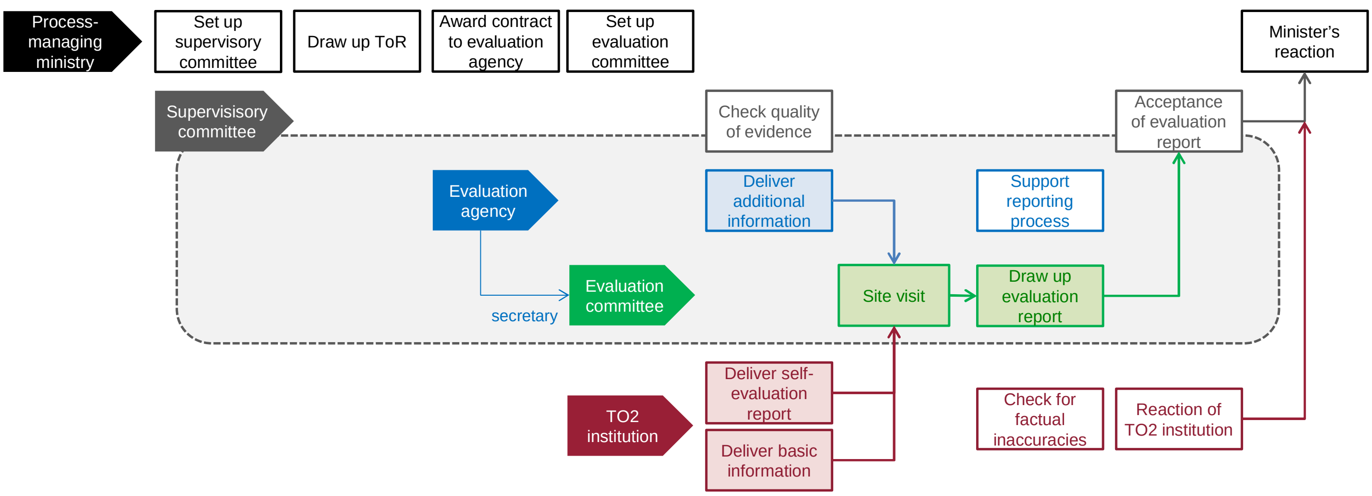
2 Evaluation of the TO2 institutions

This chapter describes the basic approach of the TO2 institution evaluation as well as the adapted approach for the two larger TO2 institutions, TNO and DLO. The chapter ends with a summary of the division of responsibilities and tasks between the various parties involved in the TO2 institution evaluation.

2.1 Basic approach for the TO2 institution evaluation

Figure 1 illustrates the basic approach for the four-yearly individual TO2 institution evaluations. The end product of each TO2 institution evaluation is an evaluation report made by a broad-based evaluation committee. This means that six reports are produced every four years.

Figure 1 Basic TO2 institution evaluation approach



1. Supervisory Committee

The process starts with the selection and installation of a supervisory committee for the six TO2 institution evaluations and the synthesis of these evaluations. The supervision is entrusted to a single broad-based supervisory committee in order to ensure the same approach is followed for all six TO2 institution evaluations and the synthesis. This committee's task is to monitor the process and the quality of the evaluations. It has no influence on the content of the assessments.

The supervisory committee is made up of representatives of the process-managing ministry and the content-managing ministries. These are supplemented with several external research evaluation experts and practitioners with experience in the field of institution management.

The process-managing ministry is responsible for the selection and installation of the supervisory committee. The composition is determined in consultation with the relevant content-managing ministries.

The supervisory committee is responsible for supervising the evaluation agency (see below). It oversees the quality of the evaluation approach and the deliverables. It verifies whether the information supplied by the evaluation agency and the TO2 institutions meets the requirements of the protocol and the Terms of Reference. It is also responsible for the formal acceptance of the evaluation report of the evaluation committee (see below).

2. Defining the Terms of Reference for the four-yearly evaluation

The process-managing ministry, acting in consultation with the supervisory committee and the TO2 institutions, draws up Terms of Reference (ToR) for each of the six TO2 institution evaluations and the synthesis. This ToR describes the questions and the various responsibilities and tasks of the parties involved, as well as the accompanying timelines. The ToRs must adhere to the protocol which is binding. The ToRs are institution-specific elaborations of the evaluation protocol. They can contain specific evaluation questions and additional requests for information tailored to the specific nature of each TO2 institution. The ToRs set out the framework within which the supervisory committee, evaluation committee, evaluation agency and TO2 institutions must operate.

3. Engagement of Evaluation Agency

The process-managing ministry engages an evaluation agency for the TO2 institution evaluations and the synthesis via a procurement procedure. In view of the size of the contract, it can be split into sub-contracts that are awarded to several evaluation agencies acting individually or as a consortium.

Based on the Terms of Reference, the evaluation agency is requested to make a proposal for the collection of additional data, taking account of the specific mission, tasks and context of each TO2 institution. The process-managing ministry consults with the TO2 institutions about the specific data collection questions. Annex 2 provides more information on the guidelines for the additional data collection process.

Other tasks of the evaluation agency – alongside the additional data collection – are to support the evaluation committee(s). The evaluation agency supplies the secretary of the evaluation committee. The secretary and evaluation team of the evaluation agency help the chairman (and/or members) of the evaluation committee to write the evaluation report.

The process-managing ministry is responsible for the procurement procedure and for handling the administrative and financial aspects. The selection takes place in consultation with the supervisory committee. One of the selection criteria concerns the availability of expertise and experience in the evaluation of (applied) research and research organisations and familiarity with the context in which the TO2 institutions operate.

4. Installation of Evaluation Committees

Shortly after the evaluation agencies have been selected, the evaluation committees are chosen and installed. The task of the evaluation committee is to make an assessment based on the three main criteria and to report its findings. The determination of the composition of the evaluation committee is therefore an important step in the evaluation approach. The members must be independent and able to make an assessment on the basis of knowledge and expertise.

The following mix of knowledge and expertise must be present among the evaluation committee members:

- Expertise in recent developments and the state-of-the-art in the various research areas
- Expertise in recent developments in relevant areas of application and innovation
- Expertise in knowledge transfer, realisation of impact with application-oriented research
- Expertise in the management of applied research institutes
- Expertise in the evaluation of application-oriented research/research institutes
- Familiarity with the Dutch research and innovation system and research funding methods

The secretary of the evaluation committee is supplied by the engaged evaluation agency (see above).

Foreign experts will also be invited to assure the independence of the members of the evaluation committee. The evaluation committee must have sufficient knowledge of the Dutch context to be able to assess the TO2 institutions in that context. It may therefore be inevitable to invite one or more experts who are personally involved in the TO2 institution (e.g. as a member of an advisory council of the TO2 institution). Clearly, this must in no way compromise the independence of the evaluation committee.

The process-managing ministry is responsible for the timely installation of the evaluation committees for each of the TO2 institution evaluations. The process-managing ministry obtains advice from diverse parties in determining the composition. The TO2 institutions are asked to nominate members for the evaluation committee. The evaluation agency is also consulted. Where possible and useful, experts can participate in several evaluation committees. The process-managing ministry, acting in consultation with the supervisory committee, appoints the chairman and other members of the six evaluation committees.

The process-managing ministry is responsible for handling the administrative and financial aspects. Evaluation committee members are entitled to a reimbursement of expenses. The members of the evaluation committee must sign a declaration of confidentiality. The evaluation committee operates independently and in accordance with the guidelines of the protocol. It reports to the supervisory committee.

The evaluation committee bases its assessment on four sources of information: (1) the basic information from the annual monitoring; (2) the self-evaluation report; (3) the additional data collection by the evaluation agency; and (4) the site visit to the TO2 institution. These sources are discussed below.

5. Delivery of basic information by the TO2 institution (Source 1)

The first source is the basic information consisting of facts and figures on an annual basis. This information forms part of the annual monitoring for the process-managing ministry. The facts and figures provide a quantitative basis for the evaluation of the quality, impact and viability of the TO2 institution by the evaluation committee. The basic information must adhere to the guidelines and formats as described in Annexes 1 and 2.

The TO2 institution management is responsible for the timely delivery of the basic information to the evaluation committee, optionally as an annex with the self-evaluation report.

The supervisory committee checks whether the basic information meets the set requirements and guidelines, with the evaluation agency providing support on the content.

6. Delivery of self-evaluation report by TO2 institution (Source 2)

The second source is the self-evaluation report in which the TO2 institution provides answers to the evaluation questions. This information is supported wherever possible with quantitative data from the basic information (source 1). Annex 2 sets out guidelines for the design and content of the self-evaluation report.

The TO2 institution management is responsible for the timely delivery of a self-evaluation report that meets the guidelines in Annex 2. It ensures that sufficient manpower and resources are available within the TO2 institution and that the internal division of tasks and responsibilities is clear.

The process could consist of the following steps.

1. Set up an internal evaluation project team (writing team) with a project manager.
2. Draw up an action plan with project timelines, taking account of the guidelines in the protocol.
3. Appoint officers with responsibility for the content (per theme, programme line, group or cluster).
4. Draw up the self-evaluation report.
5. Internal approval of the self-evaluation report.
6. Send the self-evaluation report to the evaluation committee.

The supervisory committee checks whether the self-evaluation report and accompanying documentation meet the set requirements and guidelines, with the evaluation agency providing support on the content.[7]

7. Delivery of additional information by evaluation agency (Source 3)

A third source is the information that is collected by the evaluation agency on the basis of additional evaluation research. The protocol provides guidelines and suggestions for this purpose. There is scope for customisation and TO2 institution-specific evaluation questions and methods. This additional information is collected in parallel with the preparation of the self-evaluation report. Annex 2 provides instructions for the additional information collection process.

The evaluation agency is responsible for the timely delivery of the additional information according to the Terms of Reference. The action plan is discussed and approved by the supervisory committee. The supervisory committee receives interim updates on the findings and is given an opportunity to respond to a draft report with findings.

The TO2 institution is informed about the additional evaluation research. The findings of the additional evaluation research are also shared in good time with the TO2 institution so that it can check the document for factual inaccuracies and prepare for the evaluation committee’s site visit.

[7] In the case of TNO and DLO, the evaluation consists of evaluation reports of organisational units and an overarching report for the overall TO2 institution. The adapted approach for TNO and DLO is clarified in the next section.

8. The site visit (Source 4)

Fed by the three information sources, the evaluation committee pays a site visit to the TO2 institution. This site visit offers the evaluation committee an opportunity interview people of the TO2 institution and their stakeholders (partners, customers, users) and to inspect the research facilities. To ensure that all relevant stakeholders can make time available for the site visit, it is important to set a date well in advance. The evaluation committee must receive the three information sources at least one month before the site visit.

During a two-day visit, the evaluation committee must collect as much relevant information as possible.[8] The agenda for the site visit must therefore be prepared with great care. The chairman of the evaluation committee makes the final decision on the agenda after consultation with the TO2 institution which is requested to make suggestions for the agenda. The evaluation agency can also be consulted about which stakeholders within and around the TO2 institution should be interviewed and about relevant subjects for discussion and interview questions.

Further guidelines for the organisation of the site visit are given in Annex 2.

9. TO2 institution evaluation report

Drawing on the four information sources, the evaluation committee arrives at its answers to the evaluation questions and assessments on the three evaluation criteria: quality, impact and viability. The findings and conclusions are written down in an evaluation report. The evaluation committee writes the evaluation report with support from the secretary and evaluation team (from the evaluation agency).

The TO2 institution receives a draft version of the evaluation report to check it for factual inaccuracies. After its comments are incorporated, the final evaluation report is sent to the supervisory committee which is responsible for accepting the report. The TO2 institution has an opportunity to react to the evaluation report. The report and the reaction are then offered to the Minister of Economic Affairs, together with the other TO2 institution evaluation reports and the synthesis report (see below).

2.2 Adapted approach for TNO and DLO

TNO and DLO are so large and multi-faceted that an adapted approach is necessary. In the case of these institutions, the evaluation committee must assess a much broader range of research activities than at the four smaller TO2 institutions. The adapted approach is shown in the diagram in Figure 2.

The difference with the basic approach is that, prior to the TO2 institution evaluation, TNO and DLO must organise an initial series of evaluations at technology cluster (TNO) or research institute (DLO) level. This series of evaluations is spread over the four-year cycle. The TO2 institution sets up an independent evaluation committee with specific expertise in the research domain for each of these evaluations of the sub-units. These sub-evaluations are organised in line with the guidelines of this protocol. The committees must therefore be able to arrive at their opinion based on the basic information, a self-evaluation report and a site visit per sub-unit.

The broad evaluation committee of the four-yearly TNO/DLO institution evaluation receives the following information from the TO2 institution:

[8] It is advisable for the evaluation committee to gather together on the evening before the site visit in order to get to know each other, discuss the Terms of Reference, agree on the division of roles and responsibilities, etc.

1. The basic information from the annual monitoring.
2. The set of evaluation reports per sub-unit. Where necessary, information from the evaluation reports of the sub-units is brought up-to-date, for instance if major changes have occurred in the intervening period.
3. The underlying self-evaluation reports per sub-unit.
4. The reactions of the TO2 institution's management to these evaluation reports per sub-unit.
5. A report in which the TO2 institution answers evaluation questions at the level of the entire TO2 institution.

Figure 2 Adapted approach for the evaluation of TNO and DLO

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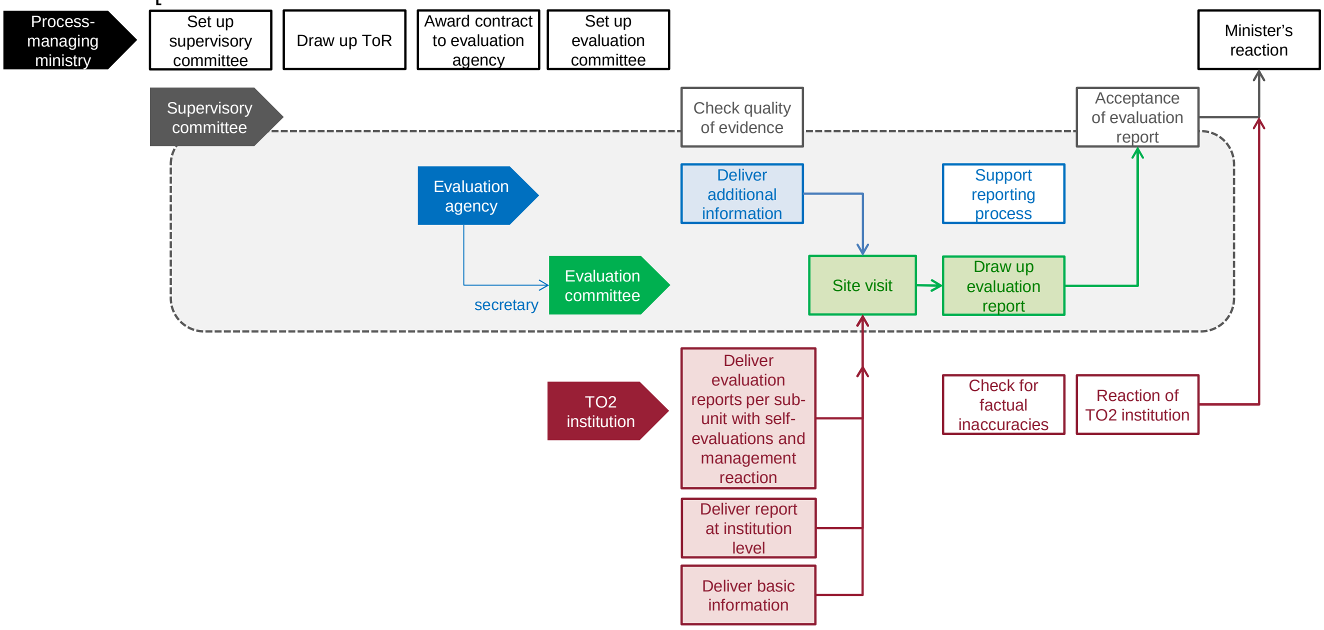

2.3 Division of responsibilities

Table 1 provides a summary of the subdivision of duties and responsibilities for the TO2 institution evaluation. It also gives the timelines for the activities, indicated in months before or after the site visit.

Table 1 Division of responsibilities

Activity	Lead	Consultation with	Timing (in months before/after site visit)
1. Set up supervisory committee (SC)			
Selection of SC members	PM	CM	-9
Set up SC	PM	CM	-9
2. Draw up Terms of Reference			
Draw up the ToR for the evaluations of the six TO2 institutions and the synthesis.[9]	PM	SC	-9
3. Engagement of evaluation agencies (EA)			
Selection of/Contract Award to EA	PM	SC	-8
Supervision of EA	SC	PM	

[9] The protocol is the leading guideline. The ToR provides room for institution-specific additions or adjustments.

Financial handling	PM		
4. Set up evaluation committees (EC)			
Nomination of committee members[10]	TO2	SC, EA	-8
Determination of composition EC	PM	SC, TO2, EA	-8
Financial handling	PM		
5. Delivery of basic information			
Delivery of basic information	TO2		-2
Check whether information meets the protocol requirements	SC	EA	-2
6. Delivery of self-evaluation report			
Delivery of self-evaluation report[11]	TO2		-2
Check whether information meets protocol requirements	SC	EA	-2
7. Delivery of additional information			
Delivery of additional information	EA		-1
Check for factual inaccuracies	TO2		
Check whether information meets protocol requirements	SC		-1
8. Organise site visit			
Set date	TO2	EC, EA	-7
Propose agenda	TO2	EC, EA	-4
Set agenda	EC	TO2, EA	-3
Organise site visit[12]	TO2	EA	-2
9. Draw up evaluation report			
Draw up draft evaluation report	EC	EA	+1
Check for factual inaccuracies	TO2		
Draw up final evaluation report	EC	EA	
Acceptance of the evaluation report	SC		
TO2's reaction to evaluation report	TO2		+1
Minister's reaction to evaluation reports[13]	MEA		+3

SC = Supervisory Committee of the evaluation / EA = Evaluation Agency / EC = Evaluation Committee / MEA = Minister of Economic Affairs / PM = Process-Managing Ministry / CM = Content-Managing Ministries / TO2 = TO2 institution

2.4 Evaluation criteria

The TO2 institutions are assessed on the basis of three evaluation criteria:

1. Quality
2. Impact
3. Viability

The three criteria are set out below.

Criterion 1: Quality

The first key question for the TO2 institution evaluation is:

What was the quality of the TO2 institution's research in the past evaluation period?

[10] Optionally, a chairman can be selected first, who is then involved in the selection of the other members of the evaluation committee. In the case of TNO and DLO, the chairmen of the evaluation committees of the sub-evaluations can also be included as members in the evaluation committee.

[11] TNO and DLO supply evaluation reports per sub-unit, including the underlying self-evaluations per sub-unit. In addition, they supply an additional synthesis report for the TO2 institution as a whole.

[12] This concerns the arrangement of practical matters (meeting room, travel and accommodation of committee members, making arrangements with people whom the evaluation committee wants to talk to, etc.)

[13] The Minister of Economic Affairs gives a reaction on the basis of the six evaluation reports and the synthesis report.

The quality of TO2 research must be assessed in a different way from the quality of academic research. This is due to the different roles that TO2 institutions and academic knowledge institutions (e.g. universities and KNAW/NWO institutions) play in the research and innovation system. TO2 research spans a broad spectrum of activities and is performed for diverse objectives and target audiences. Typical TO2 research is:

1. Research for building and maintaining their strategic knowledge base
2. Precompetitive research in collaboration with private and public parties
3. Programmatic research for policy-making knowledge
4. Contract research
5. Statutory research tasks

Accordingly, the Standard Evaluation Protocol for academic research assessments in the Netherlands is not suitable for the evaluation of the quality of TO2 research. The output of TO2 institutions is diverse and comprises far more than scientific publications.

This protocol therefore also looks at how the various stakeholders rate the quality of the research. This rating can be measured via direct questioning (customer satisfaction surveys, interviews with customers, partners and users, or focus group sessions). Indications for the quality ratings can also be found in the income obtained from diverse funding sources, repeat customers, partnerships with prominent knowledge institutions, participation in national/international research consortiums and research networks, etc.

One indirect way of measuring quality is to look at the basic conditions for delivering good quality, such as the presence of sufficient financial resources, the ability to recruit and retain talented researchers, the ability to keep strategic research facilities up to date.

Table 2 gives the indicators for assessing the quality of TO2 research.

Table 2 Quality Indicators

Indicators	Evaluation questions
1. Relevance and effectiveness of the research strategy in the past period	• Are the strategic choices well-considered and well-founded? • Are the objectives realistic and sufficiently ambitious? • Has the research strategy been properly implemented? • To what extent were the objectives for the various programmes/themes achieved?

2. Rating of research quality by customers and users	• To what extent is the TO2 institution able to:
	  • attract income from various customer groups? (Large Corporates/SMEs; national/international)
	  • serve new customers? (in absolute numbers and as share of total; national/international)
	  • secure repeat customers? (in absolute numbers and share of total)
	  • realise strategic (multi-year) partnerships with customers?
	• What are the results of:
	  • the customer satisfaction survey?
	  • the questioning of (prospective) customers and/or focus groups?
	• To what extent does the TO2 institution have an independent status and a good reputation?

3. Rating of research quality by knowledge	• To what extent is the TO2 institution able to take part in relevant international/national research consortia, knowledge

partners	networks, research programmes? • What is the position of the TO2 institution in these partnerships? • With what prominent knowledge partners in the public research and innovation system does the TO2 institution work together? (new/recurrent, national/international) • With what other TO2 institutions does the TO2 institution work together?
4. Realisation of synergy	• What are the synergy benefits (scale and scope benefits) that the TO2 institution is able to achieve thanks to a combination of different types of research, research disciplines and research facilities?
5. Conditions for delivering quality in research: money, people, management and facilities	• To what extent can the TO2 institution obtain sufficient income from different public and private funding sources for different types of research? • Does the TO2 institution have sufficient and sufficiently good researchers? • To what extent is the TO2 institution able to recruit and retain good researchers? • What is the quality of the research management? • What is the quality (compared to state-of-the-art) and relevance of the research facilities of the TO2 institution? • Does the TO2 institution manage the strategic research facilities in an efficient and effective way? • To what extent can the TO2 institution invest in maintenance and renewal of facilities? • How are the facilities used? • How do stakeholders rate the facilities?
6. Quality of the output	• What positive feedback do the stakeholders give for the most important outputs (reports, software, models, …) • What are the results of the bibliometric analysis (in terms of productivity, impact, …)?

7. International benchmark with comparable organisations[14]	• What are the results of the international benchmark study in terms of e.g.
	  • Research funding from different funding sources
	  • Research personnel
	  • Facilities
	  • Scientific output and impact
	  • Position in relevant knowledge networks, consortiums, etc.
	  • Technology portfolio

8. Qualitative case studies for supporting, interpreting and supplementing quantitative analyses	• Representative cases • Cases in which exceptionally good quality is realised • Wherever necessary and useful in combination with case studies about impact

[14] Where possible and useful. This depends on e.g. whether there are comparable research organisations and whether information on these organisations is available.

Criterion 2: Impact

A second key question for the TO2 institution evaluation is:

What impact has the TO2 institution's research had in the past period?

TO2 institutions can realise different types of impact with their research. To structure this, the protocol makes a distinction between:
1. Type of knowledge user: businesses versus non-profit organisations including public sector
2. Type of domain in which impact is realised:
- Contribution to innovation agendas of the top sectors in the Netherlands
- Contribution to the achievement of societal themes in national policy
- Contribution to European or international policy agendas and themes

In practice it is not possible to clearly separate the different types of impact and overlap can always occur. The main purpose of the evaluation is to form a good picture of the impact (great or little) that the TO2 institution has in different areas.

The protocol evaluates the impact of TO2 research along two routes:
1. *Impact perceived as knowledge utilisation by users*
   The evaluation is based on information about knowledge utilisation by various user groups. The information is collected by questioning users about their knowledge utilisation and the effects of that knowledge utilisation via knowledge utilisation surveys, via interviews with customers and users and/or via focus group sessions.
2. *Impact perceived as an approach to promote knowledge utilisation by users*
   The evaluation is based on information about the actions that the TO2 institution undertakes to promote the utilisation of research results. The question about impact thus becomes a question about how the TO2 institution connects with which stakeholders. This concerns e.g. the organisation of demand-driven research for stakeholders, performing research in partnership with users, helping users to utilise the research results, etc. These connections can be established in different ways: via interactions between individuals, via exchanges of knowledge carriers (such as texts, models, instruments) and via financial transactions. Each of these different types of connections can be evaluated with different indicators.

Annex 3 takes a closer look at the impact evaluation method.

The key indicators for assessing the impact of TO2 research are set out in Table 3:

Table 3 Key impact indicators

Indicators	Evaluation questions
1. Relevance and effectiveness of the approach to promote impact	• Are the actions to promote impact well-considered and well-founded? • Are the objectives realistic and sufficiently ambitious? • Are the actions properly implemented? • To what extent were the objectives for various programmes/themes achieved?

2. Knowledge utilisation by businesses, government agencies and non-profit	• What are the results of:
	  • the customer/user surveys about knowledge utilisation?
	  • the questioning of customers/users in interviews and/or focus group sessions about knowledge utilisation?

organisations at home and abroad	• What contributions did the TO2 institution make towards:
	  • the realisation of innovation agendas in the top sectors?
	  • the realisation of objectives relating to the societal themes in the national policy agendas (of content-managing ministries)?
	  • the realisation of European and international policy agendas and themes?

3. Impact related to the importance of the sectors/themes/-agendas for the Netherlands	• What is the economic significance of the sectors in which the TO2 institution realises impact? (In terms of the sector's share in GDP, employment and R&D expenditures, the growth perspective; the international competitiveness of the Netherlands) • What is the societal significance of the themes for which the TO2 institution realises impact? (In terms of prioritisation in national, European or international policy)
4. Connections with customers/users in private and public sectors for the realisation of impact	• Who are the most important customers/users of the TO2 institution? Why these parties? • How does the TO2 institution connect these parties during the research process (agenda-setting, programming, implementation and knowledge transfer)? Why this approach? • To what extent is this approach adequate and effective?
5. Connections with leading knowledge institutions at home and abroad	• To what extent is the TO2 institution able to work together with the best knowledge institutions (including other TO2 institutions) in the Dutch research and innovation system? • To what extent is the TO2 institution able to work together with the best international knowledge institutions? (e.g. via participation in Framework Programmes)
6. Visibility in relevant media	• To what extent is the (societal) impact of the TO2 institution visible in the various media? (via media analysis)
7. Qualitative case studies for supporting, interpreting and supplementing quantitative analyses	• Representative cases about approach to realise of impact • Cases where an exceptionally strong impact was realised • Where necessary and useful in combination with case studies about quality

Criterion 3: Viability

A third key question about the TO2 institution evaluation is:

What is the viability of the TO2 institution? How well is the TO2 institution equipped and positioned for the future in the light of developments in their specific environments?

The key indicators for assessing the viability of the TO2 institution are set out below.

Table 4 Viability indicators

Indicators	Evaluation questions
1. Relevance of the strategic plan for coming period a. External analysis – opportunities and	• Who are the most important current/future stakeholders and target audiences of the TO2 institution in the

threats in the specific environments	private/public sector and wider society? (National and international, existing and potential) • What are the economic and technological developments among these stakeholders? (as opportunity or threat for (the relevance of) the TO2 institution's research) • What kinds of knowledge will stakeholders need in the coming period?
b. Internal analysis – current and future strengths & weaknesses	• What are the strengths and weaknesses in • the research portfolio? • the research employees and management? • the research facilities? • the research funding (business model)?
c. Strategic choices in the strategic plan	• To what extent does theTO2 institution respond adequately to the identified external developments by making adjustments (where necessary) to the research portfolio, research employees and management, facilities and/or business model? • To what extent is the TO2 institution able to realise internal synergies between the various activities/parties? • To what extent are the findings from the earlier evaluation taken on board in the strategic plan for the coming period?
2. Financial robustness	• To what extent is the TO2 institution able to raise sufficient funding for the implementation of the strategic plan?
3. Justification of Government Contribution[15]	• Does the TO2 institution resolve a 'market failure'? Does the TO2 institution perform research or generate knowledge that would otherwise not be realised?[16] • Does the TO2 institution promote continuity in Dutch applied research that would otherwise not exist?[17] • Is there synergy between the activities/business units within the walls of a TO2 institution?[18] • Does the TO2 institution play an important role in national and international networks that would not have been fulfilled without this TO2 institution?[19] • Does the TO2 institution play a role in national/international knowledge and innovation networks that would otherwise not have been (properly) fulfilled?[20]

[15] The evaluation agency can gather information via additional evaluation research to answer the accompanying evaluation questions.

[16] Note: One reason for public funding is that the TO2 institutions invest in precompetitive knowledge research that businesses are insufficiently able or willing to carry out themselves. This also applies to large-scale research facilities. In addition, the TO2 institutions fulfil an R&D role for the SME sector.

[17] Note: One reason for public funding is that the applied research is aimed at the development and/or application of knowledge for society and government. These objectives require a solid knowledge base that cannot be built from one day to the next.

[18] Note: One reason for public funding is that the knowledge development of the TO2 institutions generates economies of scale and synergy benefits which would not occur if research is fragmented over numerous different parties.

[19] Note: One reason for public funding is that TO2 institutions have an independent status and a good reputation. This is notably important for the performance of socially relevant research whose results must be perceived to be absolutely independent and where the direct availability of and access to the resulting knowledge must be guaranteed for government agencies. This also applies to a strong degree to research in areas where specific information requirements (confidentiality, integrity and availability) apply for state security/defence reasons.

[20] Note: An additional argument for public funding is that TO2 institutions have access to an extensive national and international network of businesses, government agencies and knowledge institutions. They also work with multi-year strategies that are aligned with European roadmaps. These multi-year strategies often extend

	• Is the TO2 institution the best conceivable manager of the large research facilities?[21]
4. Requisite positioning of TO2 institutions[22]	• Does the TO2 institution have a clear positioning vis-à-vis private knowledge providers? • Does the TO2 institution have good connections with the fundamental research? • Does the TO2 institution operate effectively in the international context (notably with European framework programmes)?

beyond their partners' operational horizon. This means that they can be of great value for the development of (cross-)sector and societal innovation strategies. The TO2 institutions therefore also play an important role in the preparation of the innovation contracts of the Top Sectors.

[21] Note: Another argument for public funding is that some TO2 institutions manage extremely large facilities.

[22] The evaluation agency can gather information via additional evaluation research in order to answer the accompanying evaluation questions.

2.5 Score table

The evaluation committee is requested to express the outcome of their assessment in a score, accompanied by a textual explanation. The scores are given on a 4-point scale (very good, good, sufficient, insufficient) and in whole points (not e.g. 3.5 or 3+). Table 5 provides an explanation of the scores.

Table 5 Score Table

	Quality	**Impact**	**Viability**
4 (Very good)	The TO2 institution performs very good and highly appreciated research for its stakeholders. The research is world-class.	The TO2 institution maintains very good structural connections with its stakeholders. The research results are used on a large scale by its stakeholders. This knowledge utilisation is of great strategic importance for the Dutch and European economy and/or resolution of societal challenges.	The TO2 institution is extremely well-equipped and positioned for the future. The strategic plan for the coming period is highly adequate and well-thought-out. The conditions for the realisation of quality and impact are very good in terms of (1) finances; (2) research personnel and management; and (3) research facilities.
3 (Good)	The TO2 institution performs good and well-appreciated research for its stakeholders.	The TO2 institution maintains good connections with its stakeholders. The research results are used by its stakeholders. This knowledge utilisation is of strategic importance for the Dutch and European economy and/or resolution of societal challenges.	The TO2 institution is well-equipped and positioned for the future. The strategic plan for the coming period is adequate and well-thought-out. The conditions for the realisation of quality and impact are good in terms of (1) finances; (2) research personnel and management; and (3) research facilities.
2 (Sufficient)	The research of the TO2 institution shows certain clear weaknesses, but is generally of good quality and is well-appreciated by most stakeholders.	The connections of the TO2 institution with its stakeholders are generally good but show certain deficiencies. The utilisation of research results is generally good but shows certain deficiencies. The strategic importance of this knowledge utilisation for the Dutch and European economy and/or resolution of societal challenges is	The TO2 institution is generally well-equipped and positioned for the future, but has certain clear weaknesses. The strategic plan is largely adequate and well-thought-out but shows some deficiencies. The conditions for the realisation of quality and impact are largely in place, but weaknesses exist in some areas.

		generally substantial, but not in all respects.	
1 (Insufficient)	The research of the TO2 institution has clear weaknesses and is regarded as insufficient by stakeholders.	The connections with stakeholders are insufficient. The knowledge utilisation by stakeholders is insufficient. The strategic importance of the knowledge utilisation for the Dutch and European economy and/or resolution of societal challenges is small.	The TO2 institution is insufficiently equipped and positioned for the future. The strategic plan shows clear deficiencies. The conditions for the realisation of quality and impact are insufficient in certain important respects.

3 Synthesis of the evaluation reports

3.1 Purpose of the synthesis

The six TO2 institution evaluations are followed by a synthesis. The purpose of the synthesis report is to provide a summary of the findings from the six TO2 institution evaluation reports: what is the overall picture for the TO2 research in the Netherlands in terms of the quality, impact and viability of the TO2 institutions? The aim is to gain insight at overall TO2 research portfolio level into the national strengths regarding the quality, impact and viability of the TO2 research. At the level of the synthesis the extent to which these overall TO2 research portfolio strengths correspond with the economic and social priorities in Dutch policy can be assessed.

A further aim of the synthesis is to identify intersections between the TO2 institutions and opportunities for meaningful multidisciplinary collaboration. The focus is on the exploitation of synergies between the TO2 institutions and on the contribution that TO2 collaboration can make to the quality, impact and viability of TO2 research in the Netherlands. Collaboration in the TO2 context is not an end in itself, but a means of reinforcing the quality, impact and viability of the TO2 research. The TO2 institution evaluations report on the collaboration of the individual TO2 institution with other TO2 institutions. In the synthesis, these sub-reports are viewed together and compared to obtain an overall picture of the collaboration between the TO2 institutions. There is room for additional evaluation research by the evaluation agency, such as interviews with representatives of the TO2 federation.

Another specific focus is the role and significance of the TO2 federation that recently drew up a strategic framework (2015-2018) which presents a common vision and action plan (see text box below). Collaborating and connecting are the central themes in the joint strategy and approach of the TO2 institutions. The synthesis therefore also focuses on the various ways in which TO2 institutions work together. Collaboration between the TO2 institutions centres on:

- Sharing of ‘good practices’ and agreeing on uniform approaches regarding e.g. intellectual property and collaboration agreements
- Promoting cross-sector applications
- Joint development of ‘enabling technologies’
- Joint programming in top sectors
- Avoidance of duplication in knowledge development
- Efficient use of facilities
- Coordination of foreign activities
- Jointly improving the climate for foreign knowledge-intensive businesses

Text Box 2 The TO2 federation

The mission of the TO2 federation is threefold:

- Make a key contribution to the resolution of the societal challenges
- Strengthen the innovative power of Dutch businesses
- Help the government to resolve policy issues with knowledge and concrete solutions

The TO2 federation wants to act “as a link between knowledge and application in the ‘golden triangle’ of business, government and knowledge institutions. All research of the TO2 institutions is therefore mission-driven and strongly application-oriented.”

The vision of the TO2 federation is "to secure a place for the Netherlands among the world's top 5 most innovative knowledge economies as fast as possible." The TO2 institutions contribute towards this by "expanding the number and scale of the public-private partnerships within the top sectors and societal themes. The TO2 institutions thus promote knowledge circulation by connecting parties and stimulating knowledge utilisation."

In the strategic framework, the TO2 federation defines a number of objectives. The TO2 institutions want to:

- Belong to the top global players in the international knowledge market, with a leading role in European and global knowledge networks. This latter role is to be achieved in cooperation with Dutch businesses and government.
- Strengthen the innovativeness of large corporates and SMEs. The TO2 institutions actively involve the SME sector in Dutch and European innovation programmes.
- Engage high-quality knowledge workers in applied research. The aim is to realise more than 200 guest lectureships, 400 PhD employees at the TO2 institutions and 750 internships.
- Socially responsible innovation. This entails that the TO2 institutions are transparent about their approach and the fields of knowledge they work in, also to create space for commercial institutions. Civic and civil society organisations are involved in the TO2 activities.

The synthesis is not intended to make an evaluation of the TO2 system or to make a ranking of the TO2 institutions.

The synthesis forms part of this protocol because the process-managing ministry, in view of its responsibility for the overall TO2 system, requires an expert and independent assessment of the joint performance of the TO2 institutions and their TO2 federation.

3.2 Approach to the synthesis

The synthesis is made using the same approach as for the TO2 institution evaluations. The synthesis is supervised by the same supervisory committee, is based on the Terms of Reference drawn up at the start of the TO2 institution evaluations, and is performed by the evaluation agency that is also involved in the TO2 institution evaluations.

1. Supervisory committee

The synthesis is supervised by the same supervisory committee as for the TO2 institution evaluations (see section 2.1). The task of this committee is to monitor the process and quality of the synthesis. The supervisory committee is responsible for supervising the evaluation agency and for assuring the quality of the approach. It checks whether the supplied information and the synthesis report meet the requirements of the protocol and the Terms of Reference.

2. Terms of Reference

The synthesis is performed on the basis of the Terms of Reference as drawn up for the TO2 evaluation (see section 2.1).

3. Evaluation agency

The synthesis is performed by the same evaluation agency that was engaged for one or more of the TO2 institution evaluations (see section 2.1). The preparation of the synthesis report forms part of the same procurement procedure. The synthesis report is based on three information sources:

- The six evaluation reports of the TO2 institutions and the accompanying management reactions from the TO2 institutions (Source 1).

- Documentation on the joint strategic framework of the TO2 federation (Source 2).
- Information from additional evaluation research by the evaluation agency itself (Source 3).

4. Delivery of final reports of the TO2 institution evaluation (Source 1)
After acceptance by the supervisory committee, the set of six final reports of the TO2 institution evaluations is made available to the evaluation agency. The evaluation agency also receives the accompanying management reactions of the TO2 institutions.

5. Delivery of documentation for joint TO2 strategy (Source 2)
The TO2 institutions define a joint strategic framework in the TO2 federation context. To arrive at an opinion about the relevance and effectiveness of this joint approach, the evaluation agency requires information on the activities undertaken in this framework and the results. The TO2 federation supplies this information to the evaluation agency.

6. Collection of additional information (Source 3)
Based on the Terms of Reference, the evaluation agency carries out additional evaluation research to enable the proper and complete performance of the synthesis.

Guidelines for the information requested from the TO2 federation and the collection of additional information are given in Annex 2.

7. Preparation and acceptance of the synthesis report
Based on the three information sources, the evaluation agency makes a draft synthesis report that is discussed with the supervisory committee. The TO2 institutions/TO2 federation are given the opportunity to check the draft report for factual inaccuracies. Based on the feedback from the supervisory committee and the TO2 institutions/TO2 federation, the evaluation agency draws up a final synthesis report. The supervisory committee is responsible for the formal acceptance of the report. Next, the supervisory committee sends the synthesis report, together with the TO2 institution evaluation reports, to the Minister of Economic Affairs. The Minister will react to these reports and the accompanying management reactions from the TO2 institutions/federation in a Letter to Parliament.

3.3 Division of responsibilities

Table 6 gives a summary of the division of tasks and responsibilities in the approach to the synthesis. The timelines are also indicated in months before/after the delivery date of the final TO2 institution evaluation reports.

Table 6 Division of responsibilities

Main activity	Lead	Consultation with	Timing (in months before/after delivery of final TO2 institution evaluation reports
1. Delivery of TO2 institution evaluation reports			
Delivery of TO2 institution evaluation reports to evaluation agency	SC		0
Delivery of TO2 institution management reactions to the evaluation reports	TO2		0
2. Delivery of documentation on TO2 federation strategic framework			
Delivery of TO2 federation documentation to evaluation agency	TO2		-2
Check whether information meets the protocol requirements	SC	EA	-1
3. Additional data collection			
Delivery of additional information by evaluation agency	EA		-2
Check whether information meets protocol requirements	SC		-1
4. Draw up synthesis report			
Draw up draft synthesis report	EA		+1
Check for factual inaccuracies	TO2		+1
Draw up final synthesis report	EA		+2
Acceptance of the synthesis report	SC		+2
TO2 reaction to synthesis report	TO2		+2
Minister's reaction to evaluation reports[23]	MEA		+3

SC = Supervisory Committee / EA = Evaluation Agency / MEA = Minister of Economic Affairs / PM = Process-Managing Ministry / TO2 = Applied Research Organisation / TO2 Federation

3.4 Subjects for the synthesis

The synthesis is based on the same three subjects as the TO2 institution evaluations:

1. Quality
2. Impact
3. Viability

The subjects for the synthesis are worked out below.

[23] The Minister of Economic Affairs gives a reaction on the basis of the six evaluation reports and the synthesis report.

1: Quality

The key question that the synthesis must answer is:

What, overall, is the quality of the TO2 institution research?

The synthesis provides a summary overview of the quality of TO2 research (from very high to insufficient) in the various areas of research. One specific focus is the extent to which TO2 collaboration contributes to the quality of research. For instance, to what extent does TO2 collaboration contribute to the attractiveness of TO2 institutions as a partner for both knowledge institutions and customers/users.

The synthesis is based on the following subjects and questions.

Table 7 Subjects and questions for synthesis report on quality

Subjects	Questions for synthesis report
1. Areas with high quality TO2 research	• Based on the analysis of the six TO2 institution evaluation reports, in what areas is the TO2 research of a (very) high quality, also by international standards? • To what extent does this 'quality profile' of the TO2 research correspond with the economic and societal priorities of the Netherlands?

2. Added value of TO2 collaboration (synergy)	• To what extent are synergy opportunities exploited?
	• What is the added value of the TO2 collaboration in delivering good-quality research in the various areas? For instance in terms of:
	  • Alignment of working methods
	  • Promotion of cross-sector applications
	  • Development of 'enabling technologies'
	  • Joint programming in top sectors
	  • Avoidance of duplication in knowledge development
	  • Efficient use of facilities
	  • Joint acquisition of international customers

3. Relevance and effectiveness of the TO2 federation strategy in relation to quality	• Are strategic choices and objectives well-thought-out? • To what extent have the set objectives been achieved?

2: Impact

The key question that the synthesis must answer is:

What, overall, is the impact of the TO2 institution research?

The synthesis provides a summary overview of the impact of TO2 research (from very high to insufficient) in the various areas of research. One specific focus is the extent to which TO2 collaboration contributes to the impact of the research. For instance, to what extent does TO2 collaboration contribute to the realisation of broadly applicable (cross-sector) technological inventions and the establishment of strategic connections with customers/users.

The synthesis is based on the following subjects and questions.

Table 8 Subjects and questions for synthesis report on impact

Subjects	Questions for synthesis report

1. Areas with high impact of TO2 research	• Based on the analysis of the six TO2 institution evaluation reports, in what areas does TO2 research have a (very) high impact for the business and non-profit sectors? In terms of contributions to:
	  • innovation agendas of businesses and top sectors
	  • societal themes and policy agendas of the Dutch government
	  • European/International agendas and themes
	• To what extent does this 'impact profile' of the TO2 research correspond with the economic and societal priorities of the Netherlands?

2. Added value of TO2 collaboration (synergy)	• What is the added value of TO2 collaboration in the realisation of impact in the various areas? For instance in terms of:
	  • Alignment of approaches
	  • Promotion of cross-sector applications
	  • Development of 'enabling technologies'
	  • Joint programming in top sectors
	  • Avoidance of unnecessary overlap

3. Relevance and effectiveness of the TO2 federation strategy in relation to impact	• Are strategic choices and objectives well-thought-out? • To what extent have the objectives been achieved?

3: Viability

The key question that the synthesis must answer is:

What, overall, is the viability of the TO2 institutions?

The synthesis provides a summary overview of the viability of the TO2 institutions. The viability of the TO2 institutions is determined by their ability to respond flexibly to challenges of the future for the Dutch economy and society. One specific focus concerns the extent to which the collaboration in the TO2 context – in a 'TO2 Open Innovation Network' – contributes to the viability of TO2 institutions.

The synthesis is made on the basis of the following subjects and questions.

Table 9 Subjects and questions for synthesis report on viability

Subjects	Questions for synthesis report
1. Areas in which the TO2 research is best-equipped and positioned for the future	• Based on the analysis of the six TO2 institution evaluation reports, in what areas is the TO2 research (very) well-equipped and positioned to respond to changes in the specific environments in which they operate (science, business, government, civil society organisations)? • To what extent does this 'viability profile' of the TO2 research correspond with the economic and societal priorities of the Netherlands?
2. Added value of TO2 collaboration (synergy)	• What is the added value of TO2 collaboration in promoting the ability of TO2 institutions to respond flexibly to the challenges of the future for the Dutch and European economy and society?
3. Relevance and effectiveness of the TO2 federation strategy in relation to viability	• Are strategic choices and objectives well-thought-out? • To what extent have the objectives been achieved?

Annex 1. Standard formats for basic information

I. Finances

Income source		Turnover				Forecast			
		Year n-4	**Year n-3**	**Year n-2**	**Year n-1**	**Year n**	**Year n+1**	**Year n+2**	**Etc.**
Government Contribution from Economic Affairs	**Total**								
	Allocation per top sector								
	Allocation per societal theme								
	Allocation for LT knowledge base								
	Allocation for statutory tasks								
	Other, by origin								
Programme subsidies for precompetitive research	**Total**								
	EU								
	National (excl., TKI allowance)								
	Regional								
	Foreign (non-EU)								
	Other (where relevant)								
	Contribution per top sector								
	Top Sector 1								
	Top Sector 2								
	Etc.								
TKI allowance	**Total**								
	TKI 1								
	TKI 2								
	Etc.								
Contribution of businesses to precompetitive research	**Total**								
	Large corporates								
	of which international (%)								
	SME								
	of which international (%)								
	Contribution per top sector								
	Top Sector 1								
	Top Sector 2								
	Etc.								
Contribution of non-profit organisations to precompetitive research (as participant)	**Total**								
	Of which international (%)								
	Contribution per top sector								
	Top Sector 1								
	Top Sector 2								
	Etc.								
Contract Research	**Total**								
	Large corporates								
	of which international (%)								
	of which new (%)								
	SME								
	of which international (%)								
	of which new (%)								
	Government								
	of which international (%)								
	of which new (%)								

	Other customers								
	of which international (%)								
	of which new (%)								
	Income per top sector								
	Top Sector 1								
	Top Sector 2								
	Etc.								
Other income	**Total**								
	Knowledge exploitation								
	Rental of facilities								
	Other								

Note
Different TO2 institutions use different financial breakdowns. The breakdown applied here follows the systems of the TO2 institutions as closely as possible as well as the evaluation questions in the protocol.

The main difference is between income from **precompetitive research** and **contract research**. The precompetitive research is financed from various sources: the Government Contribution from the Ministry of Economic Affairs, public sector subsidies (EU, national, regional, other), the TKI allowance and private funding.

The Government Contribution can be spent on research for top sector programmes as well as on programmes relating to societal themes, the long-term knowledge base and statutory research tasks. With some TO2 institutions, a distinction can be made according to the origin of the Government Contribution, such as the Government Contribution for SBIR, DINO, etc. at TNO.

For the private sector, a distinction is made between large corporates and SMEs. This distinction is not always easy to make in practice.[24] The European Commission applies the following definition:

Small and medium-sized enterprises (SMEs) are defined in the EU recommendation 2003/361. The main factors determining whether an enterprise is an SME are:

- staff headcount and
- either turnover or balance sheet total.

Company category	**Staff headcount**	**Turnover** or	**Balance sheet total**
Medium-sized	< 250	≤ € 50 million	≤ € 43 million
Small	< 50	≤ € 10 million	≤ € 10 million
Micro	< 10	≤ € 2 million	≤ € 2 million

These ceilings apply to the figures for individual firms only. A firm that is part of larger group may need to include staff headcount/turnover/balance sheet data from that group too.

The User Guide to the SME definition[25] clarifies how the SME definition must be applied. Three types of SME are distinguished:

1. An autonomous enterprise (by far the most common category)
2. A partner enterprise[26]

[24] DLO has indicated that it cannot make this distinction on the basis of their internal administrative systems.
[25] http://ec.europa.eu/DocsRoom/documents/10109/attachments/1/translations/en/renditions/native
[26] An enterprise is a partner enterprise if:
- The enterprise has a holding equal to or greater than 25% of the capital or voting rights in another enterprise and/or another enterprise has a holding equal to or greater than 25% in the enterprise in question; and
- The enterprise is not linked to another enterprise. This means, among other things, that the enterprise's voting rights in the other enterprise (or vice versa) do not exceed 50%.

3. A linked enterprise[27]

The calculation of the number of employees and of the turnover or balance sheet total differs per category. The calculation for an autonomous enterprise must only be based on the company's own data. If a partner company is involved, a proportion of the partner's data must be included in the calculation. In the case of a linked company, 100% of the linked company must be included. This means that subsidiaries of large companies do not qualify as SMEs.

Whether a company is Dutch or foreign depends on the controlling party. If control is largely held in the Netherlands, the company is Dutch.

With the various income categories, space is provided to subdivide the income by top sector.

'Other customers' in the Contract Research category includes not-for-profit organisations and non-governmental organisations (NGOs).

'Knowledge commercialisation' includes various types of income from the commercialisation of patents.

[27] Two or more enterprises are linked when they have any of the following relationships:
- One enterprise holds a majority of the shareholders' or members' voting rights in another;
- One enterprise is entitled to appoint or remove a majority of the administrative, management or supervisory body of another;
- A contract between the enterprises, or a provision in the memorandum or articles of association of one of the enterprises, enables one to exercise a dominant influence over the other;
- One enterprise is able, by agreement, to exercise sole control over a majority of shareholders' or members' voting rights in another.

A typical example of a linked enterprise is the wholly-owned subsidiary

II. Human capital

Research employees		Year n-4	Year n-3	Year n-2	Year n-1
Researchers	**Total (FTE)**				
	In permanent employment (%)				
	Foreign nationality (%)				
	Average age				
	Inflow (FTE)				
	Outflow (FTE)				
Technicians and equivalent staff	**Total (FTE)**				
	In permanent employment (%)				
	Foreign nationality (%)				
	Average age				
	Inflow (FTE)				
	Outflow (FTE)				
Other supporting staff	**Total (FTE)**				
	In permanent employment (%)				
	Foreign nationality (%)				
	Average age				
	Inflow (FTE)				
	Outflow (FTE)				
Age structure	>60 (%)				
	50-59 (%)				
	40-49 (%)				
	30-39 (%)				
	<29 (%)				
Education	University (%)				
	Higher Vocational (%)				
	Other (%)				
Gender distribution	Male (%)				
	Female (%)				
Distribution by organisational unit	Unit A (%)				
	Unit B (%)				
	Etc.				

Note

The subdivision into three groups of employees is based on the OECD Frascati manual.

- Researchers: “Researchers are professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems and also in the management of the projects concerned. (…) Managers and administrators engaged in the planning and management of the scientific and technical aspects of a researcher’s work also fall into this category.” (…) Postgraduate students at the PhD level engaged in R&D should be considered as researchers.”
- Technicians and equivalent staff: “Technicians and equivalent staff are persons whose main tasks require technical knowledge and experience in one or more fields of engineering, physical and life sciences or social sciences and humanities. They participate in R&D by performing scientific and technical tasks involving the application of concepts and operational methods, normally under the supervision of researchers. Equivalent staff perform the corresponding R&D tasks under the supervision of researchers in the social sciences and humanities. (…) Their tasks include: Carrying out bibliographic searches and selecting relevant material from archives and libraries; Preparing computer programmes; Carrying out experiments, tests and analyses; Preparing materials and equipment for experiments, tests and analyses; Recording measurements, making calculations and preparing charts and graphs; Carrying out statistical surveys and interviews.”

- Other supporting staff: “Other supporting staff includes skilled and unskilled craftsmen, secretarial and clerical staff participating in R&D projects or directly associated with such projects. (…) Included under this heading are all managers and administrators dealing mainly with financial and staff matters and general administration, insofar as their activities are a direct service to R&D.”

III. Research facilities

Name of Facility
Type
Description
Year of construction or most recent update
Target audience/users
Income from third-party use
Operating expenses
Capacity utilisation rate
Expected investment for replacement or upgrade
Year in which expected investment will be made

Note

This concerns large research facilities. The subdivision in the Letter to Parliament about facilities at TO2 institutions of 12 October 2015 is used here.[28] This letter provides the most comprehensive overview possible of the research facilities at the TO2 institutions. This overview only concerns facilities worth € 2 million or more. Smaller facilities are left out of consideration.

Examples of 'Type' are: Lab; Test/trial; Test/measurement; Pilot; Data, computer; Simulator; Aircraft; Equipment; Storage, etc.

'Expected investment' concerns the categories in EUR millions: 0-5; 5-10; 10-15; 15-20; 20-25; >25.

[28] TK 32637, no. 204, Annex 1 *Inventarisatie van de bestaande onderzoeksfaciliteiten bij de TO2 instituten*.

IV. Research output

Audience	Texts (articles, reports, book contributions, etc.)	Numb er	Description	Artefacts (designs, models)	Num ber	Description
Scientific audience	Articles in peer-reviewed journals			Product designs (e.g. measurement instruments, tools, devices, systems)		
	Articles in peer-reviewed conference proceedings			Process designs (e.g. methods, protocols, standards)		
	Scientific books or significant contributions to scientific books at reputable publishers			Software designs		
	Top 5 best scientific contributions			Top 5 best artefacts for scientific audience		
Professional audience	Articles for professional magazines			Product designs (e.g. measurement instruments, tools, devices, systems)		
	Patent applications			Process designs (e.g. methods, protocols, standards)		
				Software designs		
	Top 5 most influential contributions for professional audience			Top 5 best artefacts for professional audience		
Other audience	Articles for a broad audience			Product designs (e.g. measurement instruments, tools, devices, systems)		
	Book contributions for a broad audience			Process designs (e.g. methods, protocols, standards)		
	Other textual output			Software designs		
	Top 5 most influential contributions for a broad audience			Top 5 best artefacts for professional audience		

Note

Research outputs of the TO2 institutions are diverse. This not only concerns output for the scientific peers (in the form of e.g. articles in scientific journals and conference contributions), but also output for companies, policymakers, civil society organisations, etc. (in the form of reports, software, models, etc.). The format gives an example of the range of outputs that a TO2 institution can report on. The exact content will differ per TO2 institution because each TO2 institution has its own mission and tasks. So there is room for different specific output indicators. The starting point is that the overview of outputs must provide an accurate picture of the quantity and composition of the outputs.

The outputs are grouped per organisational unit, depending on the subdivision normally used by the TO2 institution.

The format makes a distinction between different target audiences for the outputs. A second distinction is made between texts (e.g. papers, presentations, patents, book chapters, reports) and artefacts (e.g. product designs, methods, software tools, protocols, technical standards).

This subdivision based on audiences and types of outputs offers a framework that the TO2 institution can fill in according to its own insights. It is important to use clear definitions and to give quantitative information about the most important types of outputs on which the TO2 institution wants to be assessed.

Where possible and useful, the TO2 institution is requested to give the number of outputs per category. In the case of the textual outputs, the number of outputs must always be given.

In addition, the format asks for five representative examples of outputs per category. This provides the evaluation committee with a more concrete picture of the TO2 institution's most important outputs.

Patents

Where patents play a role in the knowledge utilisation strategy, the TO2 institution must specifically indicate:

Number of patent applications between 1 January and 31 December Patent numbers	
Number of patents owned as at 31 December	
Number of licences granted between 1 January and 31 December Of which granted to Established enterprises Start-ups	
Number of licences issued as at 31 December Of which licences generating income over EUR 1 million as at 31 December	
Number of patents transferred between 1 January and 31 December	

V. Collaborations with knowledge partners

Number of collaborations with knowledge partners	
	Total
	With universities
	of which international (%)
	With universities of applied sciences
	of which international (%)
	With other knowledge institutions
	of which international (%)
Strategic collaboration with knowledge institutions	
	Name
	Objective
	Scope
	Name
	Objective
	Scope
	Etc.

Note

The output indicator measures on an annual basis the number of collaborative relationships with partners in the public research and innovation system, such as universities, research institutes and universities of applied sciences. This concerns collaborative relationships that are based on a formal arrangement, such as a consortium agreement or a joint project application that has been granted. There can be multiple collaborative relationships with one knowledge institution.

In addition, the indicator shows the most important collaboration partners (maximum of five) with whom structural/strategic relationships are maintained, e.g. via multi-year partnership agreements. This does not concern one-off collaborations in an individual project.

VI. Relationships with customers/users

Number of customers	
	Total
	Large corporates
	of which international (%)
	of which new (%)
	SME
	of which international (%)
	of which new (%)
	Government
	of which international (%)
	of which new (%)
	Other (not-for-profit)
	of which international (%)
	of which new (%)
Strategic collaboration with business sector	
	Name
	Objective
	Scope
	Name
	Objective
	Scope
	Etc.
Strategic collaboration with other knowledge users	
	Name
	Objective
	Scope
	Name
	Objective
	Scope
	Etc.
Formalised interactions with stakeholders	
	Name
	Objective
	Scope
	Name
	Objective
	Scope
	Etc.

Note

The indicator measures the number of unique customers or other knowledge users that the TO2 institution works for. This concerns relationships that have been formally laid down e.g. in a contract, assignment, collaborative agreement, etc.

In addition, the indicator measures who are the most important customers and other knowledge users for the TO2 institution. This concerns multi-year, strategic relationships based on a formal agreement.

The indicator also measures the TO2 institution's formalised interactions with stakeholders as part of its strategy to realise impact. This concerns e.g. involving customers and users in the process (agenda-setting, programming, implementation and application of research). Examples are a programme council, working groups, advisory committees, etc.

Annex 2. Guidelines for delivery of information

1. Information for the TO2 institution evaluation

Source 1. Basic information

One important building block in the TO2 institution evaluation is the factual basic information that is tracked via the annual monitoring process. Wherever possible, this basic information is quantitative and delivered according to standard formats by the TO2 institutions.[29]

Annex 1 gives the formats that the TO2 institution must use to deliver the basic information. The formats are for

1. finance
2. human capital
3. research facilities
4. research outputs
5. connections with chain partners
6. connections with customers/users

The information on finance, human capital and research facilities must be delivered according to the standard format. If certain categories of data cannot be supplied on the basis of the existing administrative systems within the TO2 institution, this must be clearly indicated and explained. In this case, it may be necessary and/or useful to have additional work carried out (e.g. by the evaluation agency) in order to deliver the missing data. This decision is made in consultation with the supervisory committee.

The format for the research output data is provided to help TO2 institutions present the requested data in a clear manner. The TO2 institution can also use a format based on its own internal output monitoring system. The main thing is that the output facts and figures are presented in such a way that the evaluation committee is given good insight and a good factual basis for making its assessments on the three evaluation criteria. The TO2 institution is asked to explain the choices made in the presentation of the outputs.

The information on the connections with knowledge partners and connections with customers/users must be delivered insofar as possible according to the supplied formats. If the TO2 institution has good reasons for making adjustments to the format (e.g. to take account of institution-specific conditions), it must provide a clear explanation and justification of these adjustments.

[29] To prevent unnecessary administrative costs, the Ministry of Economic Affairs will ensure that this basic information corresponds insofar as possible with its Ministry-wide request for information.

Source 2. Self-evaluation report
The self-evaluation report builds insofar as possible on the basic information and provides an analysis, interpretation and explanation of relevant trends and developments. Where necessary and useful, additional information is presented in order to clarify the results on the various criteria and their impact, for instance in the form of representative case studies.

In consultation with the supervisory committee, some aspects can be left to the additional data collection by the evaluation agency, for instance a bibliometric analysis, an international benchmark study, a media analysis or an analysis of the impact related to the significance of the sectors/themes/agendas for the Netherlands.

The self-evaluation report must at least contain the following information:

1. *Presentation of the TO2 institution*
   A self-evaluation report starts with a brief description of the mission and statutory and other tasks of the TO2 institution. This is followed by a short description of the strategy pursued in the past evaluation period and an explanation of the strategic choices and the objectives and ambitions set for the various research programmes/themes. The strategic plan is enclosed with the report.

2. *Information for the evaluation of quality*
   The information presented in the self-evaluation report is largely based on the quality indicators and accompanying evaluation questions (see section 2.4).

3. *Information for the evaluation of impact*
   The information presented in the self-evaluation report is largely based on the impact indicators and the accompanying evaluation questions (see section 2.4.

4. *Information for the evaluation of viability*
   The information presented in the self-evaluation report is largely based on the viability indicators and accompanying evaluation questions (see section 2.4).

Source 3. Organisation of the site visit
The site visit is a crucial event in the evaluation procedure. Timely and thorough preparation and planning are therefore crucial.

The evaluation committee has a leading role in setting the agenda for the site visit and receives support in this respect from the evaluation agency. Ultimately it is up to the evaluation committee to determine on the basis of the evaluation protocol which subjects will be discussed and with which individuals. Possible interviewees are:

- The management of the TO2 institution
- Researchers of the TO2 institution, programme leaders and other project staff
- Knowledge users/customers from the private and/or public sectors
- Partners from the public research and innovation system

The TO2 institution plays an important role in advising on the agenda, the interviewees and the practical organisation of the site visit.

The site visit consists of at least two full days to give the evaluation committee sufficient time for interviews with various stakeholders and for internal consultation. The evaluation committee will meet on the evening before the first day of the visit to get to know each other, talk through the evaluation objectives and criteria, and agree on the approach and division of roles.

Source 4. Additional evaluation research
The evaluation agency is instructed to collect information in addition to the information delivered by the TO2 institution itself. The additional information to be collected will differ for each TO2 institution and is laid down in the Terms of Reference.

The evaluation research can, for instance, be specifically focused on certain evaluation questions in relation to the various evaluation criteria (quality, impact, viability).

Regarding the 'quality' criterion, additional evaluation research can be aimed at:

- Quality rating by customers and users via:
    - Analyses of the finances and the customer base
    - Questioning these stakeholder groups (in interviews, focus groups and/or surveys). Prospective customers/users can also be included.
- Quality rating by knowledge partners via:
    - Analyses of participation and positioning in (international) networks
    - Questioning this stakeholder group (in interviews, focus groups and/or surveys).
- Bibliometric analysis of scientific output
- International benchmark with comparable organisations

Regarding the 'impact' criterion, additional evaluation research can centre on:

- Knowledge utilisation by questioning customers and other knowledge users (in interviews, focus groups and/or surveys).
- Analysis of the impact in relation to the significance of the sectors/themes/agendas for the Netherlands and Europe.
- Media analysis.
- Patent analysis.

Regarding the 'viability' criterion, additional evaluation research can be focused on:

- External analysis in the SWOT analysis.
- Justification of the Government Contribution.
- The fulfilment of the preconditions relating to the positioning of the TO2 institution.

2. Information for the synthesis

Source 1. TO2 institution evaluation reports
The synthesis is based on the six evaluation reports of the TO2 institutions and the accompanying management reactions from the TO2 institutions. The evaluation agency receives this after acceptance by the supervisory committee.

Source 2. Documentation relating to the joint TO2 strategy
The evaluation agency receives from the TO2 federation:

- The multi-year Strategic Framework of the TO2 federation
- A report on the activities undertaken in this connection, including information on the results achieved with these activities

Source 3. Additional research
Based on the terms of reference, the evaluation agency carries out additional research for the synthesis report.

This information collection process is specifically focused on:

- Taking stock of social and economic priorities in national and European policy in order to determine the extent to which the quality, impact and viability of the TO2 research correspond with these priorities.
- Information on the results of collaboration in TO2 context to increase the quality, impact and viability of the TO2 institutions, specifically in the field of:
    - alignment of working methods
    - promotion of cross-sector applications
    - joint development of ‘enabling technologies’
    - joint programming in top sectors
    - avoidance of duplication in knowledge development
    - efficient use of facilities
    - joint acquisition of international customers.

  Insofar as this information is not available in the TO2 institution evaluation reports, it can be obtained by questioning TO2 management and stakeholders.

Annex 3. Impact measurement

Measuring the impact of research is inherently difficult. Firstly, because impact only becomes visible in the course of time and often after the evaluation takes place. Secondly, because of attribution problems: impacts are realised on the basis of multiple contributions. Usually there is no one-on-one or linear relationship between research result and impact. That is why the evaluation also looks at the manner in which the organisation creates the right conditions for realising impact. This takes place by entering into 'productive interactions' with other parties who can utilise the research results. The connections can be made at different levels (organisation, group, programme, project), at different times in the research cycle (before, during, after the research) and in various ways (informal or formal, ad hoc or structural, bilateral or multilateral, etc.).

In view of these methodological issues, the protocol gathers information on the impact of TO2 research along two routes.

1. Impact perceived as knowledge utilisation by users

The first route is based on gathering information about knowledge utilisation. The information can be collected by questioning diverse users about their knowledge utilisation and the effects of that knowledge utilisation (via knowledge utilisation surveys, via interviews with customers and users or via focus groups).

2. Impact perceived as approach to promote knowledge utilisation by users

The second route is based on gathering information about the process in which impact is realised. What strategy does the TO2 institution follow to realise impact and is this adequate and effective? Working on impact starts at the outset when setting the research agenda and programming the research: in what ways are the envisaged users involved in the process? In other words: is the organisation demand-driven and does this lead to knowledge utilisation? Even during and after the research, the chance of realising impact can be increased by actively involving the users. The question about impact thus becomes a question about how the TO2 institution connects with the various stakeholders. These connections can be established in various ways: [30]

- Via direct interactions: personal interactions where there is direct contact between people
- Via indirect interactions: connections made via an 'artefact' or text for stakeholders, such as an article or report for a professional audience, a software tool, a model, a technical standard, etc.
- Via financial interactions: connections in which an economic relationship is established between researchers and stakeholders via, for instance, a research engagement, an in-kind contribution, the sharing of facilities, etc.

Each of these types of connections can be evaluated with different indicators.

[30] The underlying idea of the evaluation of the connections is that impact is realised via 'productive interactions'. These are exchanges between researchers and stakeholders leading to the production and valorisation of knowledge that is both scientifically robust and socio-economically relevant. This approach is elaborated in the European SIAMPI-project (2009-2011) that was set up to develop indicators for the evaluation of different types of productive interactions between research and society.

Different types of impact of TO2 research

During the impact measurement, a distinction is made between impact on economic objectives and societal objectives. Clearly, the two are closely intertwined in practice as societal objectives are often realised through economic activities. Nevertheless, it is useful to make a distinction between different types of impact.

The diagram in Figure 3 makes a distinction between different types of impact. The first distinction concerns the difference in impact between the business and non-profit (including government) sectors. Next, this distinction can be worked out further in:

- Contribution to innovation agendas of the top sectors in the Netherlands
- Contribution to achievement of societal themes in national policy
- Contribution to European or international policy agendas and themes

The six impact areas cannot be strictly distinguished in practice and will show overlap. The purpose of the evaluation is to obtain a good picture of the various areas in which the TO2 institution has great or little impact.

Figure 3 Different types of impact