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APPRAISAL FOR THE TECHNOLOGY PROGRAMMES – DEVELOPMENT AND VERIFICATION OF A NEW ASSESSMENT MODEL IN SOME NATIONAL TECHNOLOGY PROGRAMMES IN FINLAND

Dr. Pekka Berg, Mr. Jussi Pihlajamaa, Mr. Malkus Lindroos

Abstract

The main portion of the public financing for technology research and development in Finland has been channelled through National Technology Agency TEKES, which plays a central role in the Finnish innovation system. In 2003, investments by Tekes were eur 392 million. Technology programmes have proved a profitable and functional form of cooperation and networking between enterprises and research institutes, which strengthens the central clusters in Finland. 24 extensive national technology programmes were running or were about to start by 2003. Tekes funding for mentioned technology programme portfolio, eur 650 million, affected worth eur 1.3 milliard total technology programme volume. This paper presents a new method how to improve the definition of the objectives of technology programmes.

Keywords: national innovation systems, programmes, assessment, decision making

1 Objectives

This research was started already in year 1989 when the author worked as a training manager at the educational organisation where the central problem was: how the utilisation of the results obtained from applied research in national technology programmes can be intensified. This was the starting point for the present study. During this study it was quite quickly discovered that the central question in the implementation of technology programmes is not the ineffective utilisation of the results. The focus in remedying the biggest problem of technology programmes is elsewhere. All attempts to utilise the results are useless if even the correct results fail to support the product development of enterprises. For this reason, the research concept was changed to the following form: how to improve the definition of the objectives of technology programmes. According to the performed present state research, the assessment mechanisms of the research programme units, the utilisation of the results during the programme, and the linkage of the research results to business strategies for the utilisation of results can be markedly improved.

2 Methods

A new method for assessment and decision making for R&D programmes was developed in the study. The method enables various parties of an R&D-programme to specify their projects in relation with the entire programme. It also links the objectives with a measurable assessment procedure and produces objective information for decision making of the

steering groups of the programmes. The method is divided into the following four parts: preparation of the assessment strategy, implementation of appraisal, monitoring in the implementation phase and evaluation. The emphasis in appraisal is on assessing the appropriateness of goals while the emphasis in monitoring is on assessing the efficiency of implementation and the emphasis in evaluation is on assessing fulfilled outputs and impacts.

The superiority of the developed model compared to previously used methods has been verified in national technology programmes in Finland. Total sum of the programmes has been about FIM 620 million. The research methods were participant observation and inquiry.

Two different samplings were used in the study. The larger sample consists of five technology programmes. The programmes were chosen to represent construction, electronic and engineering industries. This sample was examined using participant observation. The size of the sample is the number of the programmes' steering committees members, which is about 50. The smaller sample consists of two technology programmes in construction industry. This sample is examined by means of statistical analysis. The size of the sample is 144 experts, including 19 steering committee members, 86 external experts and 39 project managers, but 97 failed to respond. Response rate was 33%.

Plenty of knowledge about the advantages and disadvantages of the new model compared to earlier methods has been obtained by testing it in pilot-programmes. The usability of the new model in assessment and decision making of pilot programmes is estimated based on the direct feedback received in the implementation of the five Tekes technology programmes.

3 Description of the new method

3.1 Selection of the "Assessor"

Industrial research activities in Finland have recently shifted towards ordered research. On the one hand this is a good thing in those areas where there are enough orderers and the research will probably be concentrated on the proper subjects, at least from t he point of view of the orderers. On the other hand, business-related ordered researches often concentrates on resolving current short-term problems. Therefore public financiers should ensure the sufficiency of the allocation of funding for long-term research.

The process of assessment of research should be practised and developed extensively in order to define the concentration and effectiveness of research actions in Finland. At present the assessment is casual and is performed only if one of the orderers of the research programme sees it to be necessary [1].

The assessment of research actions is as a phenomenon as old as research and development itself. It has been and will be a constant part of the process of science and development [2].

The assessment of R&D both in research institutes, universities and enterprises can be divided into

- internal assessment, and
- assessment performed by an external party.

Internal assessment in enterprises is usually based on determining the opinions of the central interest groups concerning the examined subjects. Assessment performed from the point of

view of research institutes and public financiers has been rather insignificant, although its development has been considered important in recent years.

Enterprises perform the assessment from the point of view of business' economic utilisation of the results. Research institutes assess their research programmes mainly from the point of view of scientific utilisation of the results. Public financiers focus on assessing national science and technology policy and the long-term and mid-term socio-economic impacts of the research programmes [3].

3.2 Selection of the assessment criteria

Carlson [4] who has investigated the research programmes of Sitra over 20 years, was forced to note that "No one has this far been able to say how these (successfulness of the research) reasons can be verified. Those whose experience and intuition lead to the right direction are simply fine business men".

The assessment of science and technology policy that, for instance, OECD has performed for many years [5] have usually concerned common functionality, structures and resources of the research system.

The items to be assessed on the research programme-level have usually been the concentration, level, realisation of objectives, quality of performance, results and utilisation of the results of the research programme [2]

Above all, research objectives should be clear enough to enable their monitoring, control and assessment.

3.3 Collection of assessment data and analysing

According to Lemola [2] common methods used in the collection and analysis of assessment data include indirect measurement methods, expert methods and calculation methods.Indirect measurement methods and calculation methods are mainly quantitative while expert methods are qualitative.

Decisions concerning the selection of the data sources are also involved in the collection of the assessment data. Examples of the data sources are literary documents (technology publications and public statistics), experts, and users of the products, methods and services.

Ormala [6] divides assessment methods into three categories: those providing a framework for evaluation, those concerned with data collection and those concerned with data analysis. Again, in accordance with Ormala [6] spanning all the above-mentioned three main categories is the peer review approach.

Bozemann and Melkers [7] divides the assessment of the impacts on the R&D into the following five main methods: case studies, bibliometric techniques, patent analysis, peer review and operations research.

The assessment methods according to Wathernin [8] are the following: brainstorming, check list, matrix, cost-benefit analysis, case study, bibliometrics, peer review, technology indicators and Delphi.

3.4 Influence of the research type on the nature of the assessment

Assessment techniques can be divided according to the typical classification: basic research - applied research - product development [9]. The assessment of the applied research should

be both quantitative and qualitative. This make the assessment of this research type more variorum than that of other research types.

The report by OECD [10] emphasises the assessment of the results pursued by the basic research and the large socio-economic impacts. It emphasises the peer review, and bibliometrics methods.

In the assessment of the economic and social impacts it is evident that usually no single method can be sufficient alone. It is appropriate to use several methods at the same time. The central methods are the following: case studies, before/after comparisons, control group approach, and econometric simulations and measures [10].

3.5 Importance of the phase of the research programme in the selection of the assessment criteria

The assessment can be divided according to phases of the R&D process into [10] pre-assessment (ex ante), mid-term assessment (interim), and post-assessment (ex post).

In the pre-assessment and mid-term assessment the research can still be redirected. The post-assessment concentrates on evaluating the realisation of the set objectives and on suggestions for further activities.

3.6 Reliability and compatibility of the assessment criteria

The assessment can also give a distorted image of the subject examined. The mechanisms leading to this are [11]:

- difficulties in definition of the measurable attributes and the measuring errors and interpretation differences,
- describing the large item entirety with too few indicators,
- usage of wrong indicators,
- careless usage of the combination formulas,
- central significance of only quantitatively assessed attributes, and
- extensive significance of latent or silent knowledge (tacit knowledge) [12].

The indicator truth is only a part of the available truth and even smaller part of the whole truth.

3.7 Present stage of assessment in technology programmes

Several assessments of the applied industrial research have been performed in Finland and in Scandinavia during last years. These assessments have mainly concentrated on the evaluation of the scientific level and quality of the research actions.

The increase of the research programmes in EU has also remarkably stimulated the assessments. These assessments have mainly concentrated on evaluating the scientific level and quality of the research actions. A central challenge in the future will be enhancing the assessment of mid-term and long-term economic and social impacts.

Assessments performed by the internal experts of the research institutes is the most commonly used method in the United States. These assessments have mainly focused on evaluating the scientific level and quality of the research.

Olds [13] in his meta-analysis of the assessments of science and technology programmes in EU analysed the implementation of the programmes as follows:

- The assessments have given no consideration to the central problem: how to move programmes from knowledge production to tangible benefits?
- Projects in the programmes are chosen from the point of view of making the knowledge usable to a large number of people (social benefits) but the post-evaluation emphasises the establishment of the new product. Here we have a clear conflict.
- The difficulty of the problem of assessment has not been recognized. Olds compares assessment to a bird that is fed (input), whose flight is followed (monitoring), that sometimes lands (side effects) and finally flies behind the mountain (long term impacts).
- Olds also refers to a research by Ford and Lake according to which enterprises implement only periphery projects in technology programmes.
- The experiences of management should be collected by interviews and inquiries and the results should be made available during the programme. A more accurate bibliographic analysis of the management and scientific-technological level of the programmes would be completed later.

A point that should be emphasised is that the assessment should be continuous and entrusted to the same parties who are responsible for the implementation of the research. A major trend in current assessments is the development of the mechanism for controlling the programmes.

For assessment the research programme should be modelled as a process that links the programme's inputs and outputs together.

A problem in the assessment of applied research programmes that have participants from both research institutes and several enterprises has been how to establish common project objectives.

Assessment and decision making for applied research has been difficult because no clear objectives have been set for the programme, and measurable attributes have not been agreed beforehand. Therefore the external evaluators have considered the criteria to be assessed afterwards.

Appropriate external evaluation would evaluate those methods and arguments that the research programmes have made their decisions upon.

It is essential, in the assessment and decision making, to consider the party whose point of view is used. Public financiers usually have a more common social and structural view on the impacts of research than enterprises that examine the impact mainly in relation to their own business. Research programmes can have both of these objectives or neither of them. At present this has not been stated clearly in the setting of objectives for the programmes.

All of the assessments presented above have been coordinated by public financiers that have tried to envision the success of the programmes afterwards. This implies that the assessment emphasises the viewpoints pertaining to the social and structural impacts of the research programmes.

A central result is that the metrics of the planning phase of the research programmes are quite primitive, while post-evaluations has received excessive attention although they have no steering effect on the programme.

Industry has been asked about its opinions ont the success of objective setting and also asked afterwards in the assessments, but there has been no closer scrutiny of this item. For instance, there has been no systematic assessment indicating the reasons why industry has chosen the objectives and the metrics used to assess attainment of the objectives. Many assessments have, besides closed questions, also included some open questions on the basis of the objective setting , but the answers to these questions have not been documented. Many peoplewho were interviewed in the assessments of the research programme noted that this 'unofficial', un-documented discussion with the evaluator gave more valuable feedback information than the assessment report. The assessments of the research programmes seem to have two kinds of effects: new operation models for the assessed research programme parties and information for the public financiers on the success of the research programmes.

A good example of the development of assessment and decision making for research programmes is that Japan differs from the other OECD-countries in that only a few separate post-evaluations have been performed there. The assessment actions as such are extensive and active but have primarily been structured inside the programmes as a part of their normal planning and monitoring [15]. Compared with other OECD-countries, the assessments have concentrated more on assessing the effectiveness of the performance and utilisation of the results.

3.8 The new method

A new systematic method for the assessment of R&D programmes has been developed based upon the literature described above. This method has been applied in several pilot technology programmes. The new method includes systematic methods for assessment and decision making for R&D programmes. The method is a management tool, which helps management make decisions based on the information produced by the assessment process.

Several parties benefit from the new method, because it:

- leads companies to a more effective R&D-process and follow-up of outputs and impacts
- leads research institutes to base their operation on the needs of industry, and
- improves the control of public science and technology policies and the assessment of medium and long-term impacts of R&D programmes.

The method is based on a theoretical model which can be applied as a practical tool for different organisations. The method developed at TUT especially supports common R&D projects between enterprises and research institutes. According to the prestudy [15], an essential problem in such projects is inadequate common objectives and control mechanisms. Hence a lot of resources are wasted when the different parties to the R&D project only consider their own narrow benefits. Control mechanisms of projects, the utilisation of results and connections between R&D and business strategy can be improved remarkably.

The method is based on the data collected in the prestudy, common models of decision making, international assessment methods and theoretical research at the international level. A practical method has been developed in a real decision making situation, which helps to assess projects in the planning, implementation and utilisation phases.

R&D programmes' management and assessment are parallel processes that can be modelled, and the criteria which primarily affect the ability of industry and society to utilise the results and benefit from them can be discovered by studying their interaction. These criteria are not generally applicable but highly programme-specific.

The study attempts to combine the assessment and management aspects of R&D programmes in order to develop a new assessment method. It is impossible to find a single generally applicable assessment model to describe the R&D programme process in detail and to serve as a basis for analyses. Especially in the field of public R&D, the different bases of programme parties and the variety of R&D projects complicate the assessment (Figure 1). A viewpoint of R&D as part of the innovation process at time T can be presented in the form of the following questions.

1. How can R&D directly exploit product development ?
2. How can R&D in future exploit product development ?
3. How can R&D in future exploit R&D?

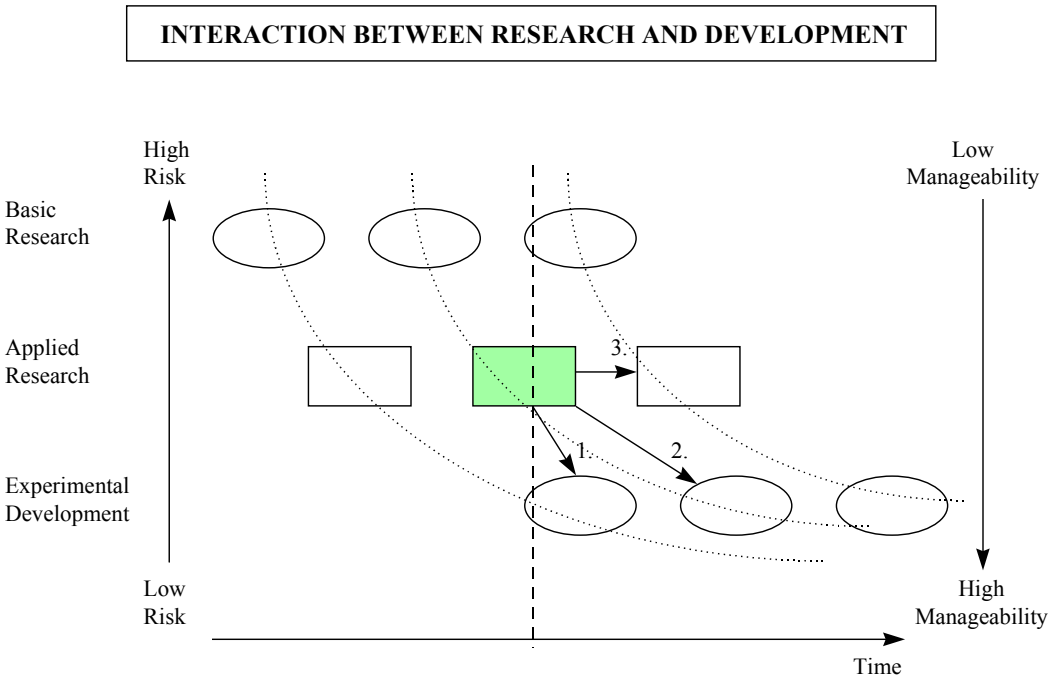

Figure 1. Interaction between research and development as a function of time.

The assessment method meets the following basic criteria:

- The method helps select the best possible quantitative and qualitative assessment indicators vis-à-vis the goals of R&D projects.
- Decision making criteria should be flexibly modified based on the decision-makers' needs during the programme.
- Evaluation and management is primarily internal assessment.

- External assessment is used to ascertain the reliability of the programme's own evaluation and management.
- Monitored criteria are to be prioritised separately from the perspective of each involved party.
- Monitored criteria must be defined so that their selection can be unambiguously verified afterwards.
- The method can be applied to various levels of R&D (e.g. R&D programme or project levels).

In the following, assessment means the determination, acquisition and analysis of objective data for the planning, implementation or result utilisation phases of R&D programmes, from the viewpoint of policy makers, industries or research organisations.

Assessment method is a process divided into four parts, as follows (Figure 2):

- Preparation of the assessment strategy of R&D programme,
- Implementation of appraisal,
- Implementation of monitoring and
- Implementation of evaluation.

Utilisation of the assessment process in the programme's decision-making is the fifth part in the entity.

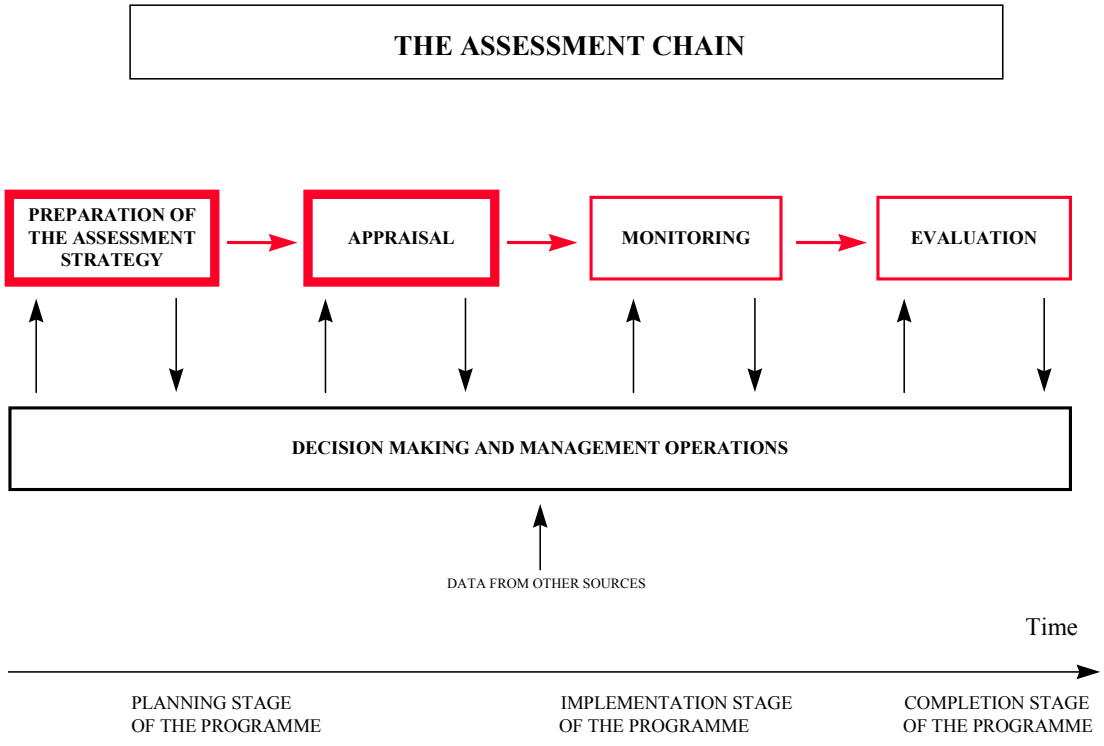

Figure 2. The assessment chain.

Next, one most crucial feature of the assessment method is presented. In the appraisal phase of the assessment the following question is asked: Are the objectives the right ones (appropriateness of the goals)? The objectives are divided into desired impacts, desired outputs and desired activities. Hoped for impacts are determined first and hoped for outputs after this. Relevant activities are determined finally.

In more details the mentioned assessment topics are divided to the sub questions as follows:

- **Hoped for impacts of the programme**
- What measurable direct impacts the programme should have ?
- What measurable impacts on the entire manufacturing industry the programme should have ?
- What measurable socio-economic impacts the programme should have ?
- **Hoped for outputs to achieve impacts**
- What profitable focus areas should be in the programme to achieve mentioned impacts ?
- What kind of knowledge (applied research) the programme should produce to achieve the mentioned impacts ?
- What kind of skills (pilot-projects) the programme should produce to achieve the mentioned impacts ?
- What kind of commercial products, methods and services the programme should produce to achieve the mentioned impacts ?
- What other kind of concrete outputs the programme should produce to achieve the mentioned impacts ?
- **Activities to achieve impacts and outputs**
- How has the utilisation of resources of technological know-how been planned to achieve the mentioned outputs ?
- How has a utilisation of economic resources been planned to achieve the mentioned outputs ?
- How has the importance of outputs to the business economy been defined from the point of view of the participants ?
- How has the utilisation of mental and creative resources been planned to achieve the mentioned outputs ?
- How has the support services to utilise the outputs offered by the programme to projects been planned ?

A crusial tool for illustrating the targets of the programme is so called logical frame. A logical frame for the national Tekes SPIN (Software Business) technology programme is presented in Figure 3.

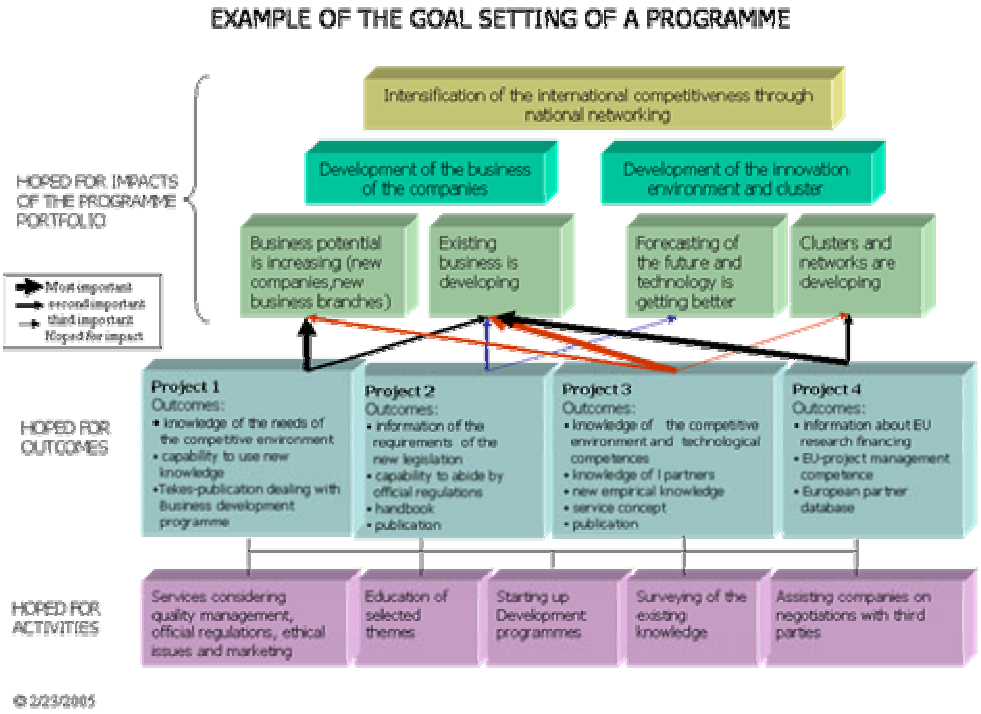

Figure 3. Example of the goal setting of national Tekes SPIN (Software Business) technology programme.

4 Results

The results of this research indicate that the new model developed includes several features better than previously used methods. The main result is that the new model is better in the objective and systematic definition of the objectives for a technology programme. This was the main criterion testing the applicability of the model. The secondary criterion for supported the main criterion's emphasis of a three-step procedure for the setting of objectives where the objectives of a technology programme are divided into impacts, outputs and activities.

A more detailed survey based analysis of the differences between different respondent groups, including 19 steering committee members, 86 external experts and 39 project managers is done. 97 respondents failed to respond.

The following conclusions can be drawn from Figure 4:

- The different respondent groups were quite unanimous about that the new model is better in the objective and systematical definition of objectives. This was the main criterion in testing the applicability of the model.
- The largest differences between respondent groups were found in their opinions about the definition of the programme manager's duties and about defining objectives in such a way that the external parties of the programme can also understand its central objectives.
- Especially the steering committee members think that the new model is better in defining the programme manager's duties.

- Especially project managers of the programmes think that the new model is better in the definition of objectives in such a way that also the external parties of the programme can also understand its central objectives.

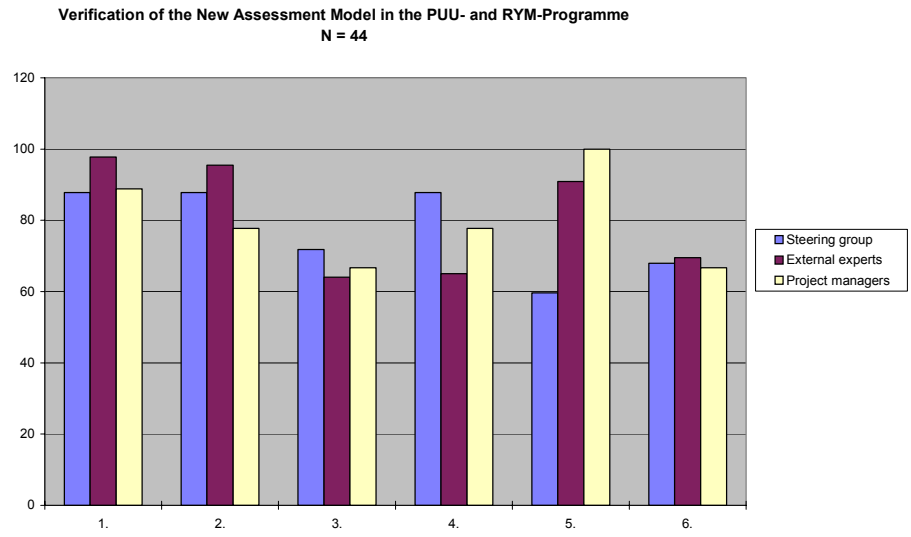

Figure 4. Verification of the New Assessment model by the WOOD-Programme Steering Group, External experts and Project managers in Respect to Other Assessment Models. Percentage of "better" Attributes in each Respondent Group. Categories of the histograms: 1. Setting the programme's objectives objectively and systematically so that the realisation of these objectives can be assessed afterwards. 2. Dividing the programme's objectives into impacts, outputs and activities so that the essential focus areas can be found easily. 3. Describing the programme's objectives in such a way that it increases the commitment of the different parties to the programme. 4. Defining the programme manager's duties in such a way that he will be able to work consistently with the programme's steering committee and with projects. 5. Describing the programme's objectives in such a way that the external parties of the programme can also understand its essential objectives. 6. Describing the programme's objectives in such a way that it steers the selection of the objectives for the programme's projects from a business perspective.

The study underlines, that special attention should be paid to the determination of impacts and outputs. After that it is easier to determine activities to achieve the desired impacts. The connection of the technology programme's objectives with the objectives of the participants would become significantly more intensive if the parties had documented objectives produced by the same systematic method, which is explained in this report. No documented method for assessment of R&D has been found in any enterprise (130 enterprises) during this research. Attributes are usually not connected with objectives at the assessment planning phase but, for instance, defining a priority list of socio-economic impacts at this phase has helped in directing further assessments.

5 Conclusions

A new model has been developed in this study that has many clearly better properties compared with the previously used methods.

The main result is that the new model is better than the previous ones in terms of an objective and systematic setting of objectives for a technology programme in manufacturing and construction industry. This was the main criterion in testing the applicability of the model.

The following conclusions can be drawn on the basis of the study material:

1. Good results have been achieved in technology programmes when the steering committee of a programme has actively participated in the preparation of the assessment strategy. The biggest benefit from the assessment strategy can be achieved when it is done in parallel with other preparation of the technology programme.
2. The appropriateness of the objectives is usually the most central field in assessment. There are real possibilities to affect the programme at this phase. It gets increasingly difficult to change the decisions made as the programme proceeds. It is difficult to separate costs of internal assessment and steering from other managing costs.
3. Special attention should be paid to the determination of impacts and outputs. After that it is easier to determine activities to achieve the desired impacts. The connection of the technology programme's objectives with the objectives of the participants would become significantly more intensive if the parties had documented objectives produced by the same systematic method, which is explained in this report. No documented method for assessment of R&D has been found in any enterprise (130 enterprises) during this research. Attributes are usually not connected with objectives at the assessment planning phase but, for instance, defining a priority list of socio-economic impacts at this phase has helped in directing further assessments.
4. Extensive socio-economic and indirect impacts and new knowledge are part of the external impacts of a programme (externalities), which have a wider scope than only the parties participating in the programme. On the other hand, impacts are not achieved only by the programme but other elements also have impacts. The main part of impacts and outputs are not documented or observed (invisibilities), but these items can have a great importance, for instance, in starting additional research projects. Invisibilities are also closely related to the concept "tacit knowledge".
5. In this method, the utilisation of outputs has been shown only as one item under the main heading Activities. It has been strongly stated that the Utilisation of Outputs should be a heading parallel to the heading Activities. This would stress the programme level idea that the mapping of existing knowledge and its utilisation should be started instantly after the selection of the focus areas along with the R&D. It seems that there is a major demand for more effective utilisation of existing knowledge.
6. In data collection the significance of information obtained by open interviews is emphasises; this information makes it possible to interpret the numeric information critically.
7. It is essential in planning to consider the things to be assessed at different programme phases and after that the follow-up procedure. This must be done in different interview rounds. The issue is too extensive to be discussed at one time, and the authorities responsible for defining objectives are not the ones responsible for defining the follow-up procedure. In addition to the responsibility questions, decisions should be made about the production of information needed for decision-making. Even if the responsibility for assessment of certain things lies with an external evaluator, it is recommended that the main part of data produced as a basis for decision-making is the responsibility of projects. This is a distinct and important trend in European assessment practice concerned with both internal and external assessment.
8. It is essential to define what kind of information is output by projects to programme level and what kind of information is produced at the programme level.

9. The results of pilot projects strongly suggest that the systematic assessment of projects requires comparing the analysis of assessment with criteria of a few national and international technology programmes. An international database will be added to the assessment method to assist the analysis. This database makes it possible to compare the results of different programmes. The development work will be done as an international cooperation project.
10. The utilisation of assessment results has clearly revealed differences depending on which phase the assessment plan has been made. Comments from the steering committee and the utilisation of impacts in the own organisations of the steering committee members have been considerably better when the assessment plan has been made during the preparation and starting phase of the programme.
11. Using the model as early as possible in starting a technology programme is perceived important. The model was applied in the pilot-programmes included in this research when the programme manager or the preparator of the programme had worked about one year with the programme. The programmes could have drawn even more concrete benefits from the model if the model had been introduced earlier. This is verified by the fact that the sub criterion lends support to the main criterion's emphasis of a three-step setting of objectives where the desired objectives of the technology programme are divided into hoped for impacts, hoped for outputs and hoped for activities.
12. The different respondent groups were quite unanimous that the new model is better in a systematic and objective setting of objectives, which was the main criterion in testing of the applicability of the model. The largest differences between respondent groups were found in the definition of the duties of the programme manager and in the description of the objectives in such a way that the external parties of the programme would also understand the central objectives. Especially the steering committee members considered the new model better in the definition of the programme manager's duties. The programme manager, in turn, considered that the new model is better in the description of the objectives in such a way that the external parties of the programme would also understand the central objectives. The weakest point of the new model was estimated to be the commitment of the different parties of the programme and the interest groups of enterprises.

The study can be criticised mainly for the reliability of the results received from the inquiry survey, since the sample and the respondent rate were quite small. The reliability of the results could have been improved by a few completed interviews besides the inquiry. This was not done. Likewise, the test arrangements and their documentation in participant observation should have been made more carefully. A more careful implementation of the participant observation concerning the scope of the study would have required much greater contribution than what was possible in this study.

Some criticisms can also be presented about the fact that the present state analysis was made from the point of view of utilising the results of R&D while the model development work and related piloting was made from the point of view of setting objectives for the technology programme. The purpose was to gain a deeper understanding during the present state analysis to revise the emphasis of the research, which can be considered to conform with the current research traditions.

In this study the model has been applied in the starting phase of technology programmes. It is extremely important to continue the application of the model in the pilot programmes to

the end of the programmes. The process should be documented accurately and the applicability of the new model should also be assessed in this respect.

It would be also be useful to apply the model in an even earlier phase of planning the technology programmes in some pilot programme. In that way the model could be tested in a more comprehensive framework.

The application of the model in international benchmarking of technology programmes is also desirable because the international nature of technology programmes will be emphasised in further development of the programmes. Successful international comparison will assume the introduction of the same kind of procedure or at least an understanding of the way of thinking in the programmes to be compared. There have been interesting discussions concerning the subject with different parties in Europe, USA and Japan.

The following subjects should be taken into consideration in the application and further development of the model:

1. The current situation and the nature of the each programme should be taken into careful consideration in the applications of the model. The subjects described in the model are not suitable for all technology programmes but the appropriate tools could be chosen for a single programme.
2. The reliability of the data collected by the model should be considered critical. This is especially important when the data collected in internal assessment is also used as basic data for the external evaluation. Special consideration should be given to the sources of information used in the internal assessment: how much information is collected from external experts and from other objective data sources.
3. Definitions of the criteria to be assessed should be improved. The central issue is to define sub-criteria supporting the main criteria for a single technology programme. That would enable a clear interpretation of the criteria.
4. The linking of national and branch specific strategies to technology programmes should be improved. Steering committee work can as such considered as a important branch specific R&D strategy work, but the performance could be intensified by inviting experts who have participated in defining national R&D strategies and technology policies to be heard in the steering committee. National strategies are seldom written in an easily understandable language. The hearing of the experts in the steering committee would enhance the linkage remarkably.

The model for the setting of objectives presented in the research has not been developed to its final form. The model is flexible and can also be applied extensively to other purposes than national technology programmes. Application targets worth proving are research and development programmes of different ministries at the national level. The model could be also applied in internal research, technology and development programmes of enterprises, research institutes and other organisations.

The study has been mainly targered to the construction industry. The observation experiences show that the new assessment model might be useful on the other industrial areas as well.

“The answers will live their time but the questions will appear again” (Writer Samuli Paronen)

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Pekka Berg
Innovation Management Institute
Helsinki University of Technology
PO Box 9555
FIN-02015 HUT
Tel. +358 9 451 6032
Fax +358 9 451 3665
E-mail: pekka.berg@hut.fi