

A LOOK INTO THE BLACK BOX

What difference do
IWT R&D grants make
for their clients?

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IWT-studies worden uitgegeven door IWT-Vlaanderen in het kader van het werkprogramma van de unit Monitoring & Analyse. De auteurs blijven persoonlijk verantwoordelijk voor de standpunten die worden ingenomen bij de uitwerking van deze studies.

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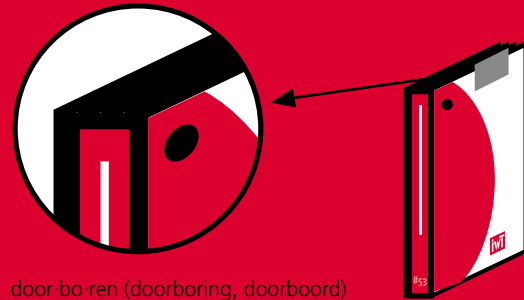
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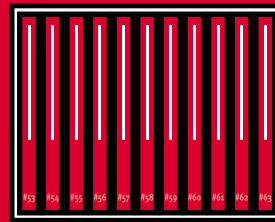
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DOORBORING



door-bo-ren (doorboring, doorboord)
1 in iets doordringen
2 doorgaan met boren
3 gaten maken in



BEWAARDOOS

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Preface

After 15 years of public funding of company R&D by IWT it seemed proper to undertake an intelligent exercise of measuring the impact of those programmes on the R&D and innovative behaviour of its clients.

In the past more classic approaches of the so called additionality of R&D-grants have been conducted to measure the added value at the start of the project – in terms of input – or at the end of the project – in terms of output or even outcome. But what still remained fuzzy or even a complete black box with these approaches was what happened in between, this is during the project, affecting the company's behaviour in one sense or another. An impact in terms of resources, in terms of the innovation process within the company and also in terms of results of the R&D and innovation projects of the company. In other words, do IWT funds help companies to conduct their R&D-activities in another way than they would have done without the help of IWT? Does IWT really make a difference?

Thanks to the theoretical framework developed by Georghiou (2003) and implemented by IWT in a pilot study in 2004, we can now present the results of a full scale study on this so called behavioural additionality of IWT grants. Not less than 382 companies have been involved in the survey of whom 100 (still) no IWT client. We would like to thank them all for their understanding and their valuable time for answering to the many questions. This study is pioneering in its



kind, not only because of the methodological improvements to the questionnaire, but also of the novel research design making use of not one but even two control groups. This is an essential part of the study if one wants to really grasp the 'difference' a public grant – and this could consider every kind of grant – makes for the beneficiary. So measuring “additionality” and not only “effects”.

After this study the question IWT asked itself can be answered in an affirmative way: IWT does make a difference for its clients in many respects. IWT succeeds in selecting the most successful projects, having a higher additionality. But the findings contain also many more details that we still have to look at it in a closer way, detecting differences according to company size and age. Big companies clearly react in a different way than SMEs and starters are not comparable to SMEs already having a certain track record.

We are convinced that this study will contribute to a better understanding of the efficiency and effectiveness of IWT grants, of the impact that public funding can have on the innovative behaviour of companies and of the place that IWT grants can take in a broader innovation policy mix.

Paul Zeeuwts
President IWT



Executive Summary

“Policy makers seek ways to evaluate the ‘additionality’ of public support to business R&D, i.e. ‘what difference does public support make’?”

WHY A STUDY ON BEHAVIOURAL ADDITIONALITY?

Questions on the efficiency and effectiveness of public funding of business R&D are of growing importance to policy makers. As they attempt to stimulate business R&D expenditure and improve its contribution to innovation, policy makers seek ways to evaluate the ‘additionality’ of public support to business R&D, i.e. ‘what difference does public support make’? The impact has typically been approached in terms of input or output measures only, treating the firm as a black box and not adequately capturing the impact of public intervention on the innovation process, the company rationale and attitude itself.

An emerging stream in evaluation studies, however, aims to **look into this black box** and to explicitly measure changes in the ways firms conduct R&D in the wake of public policy instruments. Do these instruments encourage firms to pursue different types of R&D or to strive for more collaboration in the R&D process? Is there an effect on the duration or the speed of the projects? Do firms develop improved R&D management capabilities while carrying out publicly funded R&D projects? These differences in firm behaviour resulting from government intervention are referred to as ‘behavioural additionality’.

This study presents the results of a project commissioned by IWT (Institute for the Promotion of Innovation in Flanders) that aimed at analysing and evaluating the behavioural additionality of the funding provided by IWT within the context of the R&D-company and the SME-support programmes.

AN INNOVATIVE RESEARCH DESIGN

In this study we have addressed the following key research questions:

1. Do IWT projects and subsidies lead to behavioural additionality?
2. Which company and project characteristics stimulate behavioural additionality and which do not?
3. How different are the measures of behavioural additionality, input and output additionality: do they reinforce each other or do they merely co-exist?

The data and information collected to address these research questions came from two sources: a telephone survey and in-depth interviews. The telephone survey was set up among three different groups. The experimental group refers to 194 companies that have received IWT support for one or more projects in the period 2001-2004. Control group A were 88 companies that applied for IWT support but were rejected. We consider them as the “treated” control group. Control group B contained 100 companies that are known to be innovative, but never applied for IWT support. Because they have not been in touch with IWT, we consider this control group as the “real” control group. The use of control groups and in particular of a control group that has never been in contact (not “treated”) with the public agency (i.e. control group B) is one of the novelties of this research.

We furthermore conducted 50 in-depth face-to-face interviews, both with occasional as well as regular IWT clients, to collect more qualitative inside information in order to support and illustrate the results from the telephone survey.

In what follows we present the main findings of this research structured along the different additionality concepts that we have considered.

“ What would have happened with the project if it would not have received IWT support? That is the ‘counterfactual’ question.”

‘WHAT IF NO SUPPORT?’ VERSUS ‘WHAT NOW WITHOUT SUPPORT?’

We asked the respondents of the experimental group what would have happened with the project applied for in case it would not have received IWT support. For the experimental group, this is a hypothetical situation, as they in fact have received IWT support for the specific project. Therefore, it is interesting to compare their answers with those of the respondents in control group A, companies that actually have not received IWT funding.

According to the respondents of the experimental group, about 40 % of the projects would not have taken place without IWT support (i.e.. the hypothetical situation). This percentage is confirmed by respondents of control group A (i.e. the actual situation) and is independent of the company size. Many of these projects take place in companies where innovation remains a too risky business so that the projects remain dependent on external public funding. Projects that are still far ‘away’ from market valorisation or are not within the current business lines, also have a high chance of being cancelled if not supported by IWT.

Nearly half of the projects would, according to the IWT clients, take place but with a reduced budget. In reality, according to the respondents that were denied IWT support, this is the case for 1 out of 4 projects. The budget and also the scope may be reduced by cutting of the ‘nice to have’ or by reformulating the project towards more applied instead of more basic research.

About ten percent of the projects would still take place with the same (proposed) budget in case IWT would refuse support, at least according to the respondents of the experimental group. In reality, 1 out of 3 projects has taken place with the same budget. Among these respondents there are many strongly innovative companies where a go-no go decision is usually taken on the basis of the viability of a business case and not on the potential support by IWT.

DOES IWT INFLUENCE THE RESOURCES SPENT ON R&D AND INNOVATION?

This question is about to the so-called input additionality of public funding, i.e. whether public funding is a substitute or a complement to the private R&D funding. In a broader sense we also refer to the impact of the IWT funding on the resources for innovation, and even the innovative behaviour more in general.

The share of the IWT subsidies in the total R&D-outlays remains below 10 % for 2 out of the 3 large companies but is much higher for the SMEs and the starters in particular. For a number of SMEs and starters, the IWT funded project is the only R&D project carried out.

In case the project would have taken place without IWT funding, the experimental group would have replaced the IWT subsidy in most cases by a smaller amount of internal funding. This is confirmed by the responses of control group A that were actually denied IWT funding and also during the interviews where many interviewees indicated in addition that follow-up projects that no longer qualify for IWT support are also financed through internal sources.

A majority of about 70 % of the respondents agreed that since the IWT project, they regularly undertake R&D or innovation projects and devote more attention to R&D and innovation activities. Examples are an SME company that by carrying out an IWT funded R&D-project became aware of the importance of R&D - "We are not too small" - or another company that in the past was used to wait for signals it received from its clients before starting to innovate (i.e. reactive), but since the IWT project started to initiate innovation projects by its own (i.e. proactive). Furthermore, 96 % of the respondents of the experimental group intends to apply again for an IWT grant, but also 60% of control group A, who were denied IWT support, will submit new applications.

“ Input additionality is about the question whether the public funding simply substitutes or rather complements the private R&D funding. ”

“Forty percent of the projects are breakthrough projects, getting two thirds of the total funding.”

DOES IWT HELP TO EXPLORE NEW HORIZONS ?

90% of the respondents within the experimental group were already active in the product market which the IWT funded project related to. There is a “rather big” to “perfect” fit between the IWT project of the experimental group and the core-activity of the companies. In addition, the origin of the project is for about one fourth of the respondents of the experimental group an additional element to ongoing R&D, and not an entirely new project. 40 % of the projects are breakthrough projects in terms of technology impact - using for the first time a technology that is new to the industry - or marketing impact - filling previously unknown and unmet needs. These projects receive 66 % of the funding. These results and also the comparisons with the control groups do not suggest substantial scope additionality.

Nevertheless, the respondents of the experimental group indicate that there is a positive, though not large impact, of the IWT support on the goals - they become more ambitious - and the scale - a larger scale - of the project. This is confirmed by the respondents of the control group A and also by most of the interviewees.

Many of the latter agreed that the projects they submit for IWT support are of a different nature than the ones they perform internally. The IWT support for instance allows them to do larger projects that fall outside the scope of their current business lines, projects that the companies could not carry out on their own. Similarly, several companies mentioned that IWT support allows them to perform more basic research projects with a higher risk profile. These projects would be the first to be cancelled if support would be denied, definitely when budgets are tight like in periods of economic recession.

DOES IWT RESULT IN MORE R&D-NETWORKING ?

First note that IWT clients in general are used to R&D-collaboration. More than 2 out of 3 companies within the experimental group are involved in non-subsidized R&D cooperation. This is significantly less the case for the companies in the control groups. The IWT support has, according to the respondents of the experimental group, no or only a very limited positive effect (on average) on the number of external collaborators. The respondents of control group A, who did not obtain IWT support, are more affirmative about the positive impact of IWT support on the extent of collaboration.

Many interviewees, especially among the SMEs but also among the larger companies, indicate that the IWT funds are very often used to pay the partners. Without this subsidy, these partners could not be involved or would be involved to a lesser extent. In particular among SMEs, it is very often the partner that brought the company in contact with IWT.

Besides the impact on the number of partners, we also found an impact on the type of partners. There is network additionality, more in particular for the partners that are more oriented towards basic research. Because with the partners that are more oriented towards applied research, there is in many instances cooperation outside IWT projects as well.

DO IWT CLIENTS BECOME 'SMARTER' THANKS TO THE AID ?

The respondents of the experimental group agree with the statement that the IWT project allowed them to acquire new knowledge. The other items, such as impact on management capabilities, networking skills, HR upgrading have on average been situated below the 'agreement' scores. There are no significant differences on these statements among the experimental group as far as company size is concerned.

“Technology, skills, project management experience etc “spill over” to other business units or other R&D and innovation projects making the company as a whole “smarter”. ”

“ The success rate of the projects supported by IWT is higher than for those projects that were denied IWT funding ”

The technology, skills, project management experience etc. of the subsidized projects “spill over” to other business units or other R&D and innovation projects. According to the respondents of the experimental group this is true in particular for the project management experience and the future ongoing collaboration with the same partners.

The interview results suggest that especially the companies that are less formalised in terms of their R&D-organisation, become ‘smarter’. For instance: writing a proposal helps to define the research questions in a clearer way. Some of these companies also have learned to work more project-oriented, drawing-up schedules and setting milestones. Others referred to the positive impact on their networking competences.

DOES IWT SPEED UP R&D-PROJECTS ?

When time to market is important, companies will not submit the projects for IWT support because they must first write a proposal and then wait for the decision on the funding.

However, for the projects that are submitted, the IWT grant enables companies to undertake their project faster on average than what would be possible without IWT support. Companies confirmed that the IWT support may help to start a project earlier because it gets a higher priority, while without funding it would be postponed due to a lack of internal financing. Projects can also be realised faster with a better competitive position as a consequence. The IWT support for instance allows including partners that can perform certain tasks more efficiently, whereas the obligation to submit progress reports and to respect deadlines puts pressure behind the project, especially within traditional SMEs where the time spent on innovation must compete with the day-to-day production activities.

HOW SUCCESSFUL ARE IWT SUPPORTED PROJECTS ?

69 % of the product innovation oriented projects of the experimental group resulted in the introduction of a new or improved product, for another 18 % this will very likely or certainly be the case in the next 2 to 5 years. Analogously, nearly 60 % of the process innovation oriented projects resulted in the introduction of a new or improved production process, and another 21 % will very likely or certainly be successful in the next 2 to 5 years. 30 % of the product innovations and 38 % of the process innovations resulted from projects that would have been cancelled without IWT support. The success rate of the IWT sponsored projects is higher than for those projects that were denied IWT funding, in particular for the process innovation oriented projects.

Sometimes the output of the project was also considered to be very positive because the results could be used in follow-up projects. Moreover, new products or processes are not the only kind of outputs that can be considered as a measure of success of the projects. Some companies could patent the knowledge they developed and now have revenues from these patents such as royalties and license income. Other companies stressed the fact that IWT support is important for long term development, so that in the short run one should not expect important outputs in terms of new products.

DOES IWT HAVE A STRATEGIC IMPACT ON THEIR CLIENTS ?

There is qualitative evidence of the impact of IWT subsidies on the R&D- and even production location decisions of the supported companies, in particular among the large, foreign owned companies. In the context of internal competition for the scarce company R&D budgets, the IWT support may be important to keep and even further expand the R&D-activities in Flanders. The

“ Some starters indicated that they would simply not exist without the help of IWT. ”

optimisation of R&D decisions happens at group level where it will be checked whether a project can be subsidized by IWT and therefore can be carried out in Flanders. Without this funding, the company can do the research wherever it wants. The IWT support also has a positive impact on the attitude of some foreign holdings towards an on local needs based and on site organised R&D organisation model.

The fact that the IWT subsidies allow some companies to keep certain activities in Flanders also translates into employment that can be kept stable. No IWT support would result in less R&D-capacity in Flanders, a more limited research portfolio and less new products for those companies. Another strategic effect that was mentioned by a number of companies is that the IWT subsidies allow the companies to continue their research activities also during economic recessions.

Finally, a number of starters indicated that they would simply not exist (or not survive) without the IWT subsidies. The public support they receive is crucial for them to bridge the so called *Valley of Death* till they become viable on their own, or until they can attract alternative financial means from the private market.



WHY BOTHER ABOUT BEHAVIOURAL ADDITIONALITY?

Chapter 1

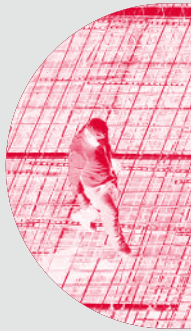
“Behavioural additionality is defined as the difference in firm behaviour resulting from a government intervention. Efforts to explicitly measure behavioural additionality have remained relatively underdeveloped until recently.”

Questions on the efficiency and effectiveness of public funding of business R&D are of growing importance to policy makers (OESO 2006). As they attempt to stimulate business R&D expenditure and improve its contribution to innovation, policy makers seek ways to evaluate the “additionality” of public support for business R&D, i.e. “what difference does public support make”.

Traditional evaluations focused on determining the amount of additional spending on R&D that resulted from government support (input additionality) or the additional outputs from the R&D process (output additionality). The evaluation of input as well as output additionality is a complex issue because of the technical measurement problems. At least as important is the observation that the relation between input and output is complex and related in an unspecified way. Its observation therefore requires an in depth insight into how an organisation operates. Until recently, little effort has been made however to identify ways in which government policy influences the type of R&D conducted by firms or the ways in which such R&D is conducted. The impact has typically been formulated in terms of input or output measures only, treating the firm as a black box and not adequately capturing the impact of public intervention on the innovation process itself.

In order to solve this problem, a third notion of “behavioural additionality” has been introduced. This concept is defined as the difference in firm behaviour resulting from a government intervention. This emerging approach to evaluation aims to measure explicitly changes in the ways firms conduct R&D as a result of government policy instruments. Does it encourage firms to pursue different types of R&D, or to include more collaboration in the R&D process? Do firms develop improved R&D management capabilities that lead to enduring changes in their R&D strategy and performance?

The behavioural changes might be present whether or not the firms conducted more R&D. As such, behavioural additionality aims to complement, not to replace, other traditional evaluation approaches focussing more on inputs and outputs of the R&D processes.



Efforts to explicitly measure changes in the ways firms conduct R&D as a result of public policy instruments have remained relatively underdeveloped until recently. However, the behavioural additionality of public R&D support, has become an important topic in recent evaluations of government financing of business R&D¹.

This study presents the results of a project that aimed at analysing and evaluating the behavioural additionality of the R&D subsidies IWT provides to companies, more particularly within the context of the R&D-company programme and the SME-programme. The project built on the exploratory pilot study carried out in 2004². We set up a telephone survey among three different samples: an experimental group and two control groups. We first analysed the results by size of the company and subsequently took into account multiple company and project characteristics to explain the observed additionality results. In addition, we conducted about 50 interviews to collect qualitative case material in order to support and illustrate the results from the telephone survey.

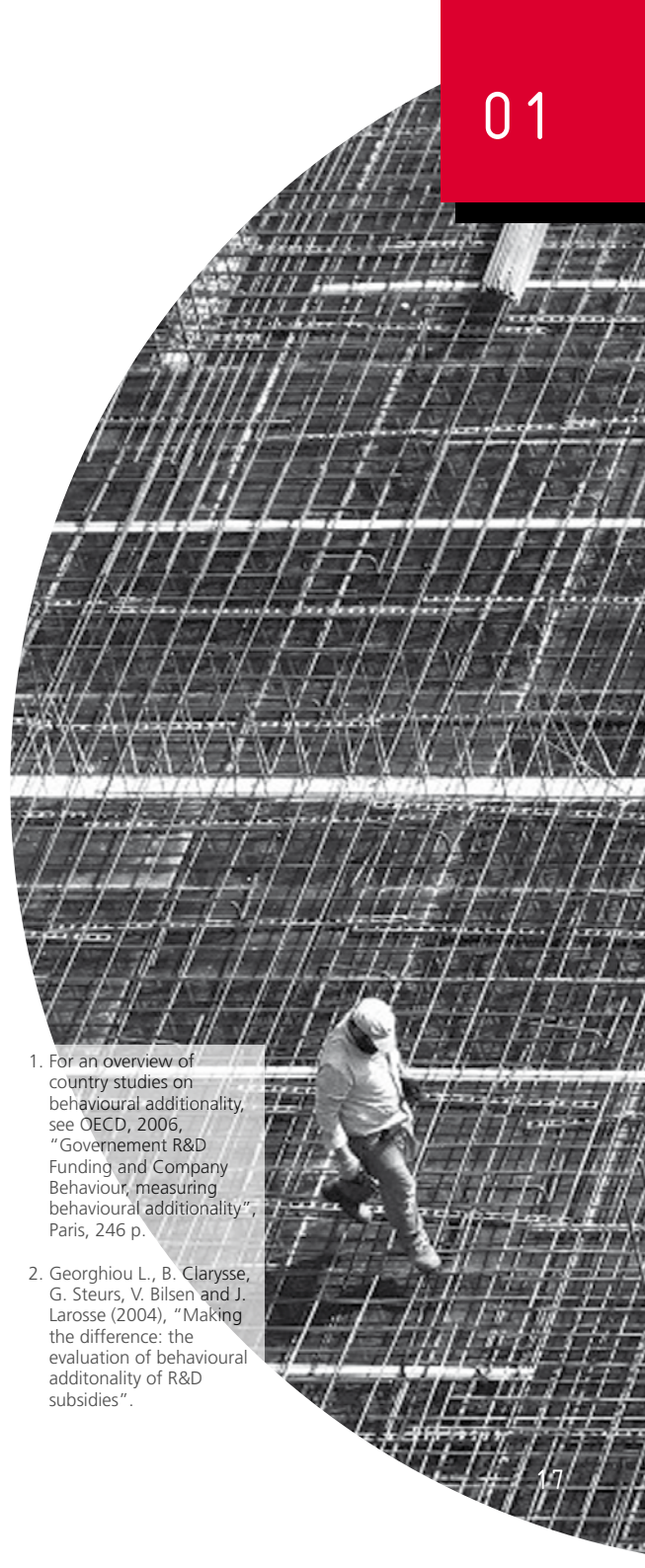
The following chapter presents the research design of the study. We first introduce the different (behavioural) additionality concepts that we used. This chapter also includes the main research questions we addressed and continues with a presentation of the questionnaires that have been used and a description of the population and the samples that have been surveyed. The chapter concludes with some remarks on the difficulty to prove additionality.

Chapter three presents the results of the descriptive analysis which we structured along the different additionality concepts. The telephone survey results are further commented on with the additional qualitative insights we derived from the interviews. We also included three small cases studies, also mainly based on the interviews.

The fourth chapter continues with the first results of a further analysis that has been undertaken: an investigation into the contingency factors that may explain the presence of different types of additionality as well as into the coincidence of behavioural additionality and input and output additionality.

1. For an overview of country studies on behavioural additionality, see OECD, 2006, "Gouvernement R&D Funding and Company Behaviour, measuring behavioural additionality", Paris, 246 p.

2. Georghiou L., B. Clarysse, G. Steurs, V. Bilsen and J. Larosse (2004), "Making the difference: the evaluation of behavioural additionality of R&D subsidies".



2.1 INTRODUCTION

In this chapter we discuss the methodological approach of this study. This approach is quite unique for the following reasons: the combination of a telephone survey with in depth interviews, the use of two control groups besides the experimental group and the further analysis of the factors that drive additionality on the basis of constructs we defined.

We first present the three main research questions we addressed in this study as well as the classification of the different (behavioural) additionality concepts we used. We describe the set up of the telephone survey as well as of the approach followed for the in depth interviews. We conclude with some methodological remarks on the proof of additionality.

2.2 THREE RESEARCH QUESTIONS

In this study the following key research questions are addressed:

1) Do IWT projects and subsidies lead to behavioural additionality?

This is the central research question in our analysis. Different types of behavioural additionality are distinguished. We followed, more or less, the additionality classification as proposed by Falk (2005) into three broad categories: resource-based concepts, result-based concepts and concepts that measure the success of policy intervention by examining desirable changes in the process of innovation (see Figure 1).



Figure 1: Additionalities in resources, processes and results

Resource-based concepts (input)		Result-based concepts (output)	
Project	Scope and scale	Competence	Output
Input	Network	Acceleration	Strategic
Process-based concepts (behavioural)			

Based on Falk (2005)

The resource-based concepts we studied are the input as well as the project additionality of the IWT subsidies. Project additionalities are in place if the research project is cancelled, unless it is supported by public funds.

The process-based behavioural additionality concepts we analysed are the scope and scale additionality, the network additionality, the competence additionality and the acceleration additionality of the support provided by IWT. Scope additionalities refer to cases where the coverage of the research project is expanded to a wider range of markets or applications than would have been possible without IWT support. Scale additionalities are on hand if IWT funding allows the project to be conducted on a larger scale. Network additionalities are there when IWT support helps to create networks. Competence additionality refers to the positive impact of the IWT support on competencies and expertise.

With regard to the result-based concepts, we will provide our findings on the output and strategic additionality. We define strategic additionality as referring to the strategic impacts on the company's (innovative) behaviour as a consequence of the IWT support for company R&D³.

2) Which 'drivers' stimulate behavioural additionality and which do not?

This second question aims at better understanding the underlying factors under which behavioural additionality (in its different forms) occurs. In other words, which characteristics (or enabling factors) stimulate behavioural additionality and which do not?

This is a relevant exercise, in particular from a policy perspective, being that the analysis might show that 'intervention' in one or another form may facilitate the behavioural additionality. For example, in the work of Wong and He (2001) it is mentioned that a firm's internal climate for innovation functions as a moderator on the relationship between public R&D support and firm innovation behaviour.

3. Note that the distinctions between the different types of behavioural additionality are not always clear cut. For instance, if scope additionality includes the expansion of an activity to a wider range of players, than the difference with network additionality becomes very small. In addition, the difference with input and output additionality is also not always very clear. Some authors such as Shin (2005) consider changes in R&D-investments over time also as a behavioural change. This would imply that the difference between input and behavioural additionality becomes very subtle.

3) Are behavioural additionality and input and output additionality reinforcing or merely co-existing?

It is also relevant to understand to what extent behavioural additionality relates to input and output additionality. Several empirical findings state that behavioural additionality leads to higher levels of performance and even to higher levels of investment in R&D.

The information we used to address these research questions basically came from two sources: a telephone survey and in depth interviews.

2.3 THE TELEPHONE SURVEY

The use of one experimental group and two control groups

The telephone survey was set up among three different samples: an experimental group and two control groups.

- The experimental group consists of companies that received IWT support for one or more projects in the period 2001-2004⁴. The analysis of the experimental group was based on a total number of 194 projects of as much companies.
- Control group A are companies that applied for IWT support but were rejected. We were able to contact 88 of these companies. We consider them as the “treated” control group. Their contacts with IWT when preparing the proposal, at the moment of submission and maybe also when they were informed about the negative decision of IWT, may have had an impact on their behaviour. For instance, the way they had to prepare their proposal for the project that afterwards was not selected, may have had an influence on the way they organised R&D projects in the company afterwards.

4. The year 2004 was selected in order to maximize the chance of having projects that are finished today so that it is possible for the respondents to say something about the impact. On the other hand we didn't go back in the past further than 2001 in order for the respondents to be able to remember the project well enough.



- Control group B contained companies that are known to be innovative, but never applied for IWT support. We received responses from 100 companies. Because they have not been in touch with IWT, we consider this control group as the “pure” control group. They were selected from two different databases. The first was a database with companies that participated in the Community Innovation Survey and on the basis of their responses can be considered as innovative firms. The second was a database composed by innovation advisors who visit companies to draw up their innovation profile and to eventually support them in setting up innovation activities.

The use of control groups and particularly of a control group that has never been in contact with the public agency (i.e. control group B) is one of the novelties of this research.

The questionnaire

The questionnaire for the experimental group was largely based on the survey model that was elaborated and refined during the pilot project. The questionnaire consisted of 8 parts that are indicated in Table 1. This table also provides an overview of the differences in the questionnaires used for control group A and control group B on the one hand, and the experimental group on the other hand⁵.

5. The full questionnaire is available in the overall evaluation report as available on the website of IWT: www.iwt.be

Table 1: Comparison questionnaires control groups with experimental group

Experimental group	Control Group A	Control Group B
1. Identification	=	=
2. Competitive market position	=	(=)
3. Description of the project	≈	(≈)
4. Project development process and organisation	≈	X
5. Project output, results and impacts	(≈)	(≈)
6. Business accounts and economic information	=	=
7. R&D budget, grants and personnel	=	=
8. Need and use of innovation support services	=	=

Legend: = means (about) the same, ≈ indicates more important differences (typically less questions were asked to the control groups), () means that the questions were addressed to a subset of the respondents, X means not included

“The sample of the experimental group represents more than 1 out of 4 companies in the total IWT population. The sample of firms in the control group A – who were denied support by IWT - is very large with nearly 1 out of 3 companies included.”

The unit of observation is the project. In case of the experimental group, the questionnaire focused on a specific project that was supported by IWT.

In the case of control group A, the project discussed during the interview was the project that was refused IWT support. When the project did not take place after the subsidy was rejected, the set of questions on the project results, output and impact (part 5) was skipped and the respondent was routed immediately to sections 6, 7 and 8 that are not project related. This was the case for 34 projects of the 80 projects for this question. If the project did continue after the refusal of the subsidy, the questions of part 5 focused on this project.

The participants of control group B were asked in the beginning of the telephone interview to define a R&D project that took place in the last five years. 30 respondents were able to define such a project. For these respondents, all subsequent questions related to this project. All the other respondents were routed to sections 6, 7 and 8.

Representativity

Table 2 provides information on the representativity of the samples.

The population of the experimental group consisted of 712 companies that submitted 1312 projects in the period considered. 1090 projects were granted a subsidy. The sample of the experimental group represents more than 1 out of 4 companies in the population⁶. In the selection of companies, quota had to be respected in terms of company size. Due to the overall limited size of the sample, we used no other quota restrictions. Nevertheless, when comparing the sector distribution between the population and the sample, the biases are limited.

6. The representativity in terms of (positive) projects is lower, 18 %, because some companies have more than one project in the population while companies were questioned about only one project.



Table 2: Representativity of the samples

Number of companies by size	Population	%	Sample	%	Representativity
Experimental group					
Large companies	130	18%	36	19%	28%
SMEs	403	57%	111	57%	28%
Starters	179	25%	47	24%	26%
Total	712	100%	194	100%	27%
Control group A					
Large companies	35	12%	9	10%	26%
SMEs	162	55%	53	60%	33%
Starters	96	33%	26	30%	27%
Total	293	100%	88	100%	30%
Control group B					
Large companies	76	14%	13	13%	17%
SMEs	400	76%	81	81%	20%
Starters	51	10%	6	6%	12%
Total	527	100%	100	100%	19%

Source: IDEA Consult on the basis of data provided by IWT

When comparing the populations of control group A and the experimental group in terms of company size, we observe that the starters are more strongly represented in the control group, while the large companies are less present. The representativity of the sample of firms in the control group A is very high with nearly 1 out of 3 companies included. Because of the limited size of the population (293 companies), the quotas in terms of size could not be perfectly respected.

The “population” of control group B consisted of 527 companies of which more than 3 out of 4 are SMEs. We obtained valid responses of nearly 20 % of them.

2.4 IN DEPTH INTERVIEWS TO GET THE STORY BEHIND THE ANSWERS

In addition to the telephone survey that was structured along a well defined questionnaire, we interviewed 49 IWT clients in order to get a deeper insight of a more qualitative nature into the behavioural additionality of the IWT subsidies for these companies. The approach was different for the “occasional” versus the “regular” IWT clients.

The **occasional clients** were defined as the companies having maximum 2 projects approved in the period 2001-2004. Twenty companies were selected from the list of companies that were already involved in the telephone survey. The selection was based on the outliers, the “extreme” answers given by the project leaders during the telephone survey. We selected the key-additionality questions and looked for the companies that ranked either very low or very high on these questions. Their answers on these questions formed the basis for the interviews, again with the project leaders. The objective was to get the story behind these answers.

The **regular clients** were defined as the companies having at least 3 projects approved in the period 2001-2004. Some of the companies were involved in the telephone survey before, others not. In order to get a picture of the impact on the company as a whole, we did not interview the project leaders in these companies, but the R&D-managers. Before these interviews (29 in total) took place, the interviewers were briefed by the IWT advisor responsible for the follow-up of the projects of the respective companies.



2.5 THE PROOF OF ADDITIONALITY

How can we “proof” the behavioural additionality of IWT subsidies ? According to recent empirical work it is hard if not impossible to apply standard econometric methods and techniques. The variables that capture ‘behaviour’ would have to be regressed on the incidence or even the size of public assistance. But many unobserved variables can simply not be taken into account. It is also not clear how to treat the potential time lag between intervention and change in behaviour.

Most of the empirical analyses of behavioural additionality were based on one of two frameworks (Falk 2005). In the first, supported firms are compared to unsupported ones on any of the dimensions of behavioural additionality. This is also the approach taken up in this study since we included two control groups in our survey approach. We have the strongest proof of additionality when we have a statistical significant difference between the experimental (i.e. companies with funded projects) and the control groups, in particular control group B (i.e. companies that never applied for IWT subsidies). When there are differences without being statistically different, we should speak about “effects”. For example, a scale item having a high score for the experimental group without any significant difference with the control group has a strong scale effect but no scale additionality.

However the challenge would be to compare on a ‘matched’ basis, particularly with control group B who never applied for IWT funding. However, the control groups were not explicitly set up as matched samples in the sense that the companies in both groups are similar, except for the fact that the experimental group received IWT subsidies while the control groups didn’t. Nevertheless, it turned out that the differences in terms of sector and size distribution between the experimental and control group A are not statistically significant. So control group A is comparable in these

“When we see differences without being statistically different, we should speak about “effects” not about “additionality”. The proof of the latter as opposed to the former remains a challenging problem in the research into the behavioural additionality of public R&D support.”

respects with the experimental group. However, the sample of respondents of control group B differs significantly with the experimental group. On the one hand, this may imply that if we have a significant difference between both groups for certain questions or items, this may be due to the different underlying sector or size distribution. This limits the potential use of control group B as a control group. On the other hand, it should not be a surprise that control group B significantly differs from the experimental group. This reflects the different profile between IWT clients and those that are not. If we would look for a perfect match between the experimental group and control group B, the latter would very likely not be representative for the non-IWT clients.

The other approach is to directly ‘ask’ the supported companies how their innovation related behaviour has changed. Some of the questions explicitly ask about the impact of the IWT project under investigation on the innovative behaviour and strategy of the company. Another type of questions asks the respondents of the experimental group to compare the outcome with IWT support with the situation in which they would not receive IWT support. It may be difficult for the respondents to reflect on this hypothetical and counterfactual situation. Maybe they have also an incentive to answer in a strategic way and to be more positive towards IWT and the impact of its subsidies. But we also addressed these questions to the respondents of control group A that were denied IWT support but where the project took place anyway. This allows comparing the “hypothetical” answers of the experimental group with what happened in “reality” (control group A).

To sum up, the proof of “additionality” as opposed to merely “effects” remains a challenging problem in the research into the behavioural additionality of public R&D support.





Chapter 3

PICTURES OF THE DIFFERENT TYPES OF ADDITIONALITY

In this chapter we present the descriptive analysis of the telephone survey results, complemented with the results from the additional interviews. We first present some descriptive statistics on the R&D profiles and the competitive position of the experimental group versus the control groups. The subsequent sections are structured along the different additionality concepts we distinguished before. We start with the resource-based concepts, subsequently deal with the process-based concepts to end with the results-based concepts. The telephone survey results are complemented with the qualitative insights from the interviews. These allow putting the results from the telephone survey into perspective.

By convention:

- n = number of observations, i.e. number of respondents that effectively answered the question, so not taking into account "no answer/don't know"
- Response Rate (RR) = number of companies that effectively answered the question (n) divided by the number of respondents that was addressed the question. Remark that while ' n ' may be low, the response rate may be (nearly) 100 % because, as a consequence of the routing, some questions were only addressed to a subset of the respondents.

“ More than half of the respondents of the experimental group have a stable to increased R&D budget in the last 5 years. And the competition they experience is moderate to strong on the product market. ”

3.1 PROFILE OF IWT CLIENTS AND OTHERS

In this section we present some descriptive statistics on the R&D profiles and the competitive market position of the respondents versus the control groups. Some of these profile characteristics have been used in the further analysis as potentially explanatory variables or 'drivers' for the observed additionalities. The comparison between the experimental group and the control groups is also interesting on its own because it allows drawing some conclusions with regard to the profile of the IWT clients.



The R&D profile of the companies

The following tables provide information on the trend in the total R&D-outlays and the R&D-personnel of the different samples, as well as on the degree of R&D-formalisation within the companies surveyed.

Table 3: Trend total R&D-outlays

	Large companies	SMEs	Starters	Total
Experimental group	3,42	3,75	3,66	3,66
Control group A	2,71	3,46	3,09*	3,26**
Control group B	3,40	3,41**	3,4 (a)	3,40*

Question: What has been the trend in the total R&D-outlays of your company, expressed as a % of sales, in the last 5 years ? Mean score 1 to 5 with 1 = strongly decreasing and 5 = strongly increasing

(a) Sample is too small to test significance of difference with experimental group.

Significant difference with experimental group at * 10% level, ** 5% level, *** 1% level

In general, more than half of the respondents of the experimental group have a stable to increased R&D budget in the last 5 years, expressed as a percentage of sales. There is no statistically significant relationship between the increasing or decreasing trend of the R&D budget and the company size for the experimental group.

Respondents of the control groups as a whole responded significantly different from the experimental group. Control groups A and B are characterised as having a significantly lower trend, on average, compared to the answers of the experimental group. For control group A this is due to the starters who responded having a lower increase than the starters in the experimental group; for control group B the lower trend is due to the answers of the SMEs.

Table 4: Trend R&D personnel

	Experimental group	Control group A	Control group B
Less R&D personnel	17%	26%	10%
Same R&D personnel	43%	43%	59%
More R&D personnel	40%	31%	31%
n	183	70	29

Question: What is the total number of personnel, actively involved in R&D activities (in FTE equivalents) today/at project start up ?

Table 4 presents the evolution of the R&D personnel since the start of the projects.

For the experimental group, the number of R&D personnel today relative to the number at the project start up has been stable or increased for respectively 43% and 40%. The trend in the R&D personnel is not related to the company size.

The experimental group has the highest percentage of respondents having an increased number of R&D personnel (40% versus 31% for both control groups).

The respondents of the different samples were also asked about some aspects of their R&D organisation, more in particular whether they have a separate R&D department.

In the experimental group, we observe that 72% of the large companies have a separate R&D department while this is only true for

Table 5: Separate R&D department

	Large companies	SMEs	Starters	Total
Experimental group	72%	27%	23%	35%
Control Group A	89%	23%	8%	25%
Control Group B	38% **	14% **	33%	18% **

Question: Does your company have a separate R&D-department ?
Significant difference with experimental group at * 10% level, ** 5% level, *** 1% level



27% of the SMEs and 23% of the starters. Comparing the presence of a separate R&D department between the experimental and the control groups, there is no significant difference. In control group B however, there are significantly less companies that have a separate R&D department, in particular among the large companies and the SMEs.

The competitive market position

Table 6 deals with the degree of competition on the product market where the project that the survey focused on was most closely related to⁷.

Table 6: Average degree of competition

	Large companies	SMEs	Starters	Total
Experimental group	3,44	3,19	2,72	3,12
Control group A	3,38	2,7***	2,77	2,78***
Control group B	2,6*	3,22	2,33	3,03

Question: How would you describe the competition on this product market today? Mean with 1 = there is no competition, 2 = competition is small, 3 = competition is moderate and 4 = competition is strong

Significant difference with experimental group at * 10% level, ** 5% level, *** 1% level

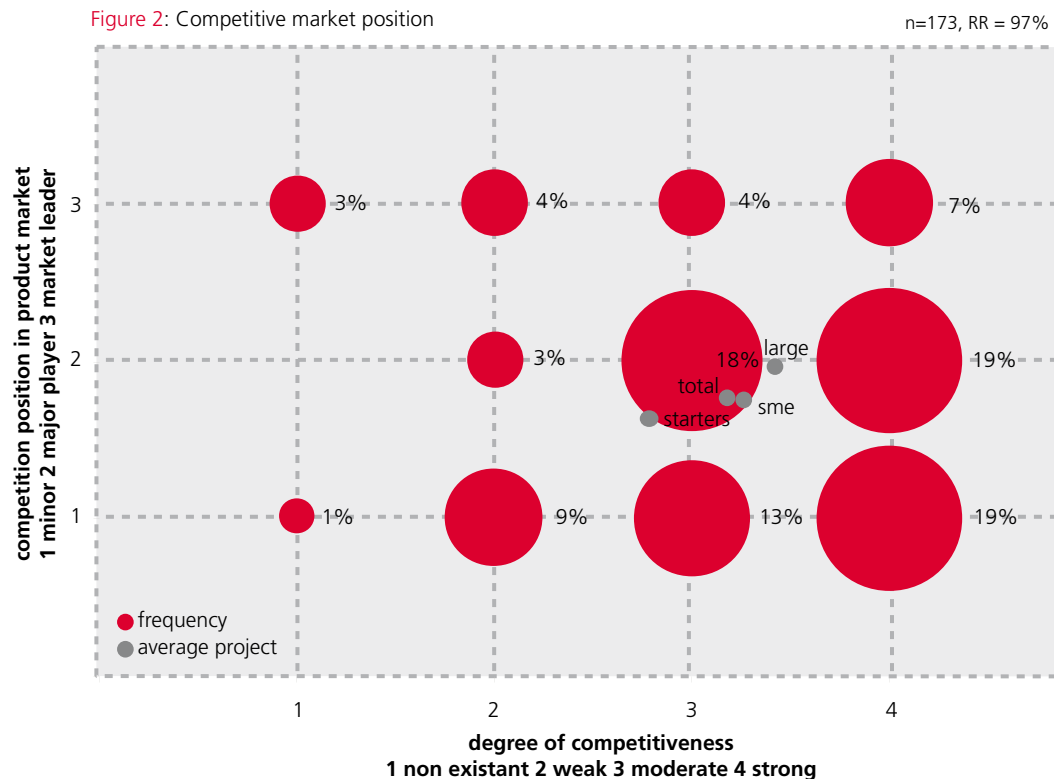
On average, respondents of the experimental group indicate that the competition is moderate to strong on this product market. Although there is no statistically significant relation between the degree of competition and the company size within the experimental group, starters are less present in the stronger competitive market segment than SMEs and large companies are. This could be explained by the fact that the large companies will probably compete on global and more mature markets, while the starters are probably active in more local and new markets.

Table 6 also shows that the experimental group (IWT funded clients) is significantly more present in the more competitive markets than the control group A (IWT clients without IWT funding). This is

7. Note that for the experimental group this was the IWT project that was approved, for control group A it was the IWT project that did not receive a subsidy and for control group B it was a project that was defined together with the respondent at the beginning of the questionnaire.

due to the subsample of IWT funded SMEs who are significantly more active in the competitive markets than the non funded IWT SME clients (control group A). For respondents who never submitted an IWT proposal (control group B), there is no significant difference in degree of competition in the products markets their projects related to, with those of the funded IWT clients, except for the subsample of large companies.

Figure 2 combines the degree of competition in the market and the current market position of the company (minor or major player up to market leader) for the experimental group. The circles indicate the number of projects. Also the average positions by company size are marked.



About 70 % of the respondents in the experimental group are minor or major players in a product market where competition is moderate to strong. Less than 20 % of the companies are market leaders. In terms of funding instead of in number of projects, we observed a larger percentage of the IWT subsidies going to the market leaders (23 % 18 %) and to major players (48% versus 40%).

A final result relates to the competitive position of the respondents on international markets.

Table 7: Sales distribution

	Large companies	SMEs	Starters	Total
Experimental group	75%	51%	50%	55%
Control group A	69%	45%	26%**	41%**
Control group B	54%	29%***	15%***	32%**

Question: What % share of total turnover (last year) you realized in the following geographical regions? The percentages refer to the share of the turnover that is exported.
Significant difference with experimental group at * 10% level, ** 5% level, *** 1% level

Table 7 shows an average export percentage for the experimental group of 55%. The large companies have with 75 % the highest export share, while export accounts for nearly 50 % of total sales of starters and SMEs. Both control groups are not homogeneous in this regard: the export share is significantly lower for the respondents of the control groups. The subsample of the large companies is quite comparable for all groups as well as the SMEs subsample of the experimental and the control group A. In particular for the subsample of starters, the export share is significantly higher for the experimental group.

“Less than 1 company in 5 is a market leader. Though in terms of funding a larger percentage of the IWT grants go to the market leaders (23 % versus 18 %) and to major players (48% versus 40%).”

“We asked the respondents of the experimental group what would have happened with the project in the case it would not have received IWT support.”

8. If we assume that a smaller budget also implies a smaller scale, than this implies that the IWT funding results in a larger scale of the projects which is an indication of scale additionality (see *infra*).

3.2 TO GO OR NOT TO GO, THAT IS THE (FIRST) QUESTION

The most obvious way to evaluate the effectiveness of public support is to determine whether it has resulted in so called project additionalities (Falk (2005)). These are in place if the project is cancelled, when it is not supported by public funds. Therefore, we asked the respondents of the experimental group what would have happened with the project in the case it would not have received IWT support. For the experimental group, this is a hypothetical situation. This raises the question whether the respondents are indeed able to reflect on their behaviour in hypothetical, counter-factual situations. Respondents may have in interest in the continuation of public support. This may have an impact on the kind of answers they provide. Therefore, it is interesting to be able to compare the answers with those of the respondents in control group A that actually did not receive the IWT grant. Their answers refer to the actual situation.

40 % of the projects would be cancelled without IWT support

Table 8 summarizes the results of the telephone survey on the go – no go decision. When we first consider the results for the experimental group separately, only about 11 % of the respondents replied that the project would have taken place with the same budget which would imply that there would be no project additionality at all. On the other hand, about 40 % of these respondents indicate that the project would not have taken place at all, which would imply full project additionality. But the decision is not a zero-one decision. About half of the projects would have taken place but with a smaller budget implying partial project additionality⁸. We found no statistically significant relation between the company size and the project additionality.



Table 8: Project additionality

	Experimental group - hypothetical (a)	Control group A - actual (b)
No project additionality (The project would have/has taken place with the same budget)		
Total	11%	32%
Large companies	8%	40 %
SMEs	19%	30 %
Starters	9%	20 %
Partial project additionality (The project would have/has taken place with a smaller budget)		
Total	48%	25%
Large companies	50%	40%
SMEs	44%	26%
Starters	57%	20%
Full project additionality (The project would not have/has not taken place at all)		
Total	41%	43%
Large companies	42%	20%
SMEs	43%	44%
Starters	35%	44%
n	191	80
response rate	98 %	89 %

(a) what would have happened in case the project would not have received IWT R&D subsidies ?

(b) what has happened after you did not receive the IWT grant ?

If we compare these hypothetical answers of the experimental group with the “actual” answers of the respondents in control group A, the percentage of projects that would be cancelled according to the

“For the experimental group, this is a hypothetical or ‘counterfactual’ situation. For the control group A though this was reality. Forty percent of the projects would be cancelled without IWT support, which implies full project additionality.”

respondents of the experimental group (41 %) is nearly the same as the percentage of projects that has actually not taken place according to the respondents of control group A (43 %). However, the percentage of projects that has taken place but with a smaller budget, is in reality lower (for control group A) than hypothetically estimated by the experimental group: 25 % compared to 48 %. On the other hand, 33 % of the respondents of control group A indicate that the project has taken place with the same budget, compared to 11 % for the experimental group.

Go – No go: an international comparison

In general, our observations on project additionality are quite similar to the results obtained in an evaluation study in Austria. For instance, in that study full project additionality was also correctly estimated by the group that never experienced a rejection by the Austrian agency for business R&D support (FFF) (28% versus 31% actual). The case of no project additionality was also underestimated by the FFF-clients.

A survey in Australia to evaluate the behavioural additionality of business R&D grant programmes found that 37 % of the projects would not have proceeded without government funding.

In a study on the behavioural additionality of public R&D funding in Finland, almost 10% of the clients responded that they would continue without modification if funding were terminated (no additionality), which is in line with our finding of 11 % of the respondents indicating no project additionality.

Source: OECD, 2006, “Government R&D Funding and Company Behaviour: measuring behavioural additionality”, Paris, 246 p.

Four types of companies

The interview results allow to shed some light on the conditions under which a project would be cancelled or not, completely or partially. Four different types of companies can be distinguished. Within the first type of companies, the projects will always take place,



independently whether IWT subsidises or not. In these very innovative companies the innovation process is organised as a funnel with a number of gates where a go-no go decision is taken on the basis of business cases. For the projects that underwent a business case, the continuation of it will not depend on the IWT support. Nevertheless, if there is IWT support, this sometimes allows doing more, especially to involve more partners because the IWT support very often serves to pay the partners (see also **Case 1: Innogenetics**).

In the second type of companies, the project will also take place, but with a limited scope and budget. The project may also be reoriented with less fundamental and more applied research.

Among the third type of companies, the continuation will be dependent on the characteristics of the project. Projects still far from valorisation would in most cases be cancelled. Another reason for cancellation is the fact that the project is not falling within the current business lines. If the project takes place, it will typically be the case that the budget is reduced by cutting off the extras. Or the working packages are dealt within a sequential order instead of taking place simultaneously.

For the fourth group of companies, typically SMEs in industrial sectors, innovation is too risky and the projects are dependent on external public funding, i.e. the IWT support. Internal financing would not be possible without disrupting the daily business and non-public external financing is mostly not available. Several interviewees also mentioned that the support helps to convince management to take the risk. So if the support is denied, the project is cancelled. In a sense, the IWT subsidy serves as an insurance for these companies and is therefore important for the go-no go decision. Within these companies, the only innovation projects that take place are IWT supported projects.

Case 1: INNOGENETICS

An international biopharmaceutical company ...

Innogenetics is a medium-sized Belgium based international biopharmaceutical company, founded in 1985. The company's headquarters are located in Ghent, Belgium. Innogenetics applies its knowhow and synergies in molecular biology, immunology, and virology to build two distinct businesses. The first one is the specialty diagnostics business dedicated to the value added, clinically targeted integration of diagnostics and therapeutics to improve patient selection, patient follow-up and disease monitoring. The second business line is the therapeutics business that develops therapeutic vaccines based on the effective transformation of therapeutics research into candidate biopharmaceutical products. Both activities develop quite independently from each other, have a separate financial reporting system as well as separate R&D activities.

where R&D is a core activity ...

Innogenetics started as a pure research company, evolved into a mix of research and market driven activities but now is a purely market driven company that is research supported. Total revenues were 48,6 mio € in 2005 when Innogenetics employed 527 people, of which 446 in Belgium.

The R&D expenses were 32,5 mio € in 2005. The number of R&D personnel was 154, active in "pure" R&D-activities, increasing to more than 200 when one takes into account also clinical trials and IP management.

that is managed by means of a formalised process.

The innovation process is typically structured as follows. Within a think tank group "research and business" numerous ideas are discussed. The most promising ones are written down into a first project proposal. Subsequently there is a meeting of the Diagnostic Portfolio Management Committee (DPMC) or Therapeutic Portfolio Management Committee (TPMC) that decides on the further development of the proposal on the basis of a document where attention must be paid on the strategic and technical aspects of it. A second meeting of the DPMC or the TPMC will take the final go decision. Later on, the follow-up of the projects is done by an operation committee.

Limited project additionality.

Innogenetics is an example of a company where the IWT support does not result in project additionality. Since each of the projects underwent a business case beforehand, the continuation of a project is not dependent on the IWT grant. But they will always check whether there is an opportunity for IWT support. If so, they may involve more partners because the IWT subsidies very often serve in part to alleviate the cost of external research. According to the Chief Scientific Officer, about 85 % of the projects would also take place with the same budget and with complete internal financing, maybe at the expense of other projects that would have to be postponed. The other 15 % would take place but with a reduced scope and potentially with less partners which is not always efficient. Partners may have very specific knowledge (e.g. specific technology, assay procedures, clinical materials). Therefore, their involvement has a positive impact on the efficiency and the speed of the project. As a consequence, the time to market may also be shorter.



More fundamental research with a broader scope.

Innogenetics considers the IWT support as a kind of research seed and risk capital which allows financing R&D projects with considerable upfront risk but also with the potential to build up crucial intellectual property. The IWT projects typically have a more fundamental research character compared to the internally financed projects. They will also have a broader scope because more partners are involved, resulting in a broader IP-portfolio. A clear example of this policy can be found in the hepatitis programme where very breakthrough research concepts could already be translated into a product development pipeline.

In some projects, they have been able, thanks to the IWT support, to develop different research paths in parallel and choose the preferred platform in the end with a positive effect on development time lines. This is an example of acceleration additionality.

Limited impact on the innovation management routines.

Since the R&D and innovation process is highly formalised within the company, it is not surprising that the IWT subsidies and the whole related process, has no real impact on the innovation management routines, the organisation of the R&D process or the R&D departments of Innogenetics. Nevertheless, the interviewee mentioned an impact of the IWT reporting system on their own R&D accounting principles in the sense that they adapted their system in order to have a better fit with the IWT reporting formats.

He also mentioned an impact on their network competencies in the sense that they learned how to better evaluate the technologies of third parties (development of critical sense).

Successful outputs.

In terms of output, Innogenetics has a number of products on the market that are the result of IWT subsidized projects. Their recognition as Contract Manufacturing Organization is also, at least partly, the consequence of the support they received. Many funded projects also resulted in patents. Some of them generate income via royalties (3,5 mio € in 2005) and licensing (2,8 mio € in 2005). Other patents are defensive to keep competitors away from their market. Even research projects that do not meet their primary objective may allow developing knowledge that can be recovered in patents.

3.3 MORE RESOURCES FOR INNOVATION

Input additionality in the strict sense refers to the complementary versus substitute character of public and private funding for R&D. The survey was not set up to address this issue in particular, but some of the questions nevertheless relate to this traditional evaluation topic.

In a broader sense we also refer to the impact of the IWT subsidies on the resources for innovation (impact on R&D and innovation budget)

or the innovative behaviour more in general (impact on attention paid for R&D and innovation activities) in the future.

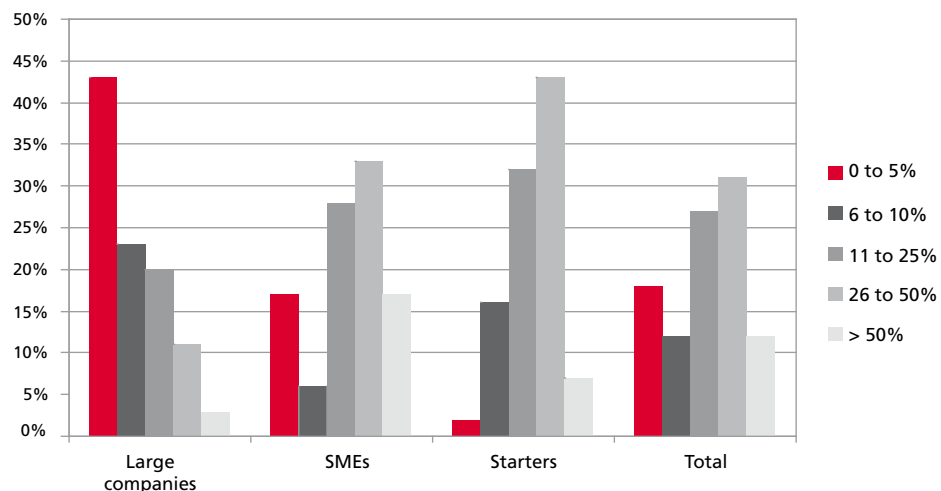
Importance of IWT in total company R&D outlays

Figure 3 gives an idea of the importance of the IWT subsidies in the total R&D outlays of the IWT clients. There is, not surprisingly, a significant relation between the company size and the share of the IWT subsidies in their total R&D-outlays. For the SMEs and the starters, the IWT subsidies represent a (much) larger share than for large companies. For more than 75 % of the SMEs and starters, the share of IWT subsidies is higher than 10 % while this is true for only 1 out of 3 large companies.

But some of R&D managers in large companies explicitly indicated during the interviews that the “qualitative” impact of the IWT subsidies on their company is (much) higher than the percentage-share of the IWT subsidies in their R&D-budget. Another related remark made by a large company was that the share of IWT in their total R&D-budget is (only) about 5 % but up to 15-20 % when one would only consider their R-budget.



Figure 3: Share of the IWT subsidies in total R&D outlays



IWT subsidy would predominantly be replaced by internal financing

Table 9 deals with the alternative sources of financing, internal or external, in case the project took place. The table refers to the situation where the project would have taken place (in the case of the experimental group) or has taken place (in the case of the control group) with a smaller budget⁹.

9. The same question was addressed to the respondents of the experimental group and the control group A that indicated that the project would take place/has taken place with the same budget. The results were very similar.

Table 9: Project proceeded with smaller budget

Alternative financing in case of partial project additionality	Experimental group - hypothetical	Control group A - actual
Instead of the subsidies we (would) have allocated more internal financial resources		
Total	59%	30%
Large companies	39%	50%
SMEs	71%	8%
Starters	50%	80%
Instead of the subsidies we (would) have allocated more external financial resources		
Total	10%	10%
Large companies	0%	0%
SMEs	8%	15%
Starters	19%	0%
Instead of the subsidies we (would) have allocated more internal as well as more external financial resources		
Total	13%	20%
Large companies	17%	0%
SMEs	13%	23%
Starters	12%	20%
Instead of the subsidies we (would) have allocated no other financial resources		
Total	18%	40%
Large companies	44%	50%
SMEs	8%	54%
Starters	19%	0%
n	92	20
response rate	100%	100%

Question: Which of the following statements best describes the way of financing in case the project would have/has taken place with a smaller budget?

“ Some of the starters, being highly dependent on the support of IWT, and also some SMEs indicated that they don't want to go to venture capitalists or industrial partners because they consider financial independency important.”

The IWT grant would in most cases be replaced with internal financing only (in 59 % of the cases) or in combination with external financing (in 13 % of the cases). This result was confirmed during the interviews. Some of the starters, being highly dependent on the IWT subsidies, and also some SMEs indicated that they don't want to go to venture capitalists or industrial partners because they consider financial independency important. It was also mentioned that when starting up, venture capital does not work as an alternative for IWT subsidies because profitability only comes at long term. These are indications that for this subgroup of respondents, the IWT subsidy may replace internal and, to a lesser extent, also external financing. We do not know however whether or not this implies that they spent less on other R&D or innovation projects. But large as well as small companies noticed that follow-up projects no longer satisfying the IWT conditions for support (because they come closer to market valorisation), are internally financed. So the initial IWT subsidy results in larger internal R&D investments in a later stage.

In nearly 1 out of the 5 projects (18 %) that would have taken place also without IWT grant, the IWT grant would not have been replaced. Note that 8 of the 18 respondents from large companies ticked this option. This is a relatively higher number when compared to the SMEs and starters.

The number of observations for control group A ($n = 20$) is limited. Therefore we cannot draw strong conclusions. 8 of the 20 respondents indicated that they have allocated no other financial resources which is a relatively much higher number if compared to the experimental group.

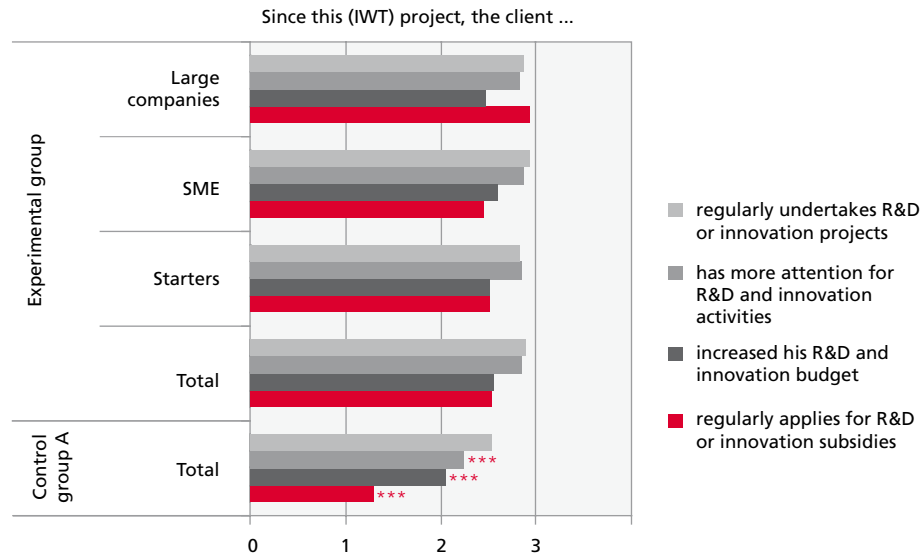
Since their IWT project, 70 % of respondents regularly undertakes R&D projects and has more attention towards R&D.

The next tables broaden the concept of input additionality. Figure 4 considers the impact of the projects on the resources for innovation and innovative behaviour more in general of the companies involved. The statements put forward an explicit relationship between the project



that is questioned and the effect described, e.g. since this project, the company regularly undertakes R&D and innovation projects. The questions were only addressed if the project was finished.

Figure 4: Impact of project on innovative behaviour



A majority of about 70 % of the respondents of the experimental group (completely) agreed with the first two statements. For the last two statements there were about as many respondents that (completely) disagreed with the statements than there were respondents that (completely) agreed.

With respect to the impact of the IWT subsidies on future innovative behaviour, we collected some nice positive examples during the interviews, typically among the smaller companies. One company thought in the past that they were too small to spend money on high level research and so their innovation activities were very limited. By

“ Follow-up projects no longer satisfying the IWT conditions for support – as coming too close to market valorisation - are internally financed. So the initial IWT subsidy results in larger internal R&D investments in a later stage.”

“ By doing an IWT granted R&D project the company became aware of the importance of R&D and of thinking about technical challenges. ”

doing an IWT granted R&D project the company became aware of the importance of R&D and of thinking about technical challenges. Another nice example is that of a company that in the past was used to wait for signals it received from its clients before starting to innovate. Since the IWT project it was involved in, it is innovating on its own initiative.

In the case of control group A, the project questioned was the project that was refused IWT support but that nevertheless took place. When we compare the mean values, we see that they are always higher for the experimental group and for most statements the difference is statistically significant, indicating an “additional” effect for the IWT supported projects. This is true in particular for the last statement which the respondents of the control group (completely) disagree with on average.

The latter result is confirmed by the answers on a separate question about future plans to apply for an IWT subsidy. There is a statistically significant relationship between the plans to apply for a new IWT grant and being funded (experimental group) or not (control group A). While nearly all respondents of the experimental group plan to apply again for an IWT grant (96 %), this is true for 60% of the respondents of control group A.

3.4 MORE AMBITIOUS

In this section we provide the results for a number of questions that relate to the scope and the scale of the IWT funded projects and the impact of the IWT subsidy on both dimensions. We interpret “scope” in a broad sense. We explore, for instance, the fit of the projects with the core activity of the companies, the newness of the project in relation to the ongoing R&D of the companies as well as the technological and marketing impact of the projects. We also consider the impact of IWT funding on the goals and the risks of the projects. While we do not find strong support for the hypothesis of scope and scale additionalities on the basis of the telephone survey results, the interviews were more affirmative about the occurrence of these types of additionalities.



IWT support has a positive though limited impact on the goals and scale of the projects.

The respondents of both the experimental group and control group A were asked to compare the project with and without IWT support in terms of the goals (\approx scope) and the scale of the project. For the experimental group, this refers again to a hypothetical situation. For the respondents of control group A, it refers to the actual situation.

Table 10: Comparison of project with/without IWT support in terms of scale and scope

- - 1	-	No effect	+	+ + 5		Large companies	SMEs	Starters	Total
With much less ambitious goals				With much more ambitious goals	E	4,00	3,66	3,83	3,77
					A	3,20***	3,47	3,60	3,48**
On a much smaller scale				On a much larger scale	E	3,90	3,58	3,90	3,73
					A	3,60	3,83	3,86	3,82

Question: In the following we compare the situation WITH IWT support with the situation WITHOUT IWT support. Has/would the receiving of the IWT grant enabled you to undertake the project ... than what would be/have been possible without IWT support? Mean scores. Significant difference with experimental group at * 10% level, ** 5% level, *** 1% level

On average, the respondents of the experimental group indicate that there is a positive, although no large impact, of the IWT support on the goals (more ambitious) and the scale (a larger scale) of the project. The opinion of the experimental group is more or less confirmed by the respondents of the control group A. The projects that took place (and so were not cancelled) after IWT support was rejected, had less ambitious goals and a smaller scale than if they had received an IWT subsidy. However, the positive impact of IWT support on the level of ambition of the project seems to be overestimated by the experimental group, in particular by the large companies.

“The projects that took place (and so were not cancelled) after IWT support was rejected, had less ambitious goals and a smaller scale than if they had received an IWT subsidy.”

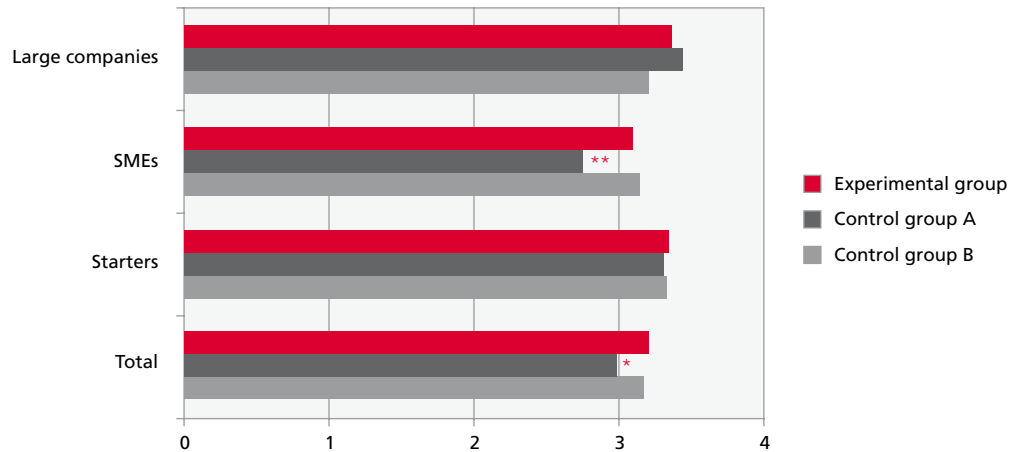
A big fit between IWT projects and core-activity of the company

About 90% of the respondents within the experimental group were already active in the product market where the IWT funded project most closely related to. So these IWT projects do not seem to expand the scope of the companies to new product markets. This percentage is also about the same when compared to the control groups A and B. A lower percentage for the experimental group would have been an indication for scope additionality.

Figure 5 describes the match of the project that the telephone survey focussed on with the core activity of the companies of the experimental group and the control groups A and B. Scope additionality would imply a smaller fit between the project and the company's core activity for the respondents of the experimental group when compared to the respondents of the control groups. The results in Figure 5 do not support this hypothesis. In general, the fit is rather big. There is little difference in the mean scores for the match of the project with the core activity between the experimental and the control groups.



Figure 5: Match of project with core activity



Legend: mean scores with 1 = no fit, 2 = rather small, 3 = rather big, 4 = perfect fit
Significant difference with experimental group at * 10% level, ** 5% level, *** 1% level

For a limited number of companies within the experimental group (31) the core activity changed since the time of the grant. These companies were asked about the match between the IWT funded project and their current activity. A shift towards the core activity of the company that is more in line with the project could be an outcome of that project. There is no strong support for this hypothesis: for 13 of the 31 respondents (41 %), the fit increased after their core activity changed. The contrary is true for 9 of the 31 companies (29 %) while for the remaining 9 companies the fit remained unchanged.

Entirely new projects receive relatively more IWT funding than projects additional to ongoing R&D

The origin of the funded projects also allows to say something about the scope of the IWT funded projects.

Figure 6: Origin of the projects

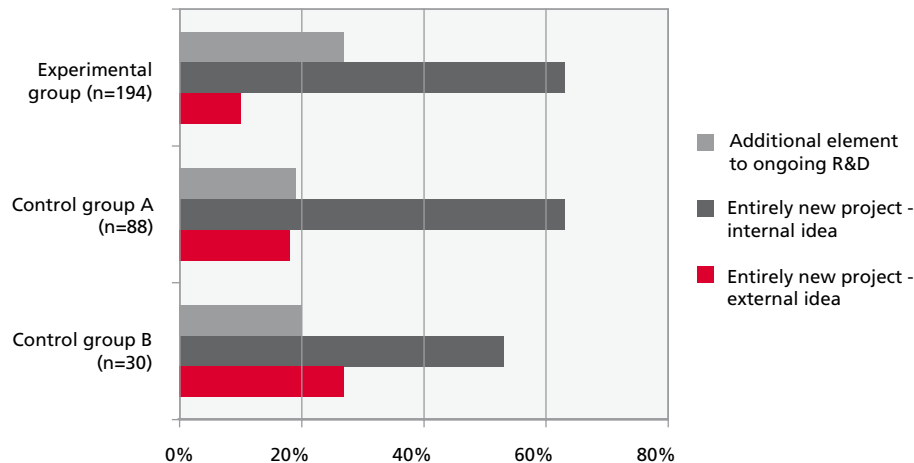


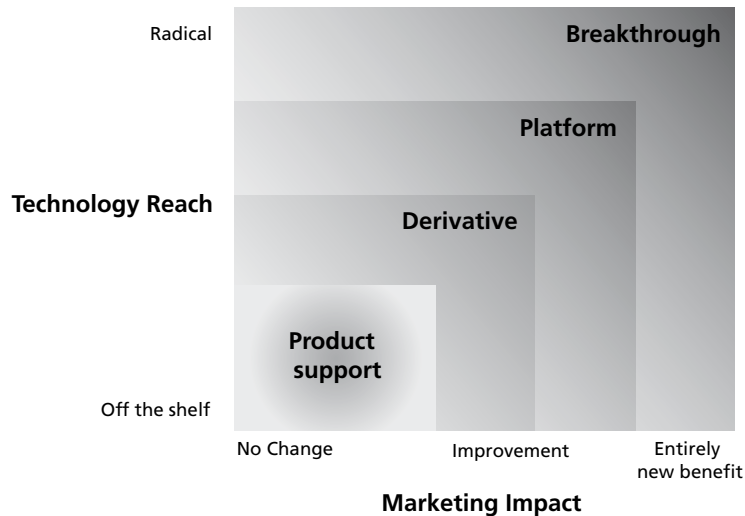
Figure 6 indicates that according to about one fourth of the respondents of the experimental group, the project was additional to ongoing R&D in the company. For nearly 75 % it was an entirely new project, in most cases based on an idea from within the company. In terms of the IWT funding provided to these projects, it turns out that, in general, the share of the projects that is additional to ongoing R&D is lower when compared to their share in terms of number of projects. So the entirely “new” projects get relatively more funding.

When we compare the results on the origin of the projects with the control groups, both are significantly differing from the experimental group. The percentage of projects that is described to be additional to ongoing R&D is higher among the experimental group while relatively more of the projects of the control groups are described as entirely new. This is a surprising result, contradicting scope additionality, that is not supported however by the qualitative evidence we collected during the interviews.

40 % of the IWT projects are breakthrough projects receiving 66 % of the IWT funding.

The respondents were also asked to describe the project in terms of marketing impact and technology reach. This allows us to classify the projects along the lines of Wheelwright and Clark, 1993, as breakthrough (i.e. “entirely new benefit” in terms of management impact or “radical” in terms of technology reach), platform, derivatives or product support projects (i.e. “no or limited change” in terms of marketing impact in combination with an “off the shelf” technology).





Source: Wheelwright and Clark, 1993

In terms of marketing impact, most projects of the experimental group can be considered as improvements or new benefits. About 10 % of the projects are considered to be breakthrough projects in terms of marketing impact resulting in entirely new benefits (see Figure 7). We found no large differences by company size.

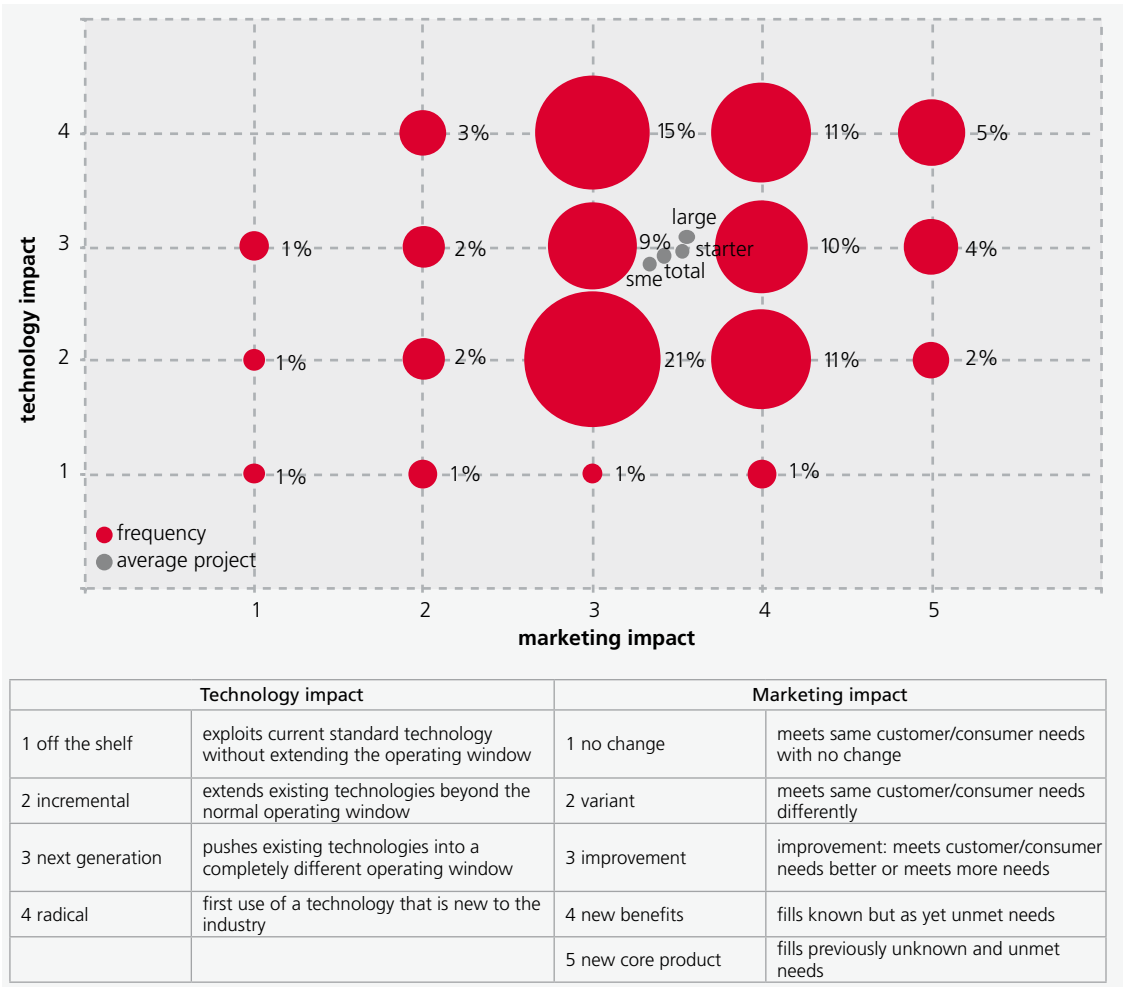
In terms of technology reach, there seems to be a wide variety among the projects of the experimental group (see Figure 7). Most technologies are described as incremental, but the group of projects that uses a radical technology and are therefore breakthrough projects in terms of technology reach is only a little bit smaller.

If the descriptions in terms of marketing impact and technology reach are combined into Figure 7, most projects can according to the Wheelwright and Clark classification be considered as breakthrough projects (40%). In terms of share in total funding,

“ A lot of projects can be considered as breakthrough projects (40%). In terms of share in total funding, those projects take two third of total IWT funding. ”

breakthrough projects represent 66% of total IWT funding.
5 % of the projects are breakthrough projects in terms of both technology reach and marketing impact.

Figure 7: Marketing impact and technology reach



Question: Please indicate which of the following statements best describes the type of the funded project(s) in terms of technology and marketing impact

Table 11 allows comparing the projects of the different samples in terms of technology reach and marketing impact.

Table 11: Marketing impact and technology reach

technology reach (a)	Large companies	SMEs	Starters
Experimental group	3,09	2,84	2,96
Control group A	3,13	3,08	3,28
Control group B	2,40	2,68	3,00
marketing impact (b)	Large companies	SMEs	Starters
Experimental group	3,56	3,33	3,53
Control group A	3,00*	3,49	3,84
Control group B	3,00	3,14	3,00

Question: Please indicate which of the following statements best describes the type of the funded project(s) in terms of technology and marketing impact
 (a) mean with 1 = off the shelf, 2 = incremental, 3 = next generation and 4 = radical
 (b) mean with 1 = no change, 2 = variant, 3 = improvement, 4 = new benefits and 5 = new core product
 Significant difference with experimental group at * 10% level, ** 5% level, *** 1% level

Higher mean values for the experimental group compared to the control groups would indicate scope additionalities. But there are no statistically significant differences between the experimental and control groups, with only one exception. This result seems to indicate that the IWT subsidies do not result in scope additionality.

IWT selects the most innovative projects with the most fundamental research character, larger than a critical size and most risky.

The respondents of the experimental group and control group A were also asked whether they had ever been in the position where they had several projects that qualified for IWT support so that they had to

select for which project(s) they would ask a grant. This was the case for about one out of four respondents in the experimental group as well as in control group A. These respondents were subsequently asked about the criteria they used to make their selection. Table 12 ranks the criteria that can be linked to the scope and scale of the projects in the broad sense.

Table 12: Criteria used for IWT application

I applied for IWT support ...	Large	SMEs	Starters	Total
for the most innovative project				
Experimental group	3,71	3,58	3,45	3,57
Control group A	3,67	2,88**	3,60	3,24*
for the project which was closest to the core of my activities				
Experimental group	2,86	3,22	3,36	3,20
Control group A	3,66	3,00	3,20	3,00
for the project that had the most fundamental research character				
Experimental group	3,57	3,14	3,09	3,19
Control group A	3,33	2,11***	3,00	2,58***
for projects which were larger than a certain critical size				
Experimental group	2,57	3,17	2,91	2,92
Control group A	3,33	2,11**	2,40	2,41*
for the most risky project				
Experimental group	3,29	2,53	3,00	2,68
Control group A	2,67	1,88*	2,40	2,18*

Question: To what extent do you agree with the following statements.

Mean scores with 1=completely disagree ; 2=disagree ; 3= agree ; 4= completely agree.

Significant difference with experimental group at * 10% level, ** 5% level, *** 1% level

Among the criteria, respondents from the experimental group as well as the control group A agreed most with the statement that they apply for IWT support for the most innovative project. The experimental group also agrees or tend to agree, on average, with all the other criteria like closest to the core of their activities, most



fundamental research character, larger than a critical size or most risky project.

For some of the criteria, there are significant differences between control group A and the experimental group. These can be interpreted as selection effects with IWT selecting the most innovative projects with the most fundamental research character, larger than a critical size and most risky.

IWT projects differ from projects carried out without public support

In general, the telephone survey results give limited support to the scope and scale additionality of the IWT subsidies. The interview results seem to be more affirmative about the occurrence of these types of additionalities.

It remains true that a number of large companies with a strongly formalised innovation decision process do not fundamentally adapt their strategy to make projects fundable by IWT. IWT has no impact on the content of the projects that are selected by going through a funnel process. But the IWT subsidies nevertheless allow doing additional work of a more explorative nature into new domains.

Most other interviewees agreed that the projects they submit for IWT support are of a different nature than the ones they do internally. The IWT support for instance allows them to do projects that fall outside the scope of their current business lines (scope additionality) and projects that do fall within the current scope can be done more indepth. The IWT projects are typically larger projects that the companies could not do on their own (scale additionality).

Similarly, several companies mentioned that IWT support allows them to do more fundamental research which is not 100 % linked to commercial potential so that the projects done with IWT support have a more

“ IWT succeeds in selecting the most innovative projects with the most fundamental research character, larger than a critical size and most risky. ”

“ More fundamental research may not be necessary in the short run but allows to develop new and more generic knowledge that results in broader applicable outcomes that are important to remain competitive in the long run. ”

fundamental research character compared to the internal projects (see case 2: Barry Callebaut). It was also emphasized that more fundamental research may not be necessary in the short run but allows to develop new and more generic knowledge that results in broader applicable outcomes that are important to remain competitive in the long run.

IWT grants also seem to allow companies to undertake more high risk projects. These projects would be the first to be cancelled if support is denied, definitely when budgets are tight in periods of economic recession.

These scope and scale effects are to a certain extent also the result of the selection criteria applied by IWT. For instance, several companies indicated they will only submit projects that (potentially) receive a larger percentage of subsidies in order to compensate for the paperwork and the resulting administrative costs. These are projects that have a more fundamental research character. The importance of confidentiality is for some companies also an explanatory factor for the kind of projects they submit. Given the more confidential character of applied research, these projects are sometimes not submitted to IWT.



Case 2: BARRY CALLEBAUT

A large company in the food manufacturing sector

Barry Callebaut is a large company within a “traditional” industrial sector, i.e. the food manufacturing sector. Barry Callebaut is the world's leading manufacturer of cocoa, chocolate and confectionery products. It is a fully vertically integrated company, from the cocoa bean to the finished product on the store shelf. The Zurich-based company operates more than 30 production facilities in 24 countries and employs some 8.000 people.

Since its foundation in 1996 through the merger of the Belgian-based Callebaut and French-based Cacao Barry, Barry Callebaut has evolved from a supplier of industry and specialty chocolate for industrial and artisanal customers into a provider of integrated solutions to the entire food industry. The company has four business units: Cacao, Food manufacturing, Consumers and Gourmet.

The production facility in Wieze belongs to the business unit Food manufacturing. It is the largest chocolate production facility in the world with a production of 250.000 tons a year. There are 750 people employed. As such, the company in Wieze plays a pivotal role within the company.

An innovation strategy based on three pillars

The first pillar is to bring to market great-tasting chocolate with significantly lower sugar, fat and calorie contents. The second pillar is offering patented and branded/trademarked “permissibility” to consume chocolate – by providing products with health promoting attributes. The third pillar of their innovation strategy is looking beyond chocolate and exploring new product areas competitively.

The company has four divisions to support this innovation strategy: applied R&D in cacao, applied R&D in chocolate (development of new chocolates on demand of the clients), R&D processing (optimisation of the production process) and fundamental R&D. Except for the first type of R&D activities, all R&D activities take place in Belgium. The fundamental R&D division is new (set up in 2005) and develops internal as well as external ideas, mainly product oriented.

Partial project additionality

Since 1996, they did 8 IWT funded R&D projects, clustered in 3 project families. The projects they submit are typically longer term projects that need the development of specific knowledge, the outcome of which is a priori less certain. Projects may for instance relate to recurring client questions for which they have no immediate answer.

All project proposals have been accepted. If support would be denied, there are two possibilities: the project would take place as originally planned or the project ambitions would be reduced. An example of the latter possibility is a project that consists of different work packages. Without support the work packages would be developed one by one and dependent on the outcome of the preceding package. So the go-decision to do the R&D project is not really dependent on the IWT support. There is no or partial project additionality.

The public support can be decisive with respect to the starting date, because without support, the project may have to wait for internal financing. So there may be acceleration additionality. In any case, if the IWT grant would be denied, the amount of public support would be replaced by internal financing.

More fundamental research in collaboration with universities and research institutes

The most important impact of IWT on the scope and the scale of the projects is that it allows doing more fundamental research that is not for 100 % linked to its commercial potential. Among the criteria that are used for internal projects is indeed the potential commercial volume that must be large enough, for instance to develop a new chocolate with specific characteristics.

In most of its IWT funded projects, Barry Callebaut cooperates with partners from universities or research institutes. Some of them, more precisely the more applied research oriented partners, are partners also in other, non IWT supported projects. So there is network additionality with respect to partners that are more oriented towards fundamental research.

Positive output effects

In terms of output, there is one cluster of projects that resulted into new insights that allow them to serve their client needs better and therefore support their competitive position. The projects in another cluster resulted in new knowledge that will allow them to fine tune their production processes. This will result in time savings up to 30 % for this part of the process leading to a higher productivity.

The research results are used within the group worldwide. The research in fermentation is mainly implemented in Africa but is nevertheless also beneficial for Flanders since one fifth of the production of chocolate of the group takes place here.

The company does not systematically take patents because the industry is quite closed. Patents would make their knowledge visible and allow competitors to invent around the patent.

Overall, there is according to the interviewee, no impact of the IWT subsidies on the R&D organisation of the company, nor on the localisation of the R&D activities. The IWT support nevertheless adds extra value to the localisation of the R&D activities in Flanders because it allows research on top of the research that is financed with internal means.

3.5 MORE COOPERATION

Network additionality refers to the impact of public support on the collaborative behaviour of the firms. There is network additionality when government support helps to create networks. We first compare the involvement of the respondents of the different samples in non-subsidized R&D cooperation. Then we consider the impact of IWT support on the number of collaborators in the project. We conclude with the results related to the continuation of the partnerships after the projects are finished. These results from the telephone survey are complemented with insights from the interviews.



Funded IWT clients are more involved in non-subsidised R&D cooperation

Table 13: Non-subsidised R&D cooperation

	Large companies	SMEs	Starters	Total
Experimental group	83%	65%	68%	69%
Control Group A	67%	45% **	32% ***	44% **
Control Group B	31% ***	24% ***	33% ***	25% ***

Question: Are you involved in non-subsidized R&D-co-operation?

Significant difference with experimental group at * 10% level, ** 5% level, *** 1% level

More than 2 out of 3 companies within the experimental group is involved in non-subsidized R&D cooperation. There is no significant relationship with the company size. The companies in the experimental group that are involved in non-subsidised R&D cooperation cooperate on average more with other firms than with universities and technology institutes. The large companies among the experimental group cooperate significantly more with universities than do SMEs and starters.

The results in **Table 13** also indicate that the companies in the control groups are less involved in non-subsidized R&D cooperation. This is true in particular for the respondents in control group B where the difference with the experimental group is highly significant for all size categories. The respondents in control group A are more involved in non-subsidized R&D cooperation than control group B but there remains a significant difference, at least for the SMEs and the starters, with the experimental group.

IWT support has a positive effect on the number of external collaborators

Table 14: Comparison of project with/without IWT support in terms of collaboration

-- 1	-	No effect	+ 5	++		Large companies	SMEs	Starters	Total
With much less external collaborators				With much more external collaborators	E	3,58	3,21	2,88	3,20
					A	3,60	3,33	3,53**	3,43

Question: In the following we compare the situation WITH IWT support with the situation WITHOUT IWT support. Has/would the receiving of the IWT grant enabled you to undertake the project ... than what would be/has been possible without IWT support? Mean scores.

Significant difference with experimental group at * 10% level, ** 5% level, *** 1% level

“Companies that indicate no project additionality, nor scale or scope additionality, seem also to experience no network additionality.”

According to the respondents in the experimental group, the IWT support has a limited positive effect (on average) on the number of external collaborators when compared to the situation in which they would not have received the IWT subsidy (see Table 14). We found a significant relationship in the experimental group with the company size: the large companies indicate the most positive impact (although still very limited) while the starters indicate no effect of the IWT support on the number of external partners.

The same question was also addressed to the respondents of control group A who were denied the IWT subsidy but continued their project. They confirm the positive, although limited, impact of the IWT support on the number of external partners. Or alternatively stated: as a consequence of not receiving the IWT subsidy, they (marginally) reduced the extent of collaboration in the project.

IWT subsidies are very often used to pay the partners

Based on the interviews we can conclude that the group of companies that indicated no project additionality, nor scale or scope additionality, seems also to experience no network additionality. There is no impact of IWT on their partnerships or cooperative behaviour since the need for partners is considered before the financing question.

However, many interviewees, especially among the SMEs but also among the large companies, indicated that the IWT subsidies are very often used to pay the partners. Without the subsidy, these partners can not be involved or will be involved to a lesser extent. One company specified that without the IWT support, the partnerships would be cancelled, definitely when budgets are tight. IWT financing also allows to pay partners with specific knowledge that the company does not have. So if they cannot be involved, this results in less efficiency, because the partners are typically more experienced.



There seems to be network additionality more particularly when they cooperate with partners that are more oriented towards basic research (universities, research centres). Because with the partners that are more oriented towards applied research, there is in many cases also cooperation outside the IWT projects (see also Case 2). This does not mean that IWT influences the selection of the partners. In most cases, it seems that (potential) partners are known to the company and so there is no influence of IWT.

Another conclusion from the interviews is that in many cases, in particular among SMEs, it is actually the partner (the different Centra De Groote, university, GOM, Chamber of Commerce, ...) that brought the company in contact with IWT (see also Case 3).

Partnerships continue after projects are finished

Project leaders of projects with partners and that were finished, were also asked about the continuation of the partnership after finishing the project. 83 % of the respondents of the experimental group indicated that the partnership continued after the project was finished, in most cases with the same intensity (42 %). Only in 17 % of the cases, the partnership was stopped. There is no statistically significant relationship between the continuation of the partnership and the company size. What we do not know, however, is whether the partners in the project were new to the company or whether they worked already together before. We also found no statistically significant difference between the continuation of the partnership in the cooperative projects of the experimental group vis-à-vis the cooperative projects in control group A that took place after IWT support was denied¹⁰.

“There seems to be network additionality more particularly when they cooperate with partners that are more oriented towards basic research.”

10. The question was not asked to control group B.

3.6 SMARTER

Competence additionality refers to the positive impact on competencies and expertise. In this section we discuss the results of a series of questions that deal with the impact of the projects on different kinds of abilities and capabilities such as the ability to network or innovation management capabilities. We also discuss the results of a question related to the impact of the project on the IP strategy of the companies (which can also be considered as a sort of expertise).

Impact on competences dependent on degree formalisation of the R&D activities

Figure 8: Impact of project on competences

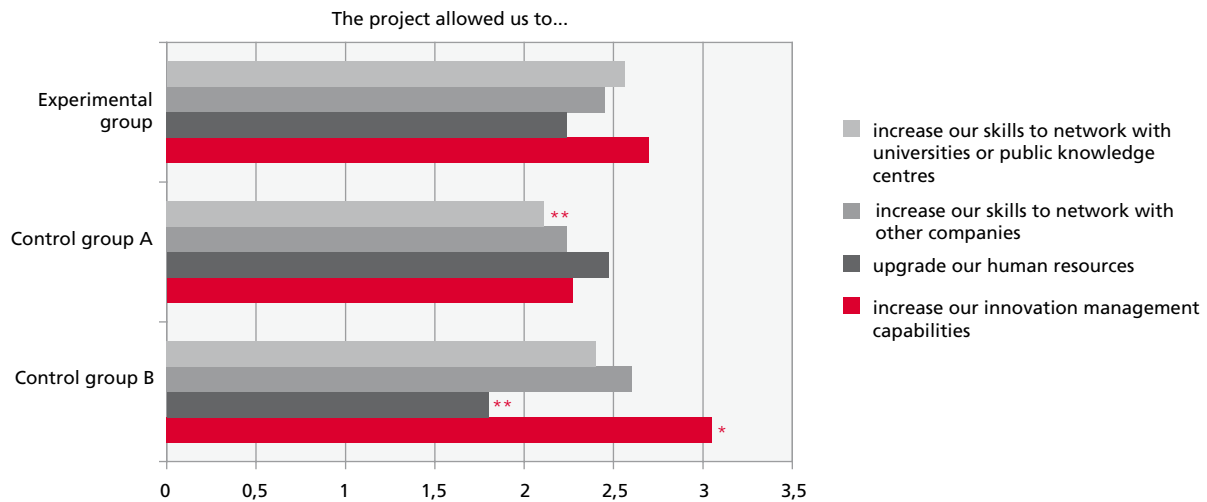


Figure 8 indicates that all items were on average situated below the “agreement” score by the respondents of the experimental group. Comparing the results with the control group A, we observe no



significant differences on the exception of the networking with universities or knowledge centres: the non-funded IWT clients agree to a lesser extent with the impact on networking with universities. Compared with the results of control group B, the experimental group seems to have an additionality for HR upgrading, as respondents of control group B disagree on this statement. Surprisingly, respondents of the control group B agree significantly more with the statement that the project increased their innovation management capabilities. However we have a very limited number of observations for both control groups on these questions.

Based on the interviews, it seems that the impact on the competences of the companies receiving IWT subsidies depends on the degree of formalisation of the R&D activities within the companies. If this formalisation degree is high, IWT will have little influence on the project management organisation or the innovation management capabilities. Some of these companies spoke about finetuning of their R&D process monitoring: there is a more thorough evaluation in the process follow up or more structuring in the process, but no radical changes or implications on the internal project organisation occur due to IWT support. In one case there was an influence of the IWT reporting on the own reporting principles, resulting in the adoption of a reporting scheme coming closer to the IWT requirements (see Case 1). The same company also mentioned that the partnerships allowed the company to develop its critical sense in looking at the technologies of third parties. There was also one example of a very innovative consumer goods company where the IWT project proposals are used internally as didactical material.

Among the companies with a less formalised R&D and innovation process, the impact of the IWT funding on their competences seems to be more tangible. For instance, it was mentioned on several occasions that writing a proposal helps to define the research questions more clearly. Some companies also learned to work more project oriented with a more formalised R&D process as a result. One company

“The impact on the competences of the IWT clients depends on the degree of formalisation of their R&D activities. If this formalisation degree is low, IWT can have a substantial influence on the project management organisation or the innovation management capabilities.”

indicated that it learned how to draw up a schedule and to put milestones which contributed to acquire more discipline, something important also towards clients. Some companies also mentioned an impact on their network competences because many companies use the IWT funding to pay their (scientific) partners. One company for instance gave the example of the high level contacts it developed (not simply on business line level) with high tech companies. That would not have been possible without the IWT grant.

IWT funding has no or only a limited impact on a company's IP strategy

The respondents of the experimental group were also asked about the impact of the IWT project on their intellectual property strategy, which we consider here as a specific competence. This impact seems to be small in general, although we miss a benchmark. When we rank the items along the total number of respondents that agreed with the statement, the softer forms of IPR protection come first. About 1 out of 5 respondents changed their contracts with customers and suppliers, 16% made use for the first time of Non Disclosure Agreements (NDA). Respondents within large companies agree less with these statements, probably because these forms of IPR are already implied within their companies. 10 % or less of the respondents filed for the first time a patent or applied for a trade mark, the stronger forms of IPR. The impact of the project on the intellectual property strategy is independent of company size, except for the item "we first heard of IP rights", mostly the case for SMEs. The interviews confirmed that IWT has no influence on the companies IPR policies, if there is one.



3.7 FASTER

There are acceleration additionalities if participation in innovation schemes speeds up the project. This may shorten the time to market with positive consequences on the competitiveness of the firms.

IWT funding may help to start a project earlier and to finish it faster

Table 15: Acceleration additionality

- - 1	-	No effect	+ 5	+ +		Large companies	SMEs	Starters	Total
Much slower				Much faster	E	3,86	3,72	4,10	3,85
					A	3,67	3,68	3,40*	3,59

Question: In the following we compare the situation WITH IWT support with the situation WITHOUT IWT support. Has/would the receiving of the IWT grant enabled you to undertake the project ... than what would be/has been possible without IWT support? Mean scores.

Significant difference with experimental group at * 10% level, ** 5% level, *** 1% level

Table 15 indicates that according to the respondents of the experimental group, the IWT grant enabled them to undertake the project faster (on average) than what would be possible without IWT support. There is a significant relationship between the company size and the impact in terms of speed on the project, indicating that the impact is largest for the starters' group.

The "hypothetical" impact in terms of speed is confirmed by the answers of the control group A. However, the impact seems in reality on average to be significantly lower for the starters.

During the interviews, it was mentioned in several cases, that if projects need to go fast (i.e. when time to market is important), companies will not submit the projects for IWT support because they must first write a proposal and then wait for the decision on the funding to be taken.

If a project is submitted, the IWT support may help to start a project earlier. As a result products that come out will also be earlier on the market. For instance, it was mentioned a few times that funding may

“ IWT helps to undertake the project faster than without IWT support. This impact is largest for starters. And projects that can be realised faster have as a result a better competitive position. ”

allow to start the project earlier because without funding it would be postponed due to a lack of internal financing. Projects may also get a higher priority at the moment they get funding.

Several companies also confirmed that projects can be realised faster with as a result a better competitive position. A reason for this that was mentioned a number of times is that the support allows including external partners that can do certain tasks more efficiently and therefore faster. (see also case 1).

Another reason mentioned is that if one is forced to write reports and to respect delivery periods because of the funding, there is more pressure behind the projects. This reason seems to be especially relevant for SMEs where the time spent on innovation must compete with the day to day production activities. A third reason is that due to the support, more research paths can be developed in parallel, while without the subsidies companies would only be able to invest in one project at a time.

3.8 BIGGER OUTPUT

Output additionality of public R&D support is a traditional evaluation topic. It refers to the additional “output” that results from the projects that receive public R&D support when compared to the output that would result without public R&D support. Output additionality, just like input additionality, is usually evaluated by econometric techniques. Our evaluation did not focus on output additionality but the questionnaire nevertheless included a series of questions that relate to the output of the projects, like the introduction of new products or production processes. We also include in this section the questions that addressed the impact of the projects on issues like the competitiveness of the company, its turnover and export or the company image. These are outputs in a broader sense and are sometimes referred to as impacts.



Nearly 70 % of the IWT funded projects resulted in the introduction of a new or improved product

A first set of tables presents the results about the “traditional” project outputs in terms of a new or improved product or production process.

Table 16: Output of project

Projects with focus on ...	Large companies	SMEs	Starters	Total
new or improved product (n=140, response rate = 100 %)				
that resulted in introduction of product (a)	54%	71%	77%	69%
that will very likely or certainly result in introduction (b)	31%	16%	13%	18%
new or improved production process (n=50, response rate = 94)				
that resulted in introduction of process (a)	60%	55%	71%	58%
that will very likely or certainly result in introduction (b)	10%	25%	14%	21%

Question a: Did the project result in the market introduction of a new or improved product/production process ? (yes or no)

Question b: What is the probability that the project will result in a market introduction of a new or improved product/production process in the next 2-5 years ?

On average, nearly 70 % of the product innovation projects of the experimental group resulted in the introduction of a new or improved product (see **Table 16**). Large companies seem to have been less successful while the reverse is true for the starters, but there is no statistically significant relationship. Of those projects that did not yet result in the introduction of a new product, 18 % (total average) will very likely or certainly be successful in the next 2 to 5 years, according to the respondents of the telephone survey.

Analogously, nearly 60 % of the process innovation projects resulted in the introduction of a new or improved production process. Again there is no significant relationship between the success of process oriented projects and the company size. Of those projects that did not yet result in the introduction of a new process, 21 % (total average) will very likely or certainly be successful in the next 2 to 5 years.

“ 70 % of the product innovation projects of the experimental group resulted in the introduction of a new or improved product. 60 % of the process innovation projects resulted in the introduction of a new or improved production process. ”

“Some companies could patent the knowledge they developed and now have revenues from these patents such as royalties and licenses.”

11. A comparison with control group B was not possible because of the too small number of respondents on these questions.

We compared the “success” of the projects between the experimental group and control group A¹¹. The projects in control group A seem to have been less successful, in particular the projects with a focus on process innovation.

During the interviews, we collected several nice examples of projects that resulted in new products that are commercialised successfully. A small enterprise, for instance, developing and producing machinery for the food industry, developed with IWT support an oven using gas instead of electricity which is successfully commercialised in several countries, even in the US (see **Case 3: IC-S**). These commercial successes on some occasions led to an increase in employment.

Sometimes the output of the project was considered to be very positive because the results could be used in follow-up projects. A company said it was using experiences and calculations from the preliminary IWT granted study in new research projects. Based on the initial research and the resulting prototype, the company did some further research and developed another product that became very successful. For another company, the project was unsuccessful in terms of new product development, but the knowledge it acquired was very useful in the context of new projects that resulted in a derived product that is actually very successful.

New products or processes are not the only kind of outputs that can be considered as a measure of success of the projects. Some companies could patent the knowledge they developed and now have revenues from these patents such as royalties and licenses. Other companies emphasized the fact that IWT support is important for their long term development, so that in the short run one should not expect important outputs in terms of new products.



30 % of the product innovations and 38 % of the process innovations resulted from projects that would have been cancelled without IWT support

We further investigated whether the projects that were successful in terms of product or process innovation would have been cancelled without IWT support. If that is the case, we can speak of output additionality since these new or improved products or processes would not have been introduced without the IWT support.

Table 17: Output additionality

	Large companies	SMEs	Starters	Total
Projects that resulted in the introduction of a new or improved product and that would have been cancelled without IWT support	14%	38%	23%	30%
Projects that resulted in the introduction of a new or improved process and that would have been cancelled without IWT support	33%	39%	40%	38%

Table 17 indicates that, on average, 30 % of the product innovations and 38 % of the process innovations resulted from projects that would have been cancelled without IWT support.

“ 30 % of the product innovations and 38 % of the process innovations resulted from projects that would have been cancelled without IWT support. The impact is largest among the starters. ”

Reported impacts of outputs are more positive for funded IWT clients

Table 18: Impact of the new or improved product or process

	Experimental group				Control group A
	Large companies	SME	Starters	Total	Total
company image	4,42	4,21	4,54	4,34 (n = 125)	4,09* (n = 32)
future innovation potential of the company	4,55	4,20	4,34	4,30 (n = 125)	3,94** (n = 31)
competitiveness of company	4,30	4,21	4,38	4,27 (n = 123)	4,16 (n = 32)
market share	4,05	4,07	4,21	4,11 (n = 123)	4,11 (n = 32)

Question: What has been the impact of the product or production process that was developed with IWT support ?

Legend: mean score with scale 1-5: with 1 = very negative, 5 = very positive.

Significant difference with experimental group at * 10% level, ** 5% level, *** 1% level

The respondents in the companies where the project resulted in the introduction of a new or improved product or production process, were asked about the impact (from very negative to very positive) of this product or production process on a number of possible project outcomes. **Table 18** presents the results for the experimental group and control group A. Items are ranked by total mean score for the experimental group. The respondents of the experimental group consider the impact on all the items listed to be, on average, “positive” and even “very positive”. The impact is significantly different by company size, except for the impact on the competitiveness of the company. The impact is largest among the starters.

12. We only compare the total means because the numbers of observations by company size are too small for the control group A

When we compare the results on the impacts between the experimental group and the control group A, we can conclude that the impact is (nearly) always more positive for the experimental group¹². In some cases the difference is statistically significant (impact on company image and future innovation potential).



Case 3: IC-S**A starter in the machinery industry**

Industrial Constructions and Solutions (IC-S) is a small enterprise that was set up in 2001 by two partners. It was therefore considered as a starter. It designs, develops and installs transport and automation systems, mainly for the food industry. Most of the machines are custom made. Today, the company employs 6 persons. Two of them are designers, the other four work in the workshop. In a small company like this, R&D, more in particular the design of the machines, and production are difficult to separate.

A new type of ovens on the market thanks to the IWT support

IC-S is for several reasons a nice case. One reason is the fact that one of the IWT funded projects resulted in the commercialisation of a new product, an oven using gas to grill meat. Most traditional ovens in the food industry use electricity. This is expensive and also the costs of maintenance of the bulbs are high. The use of gas allows savings up to 30 % of the energy costs. Other advantages are the fact that the oven is much more compact which allows a greater capacity per square meter and a smaller loss of weight as well as of nutritional value of the food because the grilling goes faster.

IC-S had started the development of this machine as a response to an individual clients demand. But the oven was insufficiently developed to be able to commercialise it on a larger scale. Thanks to the IWT support, the oven could be further developed. The oven obtained a European patent. Without the support, they would have simply served the needs of this individual client. At the same time enough money was left for the commercialisation. More in particular, it was very important to be present on trade fairs to convince potential buyers.

Because the two original partners have a technical background, they set up a new company, AFO-Heat, with a third partner who had a commercial background. IC-S constructs the machines and sells them to AFO-Heat. Because the Belgian market is much too small for this kind of ovens, AFO-Heat set up a distributors network in the US, the Netherlands, France and Germany. The product represents 25 % of the total sales of IC-S. At the moment it is still a custom's made product but for the future they hope to make it a mass-produced article and to further develop it for use in other markets (vegetables, fish, ...). For this further development they will probably submit another proposal for IWT support.

Another interesting issue in this case is that they came in contact with IWT through their university partners. IC-S has the technical expertise to construct the machines but they need partners that are familiar with "food". The partner research therefore covers subjects like for instance combustion gases, nutritional parameters, bacterial count and trace formation, migration of metal and sensory research (scent, colour, flavour, texture).

3.9 WISER STRATEGY

In this last section we consider the impacts of the (IWT) projects that are of a more strategic nature. When this impact is considered to be larger by the respondents of the experimental group in comparison to the respondents of the control groups, we consider this as strategic additionality, i.e. a difference in strategic behaviour that is the consequence of the public intervention.

On average weak agreement by survey respondents with strategic impact of IWT support on their company

Table 19 describes the impact of the specific project on the (innovation) strategy of the company. All statements refer to company level effects. The statements are ranked by the mean score for the respondents of the experimental group.

Table 19: Impact of project on (innovation) strategy

	Experimental group				Control group A	Control group B
	Large companies	SME	Starters	Total	Total	Total
The project let my firm enter into a new enabling technology	3,2	2,93	2,87	2,96 (n=182)	2,94 (n=34)	2,75 (n=20)
The project allowed my company to undertake research in areas beyond our short-term business needs	3,07	2,73	2,93	2,83 (n=180)	2,58 (n=34)	2,60 (n=20)
The project resulted in a more formalized innovation process within the firm	2,37	2,66	2,67	2,61 (n=179)	2,38 (n=34)	2,55 (n=20)
The project caused my company to undertake higher risk research than would otherwise be the case.	2,63	2,55	2,67	2,60 (n=181)	1,70*** (n=33)	2,50 (n=20)
The project eventually led to a change in business strategy	1,93	2,17	2,24	2,15 (n=181)	2,36 (n=33)	2,10 (n=20)
The project affected our choice of location for our R&D facilities	1,90	1,52	1,49	1,58 (n=180)	1,79** (n=34)	1,50 (n=20)
The project affected our choice of location for manufacturing facilities	1,59	1,44	1,33	1,44 (n=174)	1,79*** (n=34)	1,50 (n=20)

Question: Do you agree with the following statements ? Mean score with 1=completely disagree ; 2=disagree ; 3= agree ; 4= completely agree.
Significant difference with experimental group at * 10% level, ** 5% level, *** 1% level



The experimental group mostly agreed with the statement that the project let the firm enter into a new enabling technology. In fact, 3 out of 4 respondents (completely) agreed with this statement. They also (almost) agree with the statement "The project allowed my company to undertake research in areas beyond our short term business needs". Large companies agreed more with the latter statement compared to the SMEs, but the differences by company size are not statistically significant.

There is no strong support among the experimental group for the statement that "The project resulted in a more formalized innovation process within the firm". Not surprisingly, 1 of 4 respondents from large companies completely disagree with this statement. The opposite is true for the SMEs with 1 out of 5 respondents that completely agreed with this statement. There also is no strong impact of the projects on the risk behaviour of the company since the statement that "The project caused my company to undertake higher risk research than would otherwise be the case" gets a total mean score of 2,6.

Subsequently, we get a number of statements where the respondents of the experimental group tend to disagree. For instance, respondents tend to disagree with the statement that the project eventually led to a change in business strategy. This would of course be a very strong impact. Among the SMEs and starters, but not among the large companies, there are nevertheless a number of respondents that completely agreed with this statement.

The results for the last two statements indicate that the projects, on average, do not seem to affect the location of the R&D or production facilities of the companies within the experimental group. However, the interviews with the R&D managers of regular IWT clients resulted in some nice examples of these strategic impacts (see infra). Maybe that is because they have a better view on the strategic impact of the IWT projects on the company compared to the project leaders that were questioned during the telephone survey.

“Most of the projects let the firm enter into a new enabling technology.”

“ Without subsidies,
the company can do
the research where it
wants. The subsidies
are a risk insurance for
the research in Flanders
so it will stay here. ”

13. Note again that the
number of observations for
the control groups is very small
so that we can not distinguish
by company size.

When we compare the strategic impact of the IWT projects with the projects of the control groups, we cannot draw strong conclusions¹³. The mean scores are not significantly higher (sometimes they are even lower) for the experimental group. The exception is the statement “The project caused my company to undertake higher risk research than would otherwise be the case” for which the mean value is significantly higher for the experimental group when compared to control group A, but not when compared to control group B.

But there is qualitative evidence from the interviews with the R&D managers

During the interviews with the (R&D) managers of the regular clients, we collected some nice examples of strategic additionality, or at least strategic effects. A large company entered in a new technology and product domain resulting in an investment of over 50 mio € to set up the most modern production line in Europe. Another but small company indicated that the IWT support allows to take the lead in the market, while otherwise they would be a follower.

Contrary to what the telephone survey results indicate, we collected some qualitative evidence of the impact of IWT subsidies on the R&D and even production location decisions of the supported companies. This was in particular the case among the large foreign owned companies we interviewed.

One of these companies explained that when the company was taken over, the idea was to centralise the R&D activities. In the context of internal competition for the scarce R&D budgets, the IWT support was important to keep and even further invest in the R&D activities in Flanders. Another company indicated that the IWT subsidies that support the research centre allow to keep the knowledge in stainless steel in Flanders. Without support, foreign decision makers could take different decisions. This was confirmed by another company that explained that the optimisation of R&D decisions occurs at group level where they will check whether a project can be subsidized by IWT and therefore be done in Flanders. Yet another company stated it in



another way: without subsidies the company can do the research where it wants. The subsidies are a risk insurance for the research in Flanders so it will stay here. A final example is a company that indicated that IWT projects are important to support the competitiveness of the location in Flanders. It has a positive impact on the attitude of the foreign mother company towards an on local needs based and on site organised R&D organisation model.

The fact that the IWT subsidies allow some companies to keep certain activities in Flanders also translates into an employment level that remains stable. No IWT support would result in less R&D capacity in Flanders, a more limited research portfolio and less new products, according to a large telecom company.

A number of other companies also emphasized the employment effects (both direct and indirect). A company indicated there was no impact of the IWT subsidies on the R&D location, but on the location of the production facilities. The more complex designs in close relationship with the R&D activities are first produced in Flanders, while the more standard products are produced in the proximity of the clients that are located elsewhere (in Europe). So without IWT support, these production activities in Flanders would be at stake.

Another strategic effect that was mentioned by a number of companies is that the IWT subsidies allow the companies to continue their research activities also during economic recessions. When budgets are tight and savings need to be realised, IWT projects still can be continued. The IWT support can be used as an internal argument to continue the project which is important since R&D should be a long term story that should not be affected by short term problems.

Finally we spoke to a number of starters that indicated that they would simply not exist or not survive without IWT subsidies. The IWT support they receive is crucial for them to bridge the gap till they become viable on their own or can attract alternative financial means from the private market.

“Some starters indicated that they would simply not exist or not survive without IWT.”

Chapter 4

THE DRIVERS OF ADDITIONALITY DISCOVERED

From a policy perspective it is important to increase the general understanding of the drivers of additionality and to determine whether policy makers, in the context of general innovation policy development - including public funding - can facilitate behavioural additionality. The alternative is to assume that behavioural additionality is an intrinsically 'soft' process that can only be marginally influenced by active policy.

In this section, the factors influencing the different types of additionality are further examined: which contingency factors trigger or facilitate additionality as a result of public R&D funding by IWT in Flanders? Furthermore, we investigate whether the different types of additionality - input, output, behavioural - merely co-exist or reinforce one another. Note that the reported results are the first findings of a more indepth analysis of the survey results.

The point of departure for investigating these questions is formed by a series of hypotheses that we first will discuss. Subsequently we composed a number of additionality 'constructs' as combinations of specific questions covering different aspects of additionality. We also identified the most relevant company and project characteristics (i.e. the contingency factors) to test the hypotheses. We briefly comment on the development of these constructs and the selection of the contingency factors. As a third step several regressions have been carried out in order to test for interrelations and significance levels. In the last section of this chapter we present the results and further comment on them.

4.1 EIGHT HYPOTHESES TO TEST THE TYPES OF ADDITIONALITY

To narrow down the scope of the analysis, a number of hypotheses have been designed around the main focus and objectives of this study. The different hypotheses are presented below together with



the intuitive background. As the body of theoretical and empirical literature is still limited, most of the hypotheses are based on intuitive expectations.

Hypothesis 1: The larger the share of IWT subsidy in R&D, the higher the additionality.

It is expected that the higher the share of public funding by IWT is in a company's total R&D spending, the more 'additionality' will be observed because it means that the R&D and innovation activities of the company are more dependent on IWT funding.

Hypothesis 2: Subsidies for start-ups have more additionality, in particular outcome additionality.

It is expected that for start-ups that are by definition at an 'early stage' of development, the additionality effects would be higher, mainly the outcome additionality.

Hypothesis 3: Multi-partner projects have a higher additionality.

The expectation is that projects that consist of more than one partner will have a higher level of additionality. More partners allow to strengthen the existing network, to learn from the experiences of others and to perform R&D that goes beyond the scope of what is 'known' to a company at that stage.

Hypothesis 4: Companies that have a high turnover abroad will be able to achieve higher levels of additionality than those companies that are not yet international.

Companies that have already an international position (large export share) will be able to achieve higher levels of additionality because of their broader playing field (national and international).

Hypothesis 5: Companies with a more professionalized R&D organisation will have less competence additionality.

Companies having an R&D department or at least a yearly budgeting of their R&D activities (as a proxy for a formalised R&D

organisation) are expected to have less competence additionality. A R&D department already has a quite elaborated knowledge base available as it is the task of this department to develop knowledge that is relevant for future strategic developments in a professional way. In this context we would expect that for these types of companies less competence additionality would be observed than for companies with no R&D department or a yearly R&D outset.

Hypothesis 6: First projects lead to higher additionality than subsequent projects.

The first time a company does a project funded by IWT, the additionality is expected to be the highest, because before IWT support there was no 'additional' funding at all. Especially for the smaller companies, IWT funding is crucial to the expansion of their knowledge base (product, process, innovation). A subsequent (follow-up) project is expected to lead to a different additionality, but of a more marginal type.

Hypothesis 7: If companies have more cash flow (investment slack) they would have a higher additionality

Companies that have investment slack (a higher cashflow/FTE) are expected to be better positioned to 'exploit' the results of an IWT project and thus reach higher levels of additionality. In many cases this same IWT project, once finished, requires further investment and exploitation.

Hypothesis 8: Additionality, in particular outcome additionality, is more likely to show up the longer time ago the project has been finished.

The additionality effects may occur after some time and not immediately after an IWT funded project has been finished. Outcome additionality in particular may take some time because projects do not immediately result in new products or process improvements that are successfully commercialised.



4.2 CONSTRUCTS AND VARIABLES

Constructs of additionality

In view of the multiplicity of the collected data, the different questions of additionality have been grouped into broader types of additionality in order to be able to provide for a more robust analysis and discussion. As a result, a number of constructs have been developed, on the one hand based on the available conceptual insights reported in the literature, and on the other hand based on and validated by statistical checks (Cronbach's Alpha¹⁴).

We selected two resource-based concepts (input and project additionality), one process-based (behavioural) additionality concept (competence additionality) and also constructed one result-based additionality concept, i.e. outcome additionality. The latter concept combines output and strategic additionality. The annex provides more detailed information on the composition of these constructs.

It should be noted that at this stage scope and scale additionality, network additionality and acceleration additionality have not yet been further investigated. These could be considered in future research.

Variables used

The independent variables used can be classified as company characteristics and project characteristics. Besides these contingency factors, we also used the additionality constructs as independent variables. Moreover we used a group dummy in case we used the full sample, including the control groups (see *infra*) in order to detect additional effects caused by the IWT funding.

14. Cronbach's alpha measures how well a set of items (or variables) measures a single unidimensional latent construct. When data have a multidimensional structure, Cronbach's alpha will usually be low. Technically speaking, Cronbach's alpha is not a statistical test - it is a coefficient of reliability (or consistency).

Table 20 provides an overview of the variables that have been included in the regressions:

Table 20: Overview of the different variables used

Variable name	COM	PRJ	Description	Source
Contingency factors				
Project age in years	X		The 'age' of the project in years after completion	IWT
Multiple projects (dummy)	X		"1" if the project was a subsequent project (and not the first IWT funded project for the company)	IWT
Professionalization of R&D (dummy)	X		"1" when there is a separate R&D department or a yearly budgeting of the R&D-activities in the company	Questions 7.8 and 7.9
Export share	X		The share of turnover that is exported	Question 6.2
Share of IWT subsidies in R&D	X		The share of the IWT subsidies in the overall R&D budget of the company	Question 7.4
Novelty of technology		X	The novelty of the technology applied in the project	Question 3.5
Novelty of market		X	The marketing impact of the project	Question 3.6
Number of project members		X	Number of partners in the project	IWT
Average cash flow	X		Average cash flow of the company in question (year: 2003)	Bel-First
Large firm (dummy)	X		"1" if the applicant is a large firm	IWT
SME (Y/N)	X		"1" if the applicant is an SME	IWT
Additionality constructs				
Input additionality			The variable that reflects the input additionality construct.	Construct
Project additionality			The variable that reflects the project additionality construct	Construct
Competence additionality			The variable that reflects the competence additionality construct.	Construct
Outcome additionality			The variable that reflects the outcome additionality construct.	Construct

COM: Company; PRJ: Project



4.3 WHAT DRIVES (BEHAVIOURAL) ADDITIONALITY

In this part we present a selection of the regression results. We used project additionality, competence additionality and outcome additionality as dependent variables. For each of these additionality types, we discuss the outcomes of a regression on the experimental sample (the group of companies that were granted an IWT subsidy) with the contingency variables as well as the (other) additionality constructs as independent variables. The latter are included to see whether there is an interrelation between the occurrence of different types of additionality.

Table 21: Regression results of the drivers of additionality

	Project additionality		Competence additionality		Outcome additionality	
	sign	p-value	sign	p-value	sign	p-value
Project age in years	+		-		+	*
Multiple projects (dummy)	-	*	+	*	+	**
Professionalization of R&D (dummy)	+		-	**	+	**
Export share	-	**	+		+	
Share of IWT subsidies	+	**	-		+	**
Novelty of technology	-		+		-	*
Novelty of market	-	***	-		+	
Number of project members	+		+	***	-	**
Average cash flow	-		+		-	
Large firm (dummy)	+	**	-		-	***
SME (dummy)	+		+		-	***
Project additionality			+	***		
Input additionality	-	**	+	***	+	
Competence additionality	+	***			+	**
Adjusted R ²	0,115		0,293		0,128	

p-value: * = 10 %, ** = 5 %, *** = 1 %

“The higher the share of IWT subsidies in a company's R&D outlays, the higher the project additionality.”

The drivers of project additionality

- For companies with more than one project funded by IWT, the project additionality is lower. This means that if that particular project would have been denied IWT support, it would probably have taken place anyway. This can be explained by the fact that these companies, since they have several IWT projects, have a more intensive R&D activity pattern and would most likely fund the project applied for with own financial means in case they would not receive IWT support. If we consider the companies for which the project was the first IWT funded project, project additionality is higher which implies that IWT funding is more important for this project to take place.
- The higher the level of internationalisation of the companies (a larger export share), the more likely it becomes that in case IWT would not have funded the project applied for, the project would be carried out anyway. Thus lower project additionality can be observed in these cases. This can be explained by the fact that these companies are probably active in more competitive markets that force them to invest in R&D and innovation and to carry on the project, even if it receives no public support, in order to consolidate their international position.
- The higher the share of IWT subsidies in a company's R&D outlays, the higher the project additionality. We have seen that in particular among the traditional SMEs, the IWT funded project is sometimes the only R&D project they have which implies that the share of the IWT subsidies in their total R&D outlays is high. The result here indicates that for these companies the IWT support is of crucial importance for the project to take place. This confirms the qualitative findings from the interviews.
- The more novel the market envisaged with the IWT project, the lower the project additionality. This is a counterintuitive result since



we would have expected a higher novelty of the market to make the project more risky and therefore more dependent on the IWT support.

- Large firms have a higher project additionality. The benchmark is in fact the starters. This observation is consistent with the results of our descriptive analysis on project additionality (see Table 8).
- A higher input additionality occurs together with lower project additionality while higher competence additionality occurs together with higher project additionality.

The drivers of competence additionality

- For companies with more than one project funded by IWT, the competence additionality is positively affected, probably because these companies have more opportunities to build up competences through IWT funded projects. So this means that there are learning effects that are more prominent when companies have had more IWT funded projects.
- A professional R&D organisation results in lower competence additionality. This can be explained by the fact that companies with a professional R&D organisation, i.e. a separate R&D department or a yearly budgeting of their R&D activities, can learn less from their participation in IWT projects since they probably start with a higher innovation competence level. This observation is in line with the qualitative insights from the interviews.
- A large consortium (large number of project members) seems to increase the level of competence additionality. This is also consistent with the findings from the interviews. The partners are mostly involved in the more fundamental research parts of the projects from which the companies can learn most. A larger number of partners also broadens the knowledge base from which the company can benefit.

“ A large consortium increases the level of competence additionality. ”

“ Companies with more than one IWT project benefit more in terms of outcome additionality. ”

- Input additionality and project additionality are both positively and significantly correlated with competence additionality.

The drivers of outcome additionality

- Project age (in years) is positively correlated with outcome additionality: the longer ago the project has been completed, the higher the effects on outcome additionality. This corresponds with our intuition since outcome effects such as new or improved products or processes or an increase in turnover or exports, resulting from the IWT funded project, will more likely show up after a number of years.
- Companies with more than one project funded by IWT seem to be able to benefit more in terms of outcome additionality. A possible explanation here is that in many cases new projects are follow on projects that come closer to market valorisation and are therefore more likely to result in outcome effects.
- A more professionalized R&D organisation positively affects the level of outcome additionality. This could be explained by the fact that in companies with a more professionalized R&D organisation, the absorptive capacity is better developed which allows them to better exploit the results of the projects.
- The higher the share of IWT funding in the overall R&D budget of the company, the higher the effects in terms of outcome additionality. This may be due to the fact that when the IWT support is of greater importance, as reflected by the share in the total R&D outlays, the company will attribute the positive outcomes more easily to the project since there will be a closer link.
- The more 'novel' a project is in terms of the technology used, the



less direct effects can be expected in terms of outcome additionality. The novelty of the technology may imply that the project is a more risky one with a smaller chance of resulting in positive outcomes.

- We observe a positive and significant co-occurrence of competence additionality in relation to outcome additionality. This could indicate that a certain level of competence additionality is necessary in order to move to outcome additionality.

The proof of additionality

We ran similar regressions on the full sample, i.e. by adding the observations of the control groups, and included a group dummy. The results (not reported here) indicate that this dummy is significant for the three types of additionality and has a positive sign. So project additionality is higher among the experimental group than among control group A, that applied for IWT support but did not receive it¹⁵. This implies that IWT “selects” the companies for which project additionality is higher, i.e. for which the IWT support is of greater importance for the projects to take place. This result is also in line with our observations from the descriptive analysis.

Similarly the group that has received IWT funding achieves higher competence additionality effects than the control group. This suggests “additionality” since the competence effects observed are higher for the IWT funded clients than for the non funded companies.

The same is true for outcome additionality. IWT funded clients achieve higher outcome effects than the non funded companies. This suggests again “additionality”.

The findings on a row

The following table summarises the findings based on the testing of the hypotheses.

“ In short, IWT
“selects” the
companies for which
project additionality
is higher. ”

15. Note that there was no question on project additionality for control group B since they never applied for IWT funding. The companies in control group B received an average value for this variable and therefore cannot have an influence on the results.

Table 22: Summarizing overview testing of hypotheses

Hypotheses	Results	Not rejected/rejected
Hypothesis 1: The larger the share of IWT subsidy in R&D, the higher the additionality.	IWT support is of crucial importance especially for SMEs. For project and outcome additionality we indeed can observe a higher additionality (positive and significant effects). No effect can be observed concerning competence additionality.	Not rejected for outcome and project additionality Rejected for competence additionality
Hypothesis 2: Subsidies for start-ups have more additionality, in particular outcome additionality.	Large firms and SMEs have less outcome additionality (negative significant effect). As the start-ups are the baseline, the start-ups show higher levels of outcome additionality.	Not rejected for outcome additionality
Hypothesis 3: Multi-partner projects have a higher additionality.	Multi-partner projects have higher competence additionality (positive and significant effects) than projects with only one partner. This does not hold for outcome additionality (negative and significant effects). In the case of project additionality, there is no significant relationship.	Not rejected for competence additionality Rejected for outcome and project additionality
Hypothesis 4: Companies that have a high turnover abroad will be able to achieve higher levels of additionality than those companies that are not yet international.	For strongly internationalizing companies, lower project additionality can be observed (meaning: these companies would self-finance the project). For both outcome and competence additionality there is no significant relationship.	Rejected (for all types of additionality)



Hypotheses	Results	Not rejected/rejected
Hypothesis 5: Companies with a more professionalized R&D organisation will have less competence additionality.	A more professionalized R&D company achieves lower levels of competence additionality. They 'learn' less from participation in IWT projects.	Not rejected
Hypothesis 6: First projects lead to higher additionality than subsequent projects.	For companies with more than one project, the project additionality is lower. Outcome additionality, as well as competence additionality are however positively affected (more opportunities to learn).	Not rejected for project additionality Rejected for outcome and competence additionality
Hypothesis 7: If companies have more cash-flow (investment slack) they would have a higher additionality.	We do not find any significant influence of cash flow on any type of additionality.	Rejected (for all types of additionality)
Hypothesis 8: Additionality, in particular outcome additionality, is more likely to show up the longer ago the project has been finished.	There is a positive and significant relationship between the project age and outcome additionality.	Not rejected for outcome additionality

Chapter 5

CONCLUSIONS: IWT DOES MAKE A DIFFERENCE

The impact of public funding on business R&D has usually been formulated in terms of input or output measures only, treating the firm as a black box. This study is an effort to look into this black box and to measure explicitly the changes in the ways firms conduct R&D as a result of the public support they received. These changes are indications of behavioural additionality, a concept that has been introduced as a complement to the traditional evaluation concepts of input and output additionality.

The central research question we addressed is whether IWT projects and subsidies lead to behavioural additionality, i.e. whether they really make a difference within the black box of the company. Different types of behavioural additionality are distinguished, following the additionality classification as proposed by Falk (2005). We also analysed the underlying company and project characteristics that stimulate behavioural additionality and we investigated the relationship between input and output additionality on the one hand and behavioural additionality on the other.

This final chapter gives a general overview of the results and also addresses some questions for further research.

A first important result concerns the **project additionality** of the IWT support: according to the respondents of the experimental group 40 % of the projects would not have taken place if they had not received an IWT subsidy. This is confirmed by the answers of control group A who actually did not receive funding. About 10 % of the projects would have taken place, according to the experimental group, with the same budget if IWT would have rejected their proposal. In reality, 1 out of 3 projects has taken place with the same budget, according to the respondents of control group A.

A majority of about 70 % of the respondents of the experimental group agreed that since the IWT project, they regularly undertake R&D and innovation projects and devote more attention to R&D and



innovation activities. This can be considered as **input additionality** in a broad sense. Furthermore, 96% of the respondents of the experimental group intend to apply again for an IWT grant. Also 60 % of the control group A intends to submit new applications.

We found evidence for different types of **behavioural additionality**. The funded IWT clients indicated that the support had a positive impact, but in general not large, on the goals, the scale, the number of partners and the speed of the project. Again, their answers reflecting on a hypothetical situation by comparing the project with and without support, are in general confirmed by the respondents of control group A.

The indepth interviews gave **additional insights into the black box**. For instance, projects still far 'away' from valorisation or not within the current business lines have a high chance of being cancelled if not supported by IWT. Similarly, several companies mentioned that IWT support allows them to perform more basic research projects with a higher risk profile. Many interviewees, especially among the SMEs but also among the larger companies, indicated that the IWT funds are often used to pay their partners. These partners are typically more oriented towards basic research while the partners they are used to cooperate with outside the IWT projects as well are more oriented towards applied research. Many of the interviewed companies also confirmed that IWT support may help to start a project earlier because the project gets a higher priority within the company. Projects may also be realised faster because, among other reasons, the subsidized companies have to submit progress reports and to respect deadlines.

The innovative character and more in particular the **formalisation of the R&D process** seem to be more important than merely the size of the company to explain the observed behavioural additionality effects. IWT support will on average have only a marginal impact on the R&D behaviour of companies where the innovation process is



highly formalised, for instance in companies where decisions on R&D projects are taken on the basis of business cases. By contrast, IWT support is more likely to have an impact on the behaviour of companies in more traditional sectors that are much less innovative. In some of these companies, the IWT supported project is the only R&D project that moreover would be cancelled without the support.

In terms of **output**, 70 % of the product innovation projects of the experimental group resulted in the introduction of a new and improved product. Analogously, nearly 60 % of the process innovation projects resulted in the introduction of a new or improved production process. 30 % of these product innovations and 38 % of these process innovations resulted from projects that would have been cancelled without IWT support.

Further analysis showed that the **drivers** that determine the project, competence and outcome additionality are very different. For example, the professionalization of the R&D activities, a company characteristic, has a negative impact on competence additionality but a positive impact on outcome additionality. The opposite is true with respect to the impact of the number of project members. The regression results also indicate that the different types of additionality are interrelated. Input additionality for instance goes together with competence additionality.

An important remaining question is on the **policy implications** of behavioural additionality. Evaluations of R&D programs that focus on input additionality are based on the assumption that higher R&D inputs will automatically result in more innovative outputs. This assumption is based on a simple linear view on innovation. Evaluations that only focus on output additionality may induce attitudes that prefer low risk, short term oriented projects. R&D policy evaluations that consider the impact on the R&D behaviour of the supported companies are therefore a necessary complement to the traditional evaluation approaches.



It would therefore be interesting to develop indicators that allow for a more continuous monitoring of the impact on the R&D behaviour of the supported companies, and hence give way to a deeper insight in the drivers of additionality of IWT support for R&D (or more generally R&D and innovation support). A subsequent step could be to adapt the selection criteria to be used to screen the project proposals or even the R&D policy mix in order to achieve more behavioural additionality on different levels of the innovation process within a company. However, before we can do so, further research is needed on the factors that stimulate different types of additionality as well as on the relationships between input, output and behavioural additionality. Also the (ex post) proof of additionality remains a challenging issue in terms of methodology.

“ IWT needs to further develop indicators that allow for a more continuous monitoring of the impact on the R&D behaviour of the supported companies.”

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Annex

1 Input additionality

The construct of input additionality is composed of four separate questions. More specifically, the effect of the IWT project in terms of frequency of R&D, focus of the company on R&D and innovation, available budgets for R&D and innovation, and the application frequency for R&D and innovation subsidies are included in this construct. Note that this is the broader interpretation of input additionality as introduced before.

2 Project additionality

In fact we did not develop a construct for project additionality, but used the key-question on what would have happened in case the project would not have received IWT subsidies. This is the so called counterfactual situation.

3 Competence additionality

Competence additionality refers to the effects on the competences of companies in relation to the IWT funded projects. The questions behind this construct refer to the acquisition of new knowledge, a positive impact on the ability to network with other companies as well as with universities and public knowledge institutes, an increase of the innovation management capabilities and the upgrading of the human resources, all as a consequence of the project.

4 Outcome additionality

The last construct is the construct of outcome additionality¹⁶. This construct contains questions we discussed before under the headings of output and strategic additionality, which are conceptually strongly interrelated. The outcome additionality refers to the additional effects that have been realised because of the IWT funded project (e.g. turnover effects, effects on export, effects on employment, effects on cost cutting, etc.).

16. Because some of the underlying variables are dummy and ordinal, the variables have been normalised before calculation of the composite variable (the construct).

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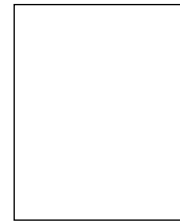
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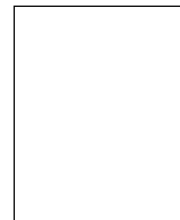
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De nieuwe IWT-unit Monitoring & Analyse ondersteunt de verdere professionalisering en performantieverbetering van het IWT en haar diensten en producten.

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