

### About the effect analysis

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This effect analysis presents a number of studies on the Industrial PhD programme that have not been published before.

A common aspect for the studies is that they shed light on various aspects of the Industrial PhD programme that have not been published previously, and that the sub reports that this effect study is based on are in themselves not enough to shed light on the Industrial PhD programme.

For this reason, the Research and Innovation Council asked Oxford Research to compile this and the results of the different analyses in one complete effect analysis for the purpose of describing the potential useful value the Industrial PhD programme has for enterprises, students and universities.

The main sources for this work are the following materials which have not been published before:

- Time series study from Statistics Denmark from 2006
- Questionnaire from Kvistgård Consult from 2005
- The Research and Innovation Council's extensive statistical data materials on the Industrial PhD programme

In addition to this there are previously public evaluation reports from PLS Consult from 1996 and Right, Kjaer and Kjerulf from 2003.

It is always difficult to combine different reports and analyses, yet in this case that appears to be the only applicable method to clarify the significance the Industrial PhD programme has had for the people involved.

### 8.1 Effect analysis

Oxford Research is responsible for the effect analysis. The analysis was prepared for the period November 2006 to January 2007.

Chief Analyst Henrik Mahncke is the author and chiefly responsible for the report under the supervision of Kim Møller and with the assistance of researcher Stine Zoffmann Bisgaard.

Special Consultant Jens Peter Vittrup from the Research and Innovation Council is the Ministry of Science, Technology and Innovation's sparring partner for the report and the analyses.

### 8.2 Time series analysis

The basis for the Statistics Denmark analysis is the PhD registry which in principle includes everyone who has successfully completed a PhD education in Denmark. For statistical and methodological reasons, it was not possible for Statistics Denmark to go further back than 1993 and up to 2003. It has not been possible to identify everyone who has successfully completed a PhD education for this period. Thus, only 8,580 out of approximately 12,500 other PhDs and 448 of approximately 800 Industrial PhDs who successfully completed a PhD during that period.

### 8.3 Questionnaire analysis

The questionnaire analysis is based on a database with data from 157 enterprises, 172 university supervisors and 422 candidates. Compared to the gross population of the study<sup>21</sup> that gives response percentages of 61.73 and 63 for the three respondent groups stated in Table 8.1:

<sup>21</sup> Gross population means all candidates who started after 1992 as well as all enterprises and university counsellors, who have participated in the initiative since 1999.

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**Table 8.1: Response percentages and uncertainties in the questionnaire analysis**

	Questionnaires sent out	Number of responses	Response percentage	Uncertainty
Enterprises	256	157	61	+/- 4.9%
Universities	237	172	73	+/- 3.9%
Candidates	635	422	66	+/- 2.8%

As shown, the response percentages are relatively high and the statistical uncertainties low. Thus, the study is based on a solid database, which means we can with confidence take the responses as an expression of the overall opinion the participants in the Industrial PhD programme have of the effects of the programme.

### 8.4 Background data on Industrial PhD candidates

The report also includes overviews prepared by the Industrial PhD Secretariat in the Research and Innovation Council. The overviews are prepared based on application forms for the period 2002 to the first half of 2006. The Research and Innovation Council has changed their practices since then, so detailed statistics are no longer available. In some cases, the overviews are supplemented with statistics compiled by the Danish Academy of Technical Sciences from the time before the Ministry of Science, Technology and Innovation took the administration over in 2002.

### 8.5 Study on the support effectiveness of the Industrial PhD programme.

In 2003 the Ministry of Science, Technology and Innovation tasked Right Kjaer & Kjerulf to analyse the support effectiveness of the Industrial PhD programme.

The methodical basis for the analysis is a survey of all 77 applicants to the Industrial PhD programme in 2002. There are three different types of questionnaires.

1. A paper-based questionnaire to all 31 applicants that were rejected to evaluate whether they have started a research education in another way or whether they gave up the desire to have a research education. There was a response rate of 71 percent. (22 out of 31).

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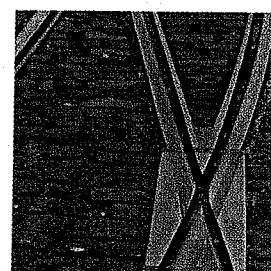
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2. A web-based questionnaire to the 46 candidates who had an Industrial PhD project approved in 2002. There was a response rate of 80 percent. (37 out of 46).
3. A web-based questionnaire to the enterprise supervisors for the approved Industrial PhD projects. There was a response rate of 65 percent. (30 out of 46).

**Table 8.2: Response rates for the support effectiveness analysis**

	Questionnaires sent out	Number of responses	Response rate
Applicants, rejections	31	22	71
Applicants, approved	46	37	80
Enterprise supervisors	46	30	65

Given the relatively limited population in the study, and despite the good response rate, responses were not received from all the enterprises and applicants and so the results should be interpreted with some caution.



## Literature & Links

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### Additional reading:

**Aston Lisberg (2001):** Evaluation of the Industrial Researcher programme.

**The Danish Research Political Council (2006):** Follow up on the evaluation of Danish research education, the Research and Innovation Council, Copenhagen.

**Danish Centre for Research Analysis (2006):** Innovation in the Danish business world 2002-2004, Århus

**The Danish Research Academy (2000):** PhDs who successfully completed the programme 1997 and 1998. Århus.

**PLS Consult (1996):** Evaluation of the Industrial Researcher Education, Prepared for the Danish Agency for Development of Trade and Industry, the Danish Ministry of Economic and Business Affairs.

**The Government (2006):** Progress, renewal and security, the Danish government's globalisation strategy.

**Right, Kjaer & Kjerulf (2003):** Study of aspects of the support effectiveness in the Industrial PhD programme.

**The Ministry of Science, Technology and Innovation (2004):** Evaluation of the research patent act, Copenhagen.

**The Ministry of Science, Technology and Innovation (2006):** A Public Good – PhD Education in Denmark, Copenhagen.

**The Research and Innovation Council (2007):** Innovation Danmark 2007-2010 – Summary of the Danish Council for Technology and Innovation plan of action for more innovation and effective knowledge sharing

**The Research and Innovation Council (2007):** Annual Report of the Danish Council for Technology and Innovation for 2006

**The Research and Innovation Council (2007):** Industrial PhD – New knowledge for the business world and the universities

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## Appendix A /

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# How do you become an Industrial PhD?

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The Industrial PhD project is completed in collaboration between a private enterprise, an Industrial PhD student and a university for a specific research project.

The Industrial PhD student is employed by the private enterprise. This is why it is the enterprise that formally submits the application to the Research and Innovation Council for support for the project.

### Co-financing

The core of the Industrial PhD programme is the interplay between research, education and the business world. This is illustrated by the financing of an Industrial PhD project.

The Industrial PhD student is employed by the enterprise for the duration of the education, and thus the enterprises pay the salary to the Industrial PhD student. For this the enterprise receives a salary subsidy of up to 50 percent of the agreed PhD salary. It is currently DKK 12,500 per month or DKK 450,000 over three years<sup>22</sup>.

There are also various subsidies for participation in business-oriented courses and skills-building stays abroad. The remaining portion of student salaries and other expenses are paid by the enterprise.

<sup>22</sup> The amount is adjusted at regular intervals so that it reflects the development of wages for PhD students. This amount is for January 2007.

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## Appendix A /

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The university receives DKK 300,000 for experimental education and DKK 210,000 for non-experimental education. The subsidy covers participation in PhD courses, supervision of the student, evaluation of the PhD dissertation and costs related to the student's work facilities at the university.

Read more about the rules for financing of an Industrial PhD projects at [www.erhvervsphd.dk](http://www.erhvervsphd.dk)

### Application evaluation

A decision for approval or rejection of an Industrial PhD application is made by the Danish Council for Technology and Innovation (DCTI) upon request from the Research Committee (see Box A).

The application should contain a detailed description of how the research will be state-of-the-art in its field, a clear research hypothesis, a description of the specialised research perspectives, a project description divided into phases and observations on the commercial aspects for the enterprise.

An Industrial PhD project must be approved by the Danish Council for Technology and Innovation and the university PhD evaluation committee before it may begin.

The Danish Council for Technology and Innovation values the Industrial Research Committee's assessment of the application and whether the enterprise can professionally and financially support the project, whether the candidate is qualified and whether the university environment is relevant to the project. The Industrial Research Committee is thus an important cornerstone in the quality assurance of the approved Industrial PhD projects and the initiative as a whole.

If the Danish Council for Technology and Innovation rejects an Industrial PhD project, the project will not be eligible for subsidies under the Industrial PhD programme regardless of whether it is approved by the university.

## Appendix A /

### Box A: Members of the Industrial Research Committee

#### Chairman

Willy Bergstrøm, Customer Centre Manager, NESA A/S

#### Vice-Chairman

Lone Rossen, PhD, Patent manager, graduate in agriculture,

Kurt Bardeleben, Esq.  
Legal Adviser to the Danish Government  
Law Firm of Poul Schmith  
Professor Anders Bjarklev, Director,  
Technical University of Denmark, COM  
Agi Csonka, Head of Section, TDC A/S  
Peter Gravesen, PhD, Group Leader, Danfoss  
Professor Henrik Holt Larsen  
CBS, Institute for Organisation and  
Work Sociology  
Jørgen Nielsen, Research Manager  
Danish Building and Urban Research  
Professor Hanne Riis Nielson  
Technical University of Denmark  
Institute for Mathematical Modulation  
Anders Gersel Pedersen, Senior Vice President  
H. Lundbeck A/S

Professor Lene Schøsler  
University of Copenhagen, Romance  
Languages Institute  
the Danish Patent and Trademark Office  
Associate Professor Arne Bilbjerg  
University of Southern Denmark  
Professor Mogens Blanke  
Technical University of Denmark, ØRSTED,  
Automation Section  
Kirsten Drejer, M.Sc., PhD.  
Symphogen A/S  
Professor Klaus Grunert  
Århus Business School,  
Institute for Marketing and Statistics  
Ole Kirk, Director, Novozymes A/S  
Professor Henrik Madsen  
Technical University of Denmark,  
Institute for Mathematical Modulation  
Professor Peter E. Nielsen  
University of Copenhagen,  
Institute for Medical Biochemistry and  
Genetics  
Professor Michael Palmgren  
The Royal Veterinary and Agricultural University of Copenhagen, Institute for Plant Biology  
Associate Professor John K. Pedersen  
Aalborg University, Institute of Energy Technology

#### Observer for the Industrial Researcher Club

Lene Gerlach, Action Pharma A/S, lene@gerlach.com  
Representative for the Industrial PhD Association

Source: Danish Academy of Technical Sciences October 2006

### Evaluation upon completion of the Industrial PhD education

The host university is the one that approves the total PhD education and awards the PhD degree after it has been evaluated as suitable and defended in a public dissertation defence.

In addition to the PhD dissertation an industrial report will be drafted that must document that the student has gained an understanding of the commercial aspects through the project in both a theoretical and business-relevant context. If the theoretical aspects of the project and enterprise statements are positive, the project will be submitted for approval.