Utilisation report 2010

Technology Foundation STW _ december 2010

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STW-reference
2010/01286/STW

Technology Foundation STW

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Content

Foreword

This is not an annual report

Innovation is accelerating and the Netherlands is increasingly competing with emerging countries on an equal basis. The Netherlands will thus have to work hard in the long term to maintain its competitive advantage in terms of knowledge as an 'asset'. STW is one of the organisations in the Netherlands which ensures that knowledge flows, as quickly and efficiently as possible, from the public to the private sector, the moment that potential economic or social returns appear on the horizon.

To this end, STW has set up processes that are ideal for maximising knowledge transfer between the technical sciences and possible users. Those involved will nevertheless have to listen better to the wishes of the Dutch business community than has so far been the case. Smaller consortia, one-to-one cooperation, shorter and faster procedures, parallel processes and the embedding of programmatic activities in a larger whole are all part of a coordinating vision. This, in turn, fits in perfectly with our country's economic basis: the creation and export of products and services with a high degree of complexity. The making of choices is crucial here. A small country with an open economy cannot do everything and cannot be good at everything.

STW has the staff and mechanisms to make the necessary choices transparently in such a way that the 'best' and most applicable science is carried out by the best brains in the country. This is the 2010 utilisation report. Every year, in its utilisation report, STW accounts for the degree to which the euros invested have led to the involvement of knowledge users, new products and services and additional revenues. Additional revenues which are, of course, subsequently reinvested in new technical scientific research. Accordingly, the utilisation report is not a document in which the foundation reports how it spends its funds. Since 1985, this has been a structural report on 'what actually emerges'. Structural, transparent accountability is what matters for targeted science, not big words or glossy brochures.

Structural accountability leads to a lot of figures, letters and statistics. And, the 'diehards' lap them all up. For the rest of you, however, we have also collected a number of appealing outcomes of knowledge transfer in the form of stories. The stories behind these examples show that there is no single path to success, but that every achievement is the result of hard work, nerve, making choices, patience and even a little bit of luck.

I hope that you will enjoy reading this report.

Eppo Bruins, *director*

Results of STW-investigation

project: **04771**

A synthetic meniscus

user: OTREQ BV, Groningen

It all began in 1987 with a preliminary research proposal for STW to develop a polymer that could be used in the human body and not release toxic substances on its breakdown. This led to a prototype of a synthetic meniscus implant. In 2003, Peter van Wijk and Jacqueline de Groot set up the company ORTEQ to further develop the product for the market. The company was awarded CE certification in 2008, so that the Actifit, as the product is known, could be marketed in Europe. Clinical tests are currently ongoing in the United States and surgeons have implanted the first synthetic meniscuses.

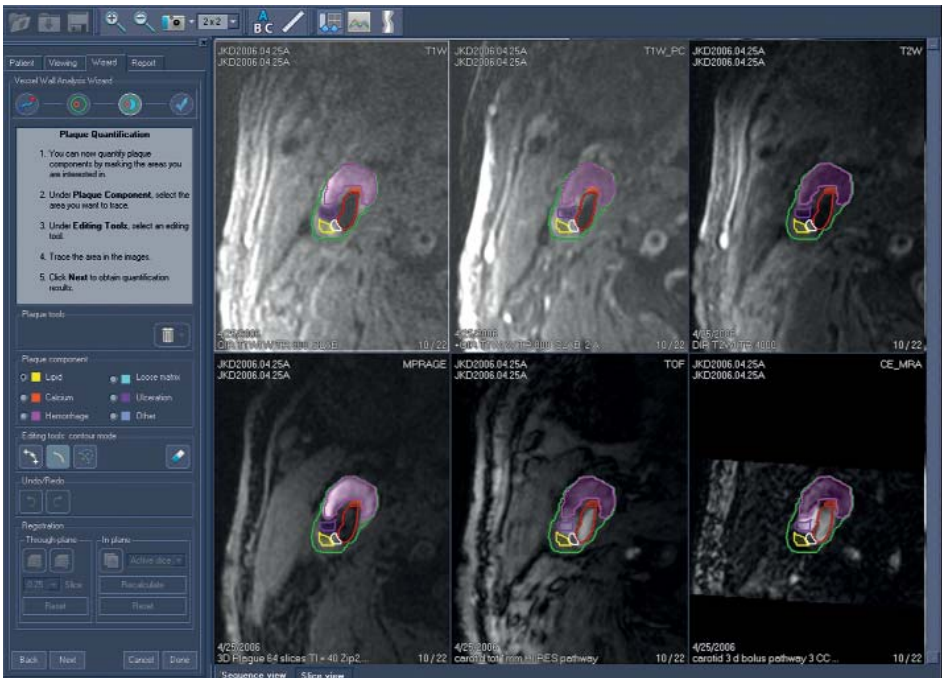
Actifit, the synthetic meniscus.

project: **06454**

Automatic analysis of plaques in the carotid artery

user: Medis Medical Imaging Systems BV, Leiden

Constriction of the carotid artery is caused by the accumulation of plaque in the arteries. Plaque that comes loose can cause a stroke. The probability of this happening is determined by the composition of the plaque. The composition of plaque can now be examined visually. An STW project found ways to produce three-dimensional MR images which can be used for the automatic segmentation, classification and quantification of arteries, constrictions and plaques. Medis Medical Imaging Systems has developed the QPlaque® MR software package on the basis of these results. This software is now being marketed to a limited extent.



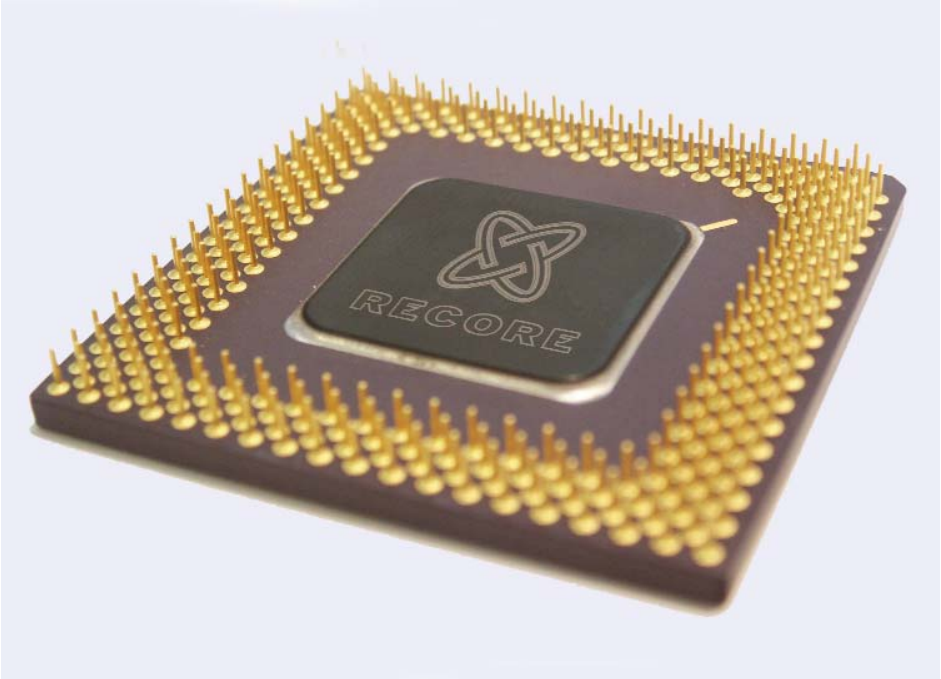
Detection of the condition of vascular walls and classification of tissue: comparison of manual and automatic analysis.

project: **05004**

Multicore platform chips for digital signal processing

user: Recore Systems, Enschede

An STW project from ten years back has yielded intelligent low-energy software and a low-energy processor. A combination of these two formed the basis upon which Paul Heysters and colleagues founded the company Recore Systems. Further development by Recore Systems led to a reconfigurable chip. The company is currently working on the application of this reconfigurable chip in multicore platforms for digital signal processing.



Recore's first multicore platform chip for multimedia applications.

project: **06079**

Better sides on tyres

user: Timcal Belgium SA/NV

Timcal produces a wide range of synthetic and natural graphite powders and conductive carbons. The company became involved in Prof Jacques Noordermeer's research at the University of Twente during a relatively late stage. Noordermeer's work involves the mixing of rubbers with fillers, the purpose being to influence the design and properties of rubber products. Timcal was particularly interested in the application of this research to the sides of tyres. 'The project was a perfect framework for testing our product in new applications. It enabled us to develop the product in a way that would not have been feasible otherwise', Thomas Gruenberger, Plant Manager at Timcal, said.

project: **06150**

Knowledge exchange

user: Spark Holland, Emmen

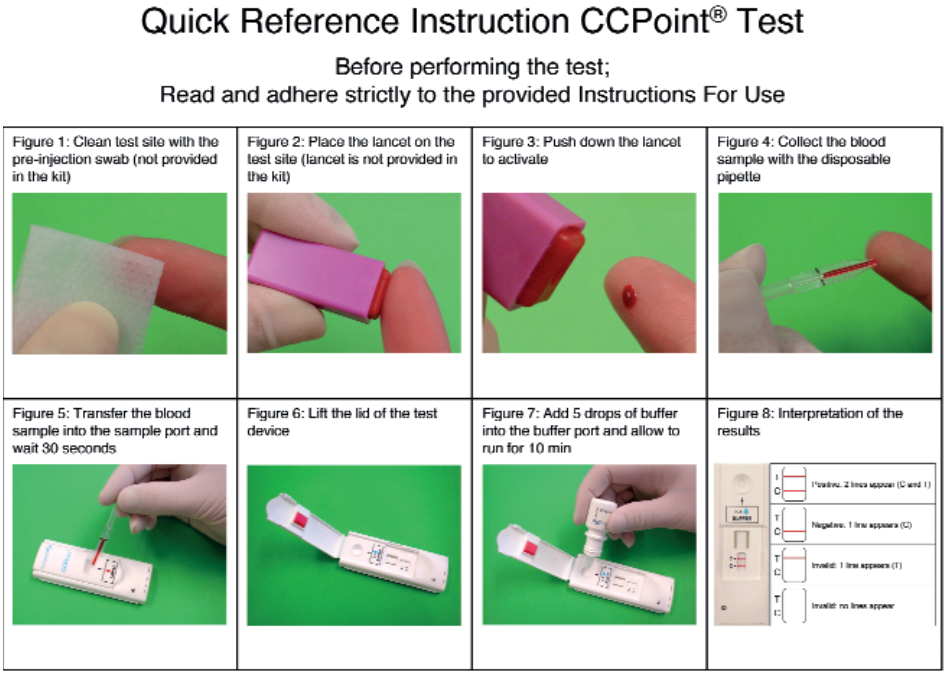
The company Spark Holland focuses entirely on the separation of the constituents of liquids. It does not matter whether the liquid in question is waste water, bodily fluids, fruit juice or blood. Five years ago, Spark Holland became involved in an STW project led by Rainer Bischoff (University of Groningen). This project concerns the disturbed action of enzymes that cause diseases such as rheumatoid arthritis, asthma, Alzheimer's disease, heart hypertrophy and tumour metastasis. The objective of the project is to find methods of detecting these diseases in their early stages. The enzymes in question must be separated from blood samples before they can be examined. According to Bert Ooms, head researcher at Spark Holland, Bischoff is able to convert biological needs into instruments. In his opinion, participation in the project is worthwhile for his company for two reasons: Spark Holland can learn from this 'conversion' and the cooperation raises the profile of the company amongst researchers.

project: **06209**

Test detects rheumatism in its early stages

user: Medis Medical Imaging Systems BV, Leiden

Why does one person get rheumatism and not another? That was the key question for biochemist Walther van Venrooij in 1990. But, he was not the only one who was concerned about this disease. All over the world researchers were working diligently to find a way to recognise rheumatism (officially known as rheumatoid arthritis) in its early stages. Early detection is vital for the prevention of the irreversible damage to joints that arises in many patients. Van Venrooij and his research team at Radboud University Nijmegen made a substantial contribution to this search through an STW project. They 'invented' the CCP test for the rapid, early detection of rheumatism. Together with Van Venrooij, Euro-Diagnostica developed the CCP2 test, which was launched in 2002. Global experiences with this test have been so good that it was incorpo-rated in the improved criteria for rheumatoid arthritis in 2009.



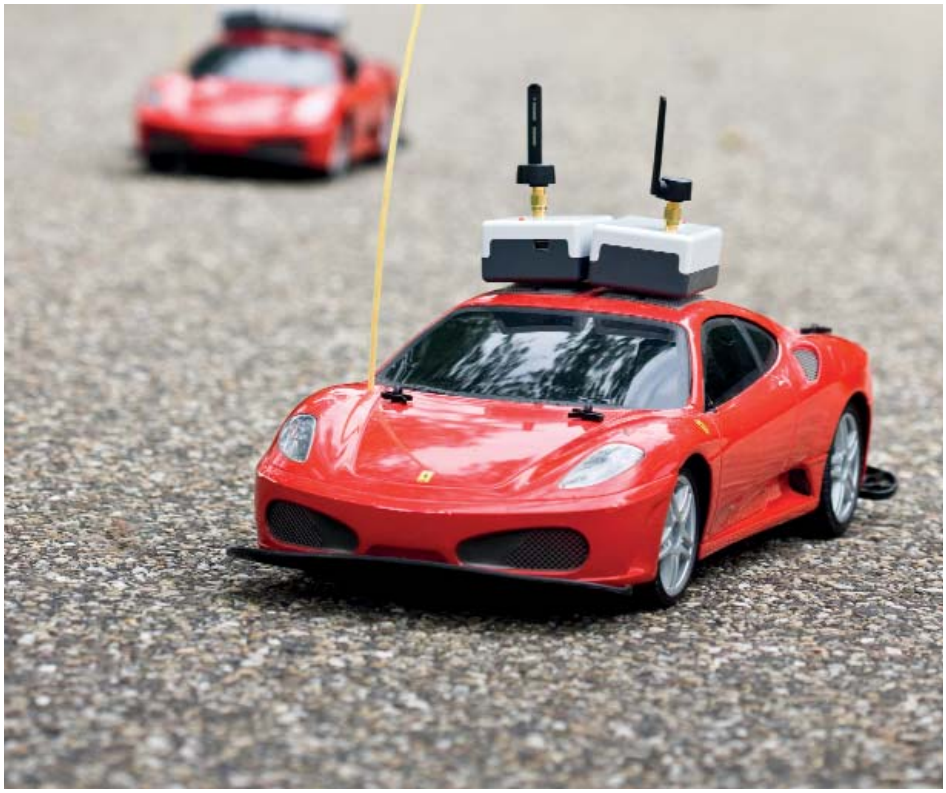
The rheumatoid arthritis test in practice.

project: **06390**

Intelligent wireless networks

user: Inertia Technology, Enschede

Everything in a wireless network is in motion. Each device in the network has its own characteristics, such as specific types of calculating power, energy stocks and radio transmitter strengths. In a research programme co-funded by STW, Raluca Marin-Perianu, PhD candidate at the University of Twente, worked out the mathematics with which mobile devices can collaborate well in a network. The result was a self-organising dynamic network. She expanded the devices with sensors and modified her algorithms so that the sensors could organise themselves in clusters on the basis of their position in space. Attached to objects, animals or people, these sensor networks can, for example, be used in logistics, hospitals and sports. Inertia Technology is now working on applications based partly on Marin-Perianu's research.



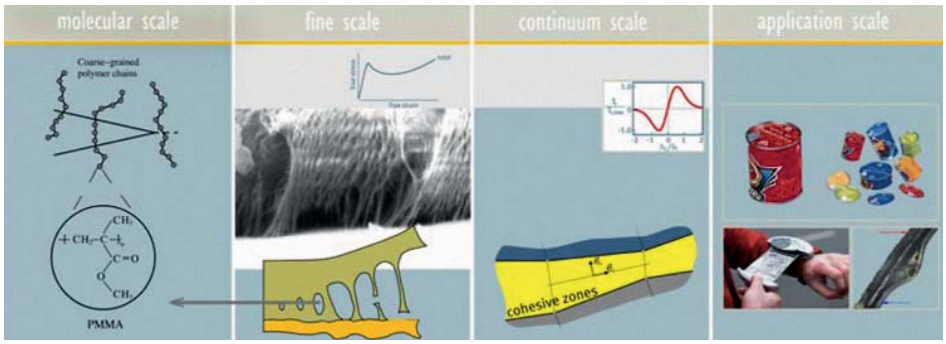
Model cars search for and find their own way: coordinated autonomous steering.

project: **04901**

Nanotechnology by the kilometre

user: Packaging Applications, Tata Steel, IJmuiden

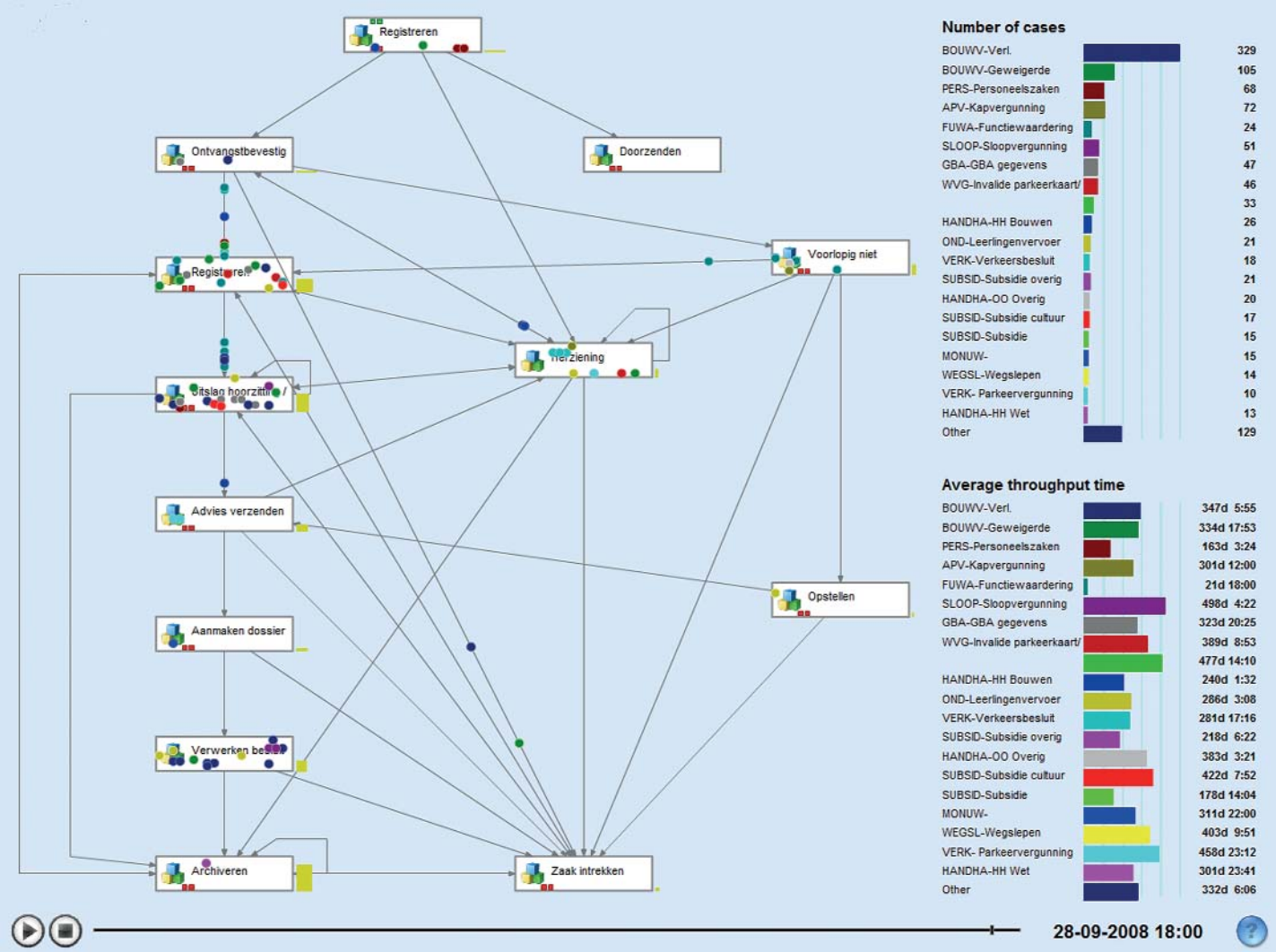
Improving protective layers on steel involves nanoscale precision. Furthermore, the knowledge-based technology must be applicable to square kilometres of steel. STW research has yielded a measuring technique which can be used to determine whether the required coating adheres properly to the steel substrate. This and other insights that have emerged from recent research are now applied in Tata Steel's production process, according to Hans van der Weijde, head of the Packaging Applications Department at Tata Steel Research.



Nanotechnology for coatings.

project: **06447**

Portraying operational processes as images



An automatically generated picture of operational processes.

user: Futura Process Intelligence, Eindhoven

An STW project was set up with the objective of analysing an operational process in one go. This resulted in the ProM software package. The package works with all the existing registered data of a process and rapidly produces a picture of that process - literally. Peter van den Brand and Georgi Jojgov began the company Futura Process Intelligence and developed ProM into the Futura Reflect application. This product is now used by various companies.

project: **06446**

Proces mining for better operational processes

user: Pallas Athena, Apeldoorn

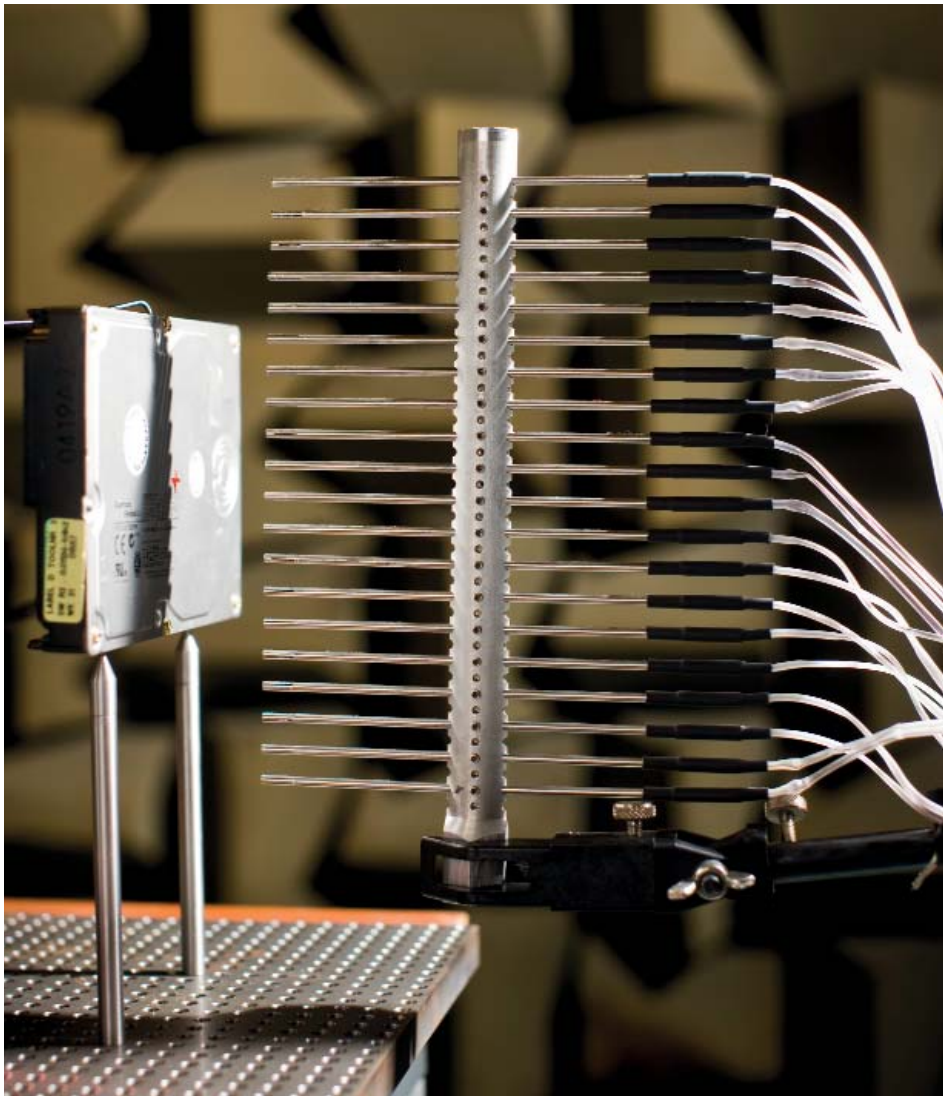
Take an administrative organisation of any size and there is a pretty good chance that it will be on Pallas Athena's customer list, according to director Remmert Remmerts de Vries. The company delivers business process management software for administrative organisations and also takes care of its implementation. Process mining was developed at Eindhoven University of Technology, partly on the basis of STW research. It comprises software which, using data in an existing dataset, automatically sketches the model of the organisation's operational process. As a result, ways of improving the process can be determined faster. Pallas Athena has a global clientele.

project: **06618**

Pin-pointing the source of irritating noise with a robot

user: Sorama, Eindhoven

Noise caused by equipment and installations can be extremely irritating. Tracking down the source is often difficult, certainly if it is a very small source, such as in mobile telephones or laptops. An STW project has yielded a method of localising the precise source of a noise and converting all the registrations into an image or a film. It uses an array of directional micro-phones to do so. Once the source is known, the solution is, in theory, within reach. Former STW PhD candidate Rick Scholte and colleagues set up the company Sorama on the basis of this method in 2009. Sorama now carries out measurements on site at companies and advises on how to solve irritating sound and vibration problems.



Antenna array listens to a hard disc.

Statistics

Summary of figures

The figures give an insight into the situation immediately after a project has ended. Often, the development phase has at that stage yet to begin. It is therefore perfectly conceivable that incomes will increase significantly over the next view years *(see table 1)*.

1999

Until now, 69,5 percent (=score B and C) of the projects that were started in 1999 have led to an active relationship with one or more users *(figure 5 on page 17)*, 67,4 percent (= score B and C) has yielded a concrete product, and 30,6 percent (=score B and C) has yielded income in cash or in kind.

Of the projects that started in 1999, 30 have received funding for further research or are continuations of projects that were previously funded.

2004

Until now, 72 percent (=score B and C) of the projects that were started in 2004 have led to an active relationship with one or more users *(figure 6 on page 17)*, 84,7 percent (=score B and C) have yielded a concrete product, and 24 percent (=score B and C) income in cash or in kind. As for these recently ended projects are concerned, in many cases talk of a definite and clear exploitation of knowledge would be premative.

Of the projects that started in 2004, 13 received follow-up funding or are a continuation of a project that was financed earlier.

Figures 7 and 10 show the IPI code for the 1999 and 2004 projects. An explanation of these figures is given on *page 18*.

table 1 **Projects started in 1999 up to and including 2004 have (5 years after the start) yielded the following, up to 2009:**

	number	contract	patent	income (in M€)
2000	91	82	45	7
2001	66	68	33	5
2002	89	66	27	7,9
2003	97	92	33	8,4
2004	100	88	34	10,8

figure 1 **Number of projects started**

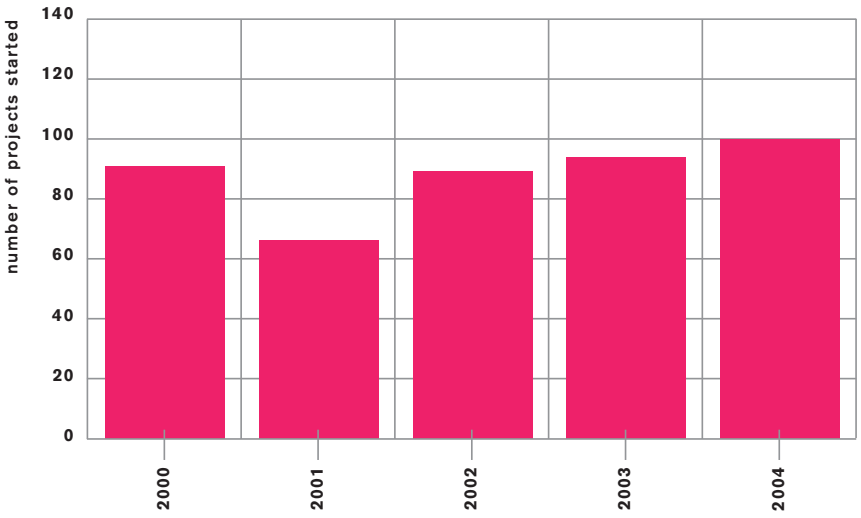


figure 2 **Number of contracts**

figure 3 **Number of patents**

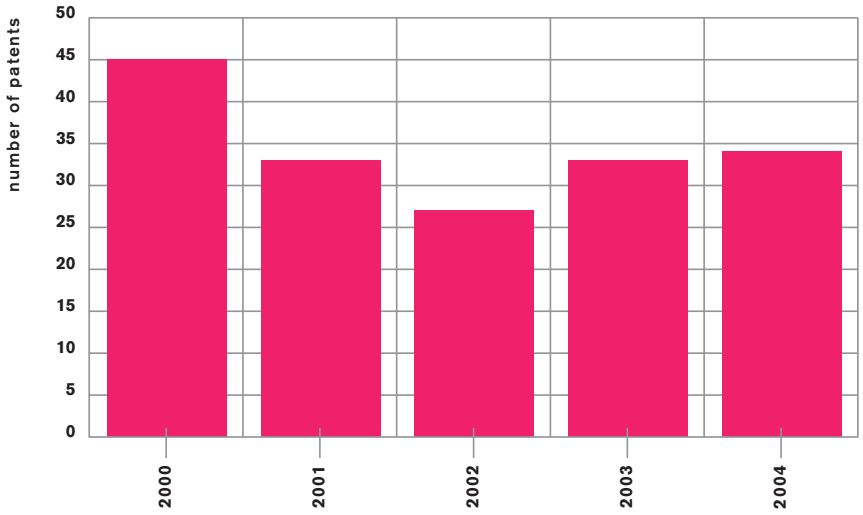
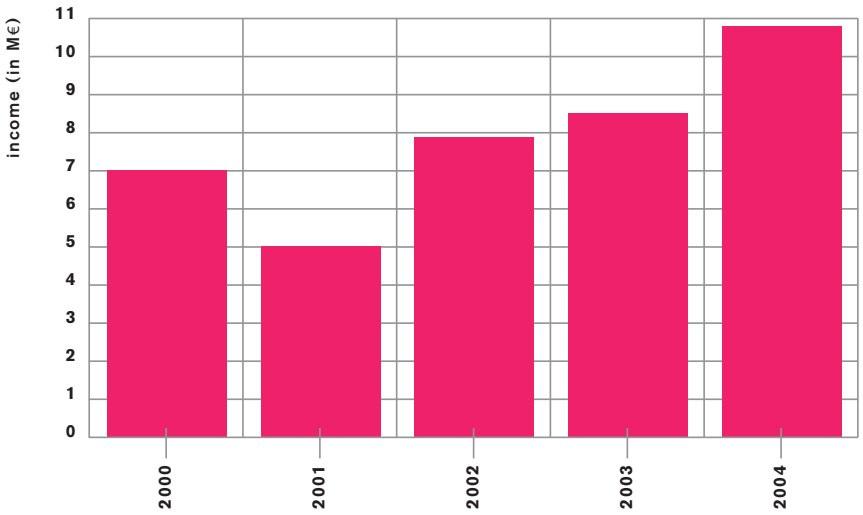


figure 4 **Income**



Income (explanation)

STW takes income to mean any money and contributions in kind generated on the basis of an STW project for the entirety of its duration, that is to say from before the project's start to beyond its termination.

Two moments of evaluation

Projects started in 1999 and 2004

In general, a long time elapses between the start of a project and the moment at which the results actually lead to a 'usable' outcome. STW's involvement is confined to the first part of this long course, namely the research stage, which generally takes from four to six years. In this utilisation report we look back on STW projects some time after the research has ended. Two moments are chosen for this evaluation: the interim report made up immediately after a project ends (in this case, the projects that started in 2004), and the final report five years after, the utilisation report (in this case, of the projects that started in 1999).

The Interim Report (covering the projects from 2004) examines the projects that started six years ago and were concluded recently. It may happen that a user wants to follow up on the results of the research. He will then often have to undertake a further period of development, which is a continuation of the research stage. This may comprise market research, setting up a production line etc, in short whatever is required to arrive at a commercial 'product'.

The Utilisation Report (covering the projects that started in 1999) already gives much more, although still not always complete, insight into the actual application and commercialisation ten to eleven years after the start of the academic research. For this reason, this report also examines the projects that started in 1999, for which a more or less complete utilisation assessment can now be made.

The method: how do we 'measure' utilisation?

Measuring the degree of use is clearly not an easy task. An improved process description can be very attractive to a user financially, without there being any talk of a concrete product. On the other hand, the realisation of an actual product (based on a working prototype) can be broken off because market-economic aspects come into play. The current state of affairs of the various projects is checked by conducting a (telephone) poll of the researchers, project leaders and users who were involved in the project in question. Where this was not possible, other available sources material will have been looked for.

In order to give an idea of the results of a research project, STW has in the past years introduced a method of measurement that is based on three – more or less independent – variables which allow quantification of utilisation. The three variables are 'Involvement', 'Product' and 'Income' (IPI). Each of these variables is subdivided into a rising four-point rating (0, A, B and C), which are defined as follows:

Involvement

The extent to which one (or more) users are involved in the research:

0: the project has failed, because the results are not relevant to a user;

A: some interest has been expressed by the users through participation in a users' committee;

B: users are actively participating. Any contributions are small – in the form of money, materials, and such;

C: users participate unequivocally in the project. Extensive support is given and the collaboration will often be formalised in a contract.

Product

To what extent have the objectives of the research been achieved, and to what extent is there a tangible 'product':

0: the project has failed or in the research stage was terminated early;

A: There is no concrete product. Further research is necessary to obtain a useable product. Preliminary conclusions have already been drawn, but various matters still need to be verified. We are still at the 'basic technology' stage. Up until this moment, the principal form of output has been scientific publication;

B: A preliminary model, principle or draft method is developed and usable. Before there can be talk of a final product, verification and fine-tuning are still necessary. The user cannot (yet) use the product completely independently;

C: a tangible product exists, for example in the form of software, a working prototype, a process description, a patent: in short, there is a concept that is more or less finalised, which the user can start to work on independently.

Income

Has the research generated income for STW and/or the research group?

0: because the project failed scientifically, or because no user can be found, this project has failed to generate income and no income is expected in the future;

A: the project has not yet generated any income. Contributions towards the research may well have been made, but as yet there is no revenue from knowledge exploitation. Future income is however not ruled out;

B: (part of) the knowledge was (or will be) sold incidentally. Here, 'income' may also connote the fact that the result is 'of value' to society;

C: there is (has been) a significant, constant or large stream of income, or there is a possibility that such might be realised within the next five years. For example if principal agreements have already been drawn up.

Using the classification described above, all projects can be classified in a 4 x 4 x 4 matrix, yielding 64 classification possibilities. This enables a more clearly differentiated image of the projects' final results to be given after five and ten years respectively.

The most successful projects fall, of course, within the category CCC. But a successful project with a large degree of involvement from a user in the non-profit sector and with a concrete and tangible product (for example environmental research) will also be assigned to a high class (CCA). A project that has resulted in a product but does not find any users will be assigned to a low category, for example ACA.

In this way the value of basic technology research to the users also becomes clear. There may not be a tangible product, but companies may still put (a lot of) money towards developing (class CAA) or buying (class CAC) this basic knowledge.

Background research belongs in class AAA. Projects that fail in certain aspects or fail completely are given a 0 classification (for example class 000).

Income (explanation)

STW takes income to mean any money and contributions in kind generated on the basis of an STW project for the entirety of its duration, that is to say from before the project's start to beyond its termination.

Projects started in 1999

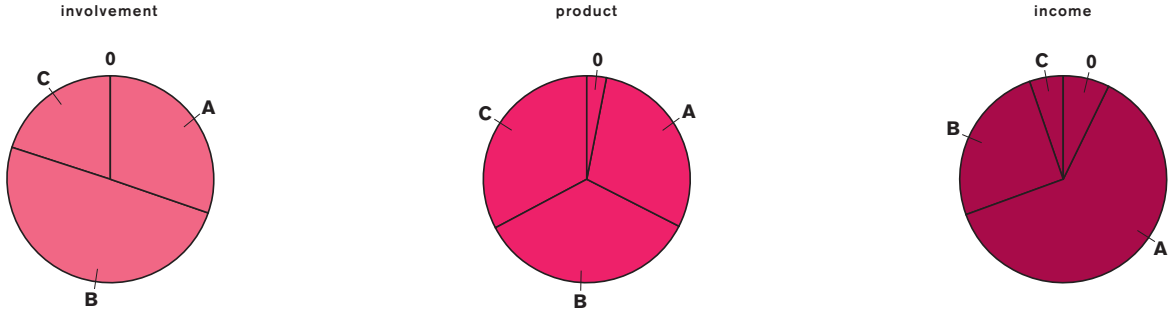
In 1999, 95 projects commenced. STW invested 34,2 million euros in these projects. With these projects, 61 contracts with users were entered into and 26 patent applications were made. Income totalling the sum of 3.4 million euros was noted.

Figure 5 indicates the division per utilisation code. The figures indicate what percentage of the projects attained a certain score in the three categories.

Figure 7 (page 18) indicates the IPI code that the projects received.

	involvement (%)	product (%)	income (%)
0	0	3,3	7,4
A	30,5	29,3	62,1
B	49,5	34,8	25,3
C	20	32,6	5,3

figure 5 **Utilisation groups 1999**



Projects started in 2004

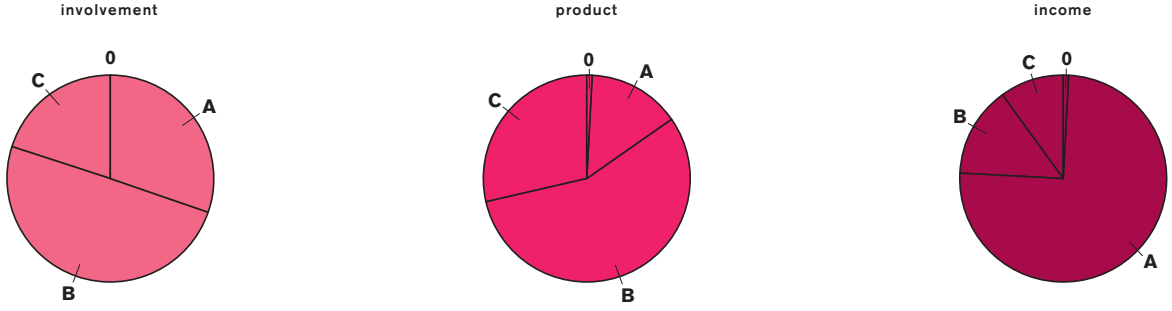
In 2004, 100 projects commenced. STW invested 48,9 million euros in these projects. With these projects, 88 contracts with users were entered into and 34 patent applications were made. Income totalling the sum of 10,8 million euros has been noted (until now).

Figure 6 indicates the division per utilisation code. The figures indicate what percentage of the projects attained a certain score in the three categories.

Figure 10 (page 19) indicates the IPI code that the projects received.

	involvement (%)	product (%)	income (%)
0	1	0	1
A	27	14,3	75
B	51	56,1	14
C	**21**	**28,6**	**10**

figure 6 **Utilisation groups 2004**



The different categories are represented by colours. A high score in the category Income can be recognised by the colour blue. A high score for Involvement is represented by the colour red and a high score for Product is represented by the colour green. Because the complete codes contain all three IPI components, the spheres all show a mix of colours. A project with a IPI code 000 will produce a black sphere. A project with a CCC code will produce a white sphere.

In addition to this, the mass of the sphere indicates how many projects have been given a particular code. So the small, predominantly red, sphere at the bottom indicates that there are 3 projects (1999) with the IPI code A00. The big grey-coloured sphere (one level higher and deeper) indicates that there are 11 (1999) and 9 (2004) projects with the IPI code AAA (basic technology). The white sphere at the right back indicates that there are 3 (1999) and 6 (2004) projects with the IPI code CCC.

The IPR score can also be expressed numerically, by substituting A=1, B=2, C=3 and adding the scores for I, P and R together. Graphs 8 (for 1999) and 11 (for 2004) show the results of I+P+R after this substitution.

Various IPR scores can lead to the same IPR sum. For example, ABB has the same value as BAB or AAC. In figures 9 and 12, a correction has been made for the number of permutations that can lead to a specific score by dividing this number of permutations. In both cases this leads to a graph with more weight on the right-hand side (high IPR sum). This shows that the outcome of the IPR sum is more than 'coincidence', and that STW's approach leads to a disproportionally large number of successful projects.

figure 7 **Utilisation projects started in 1999**

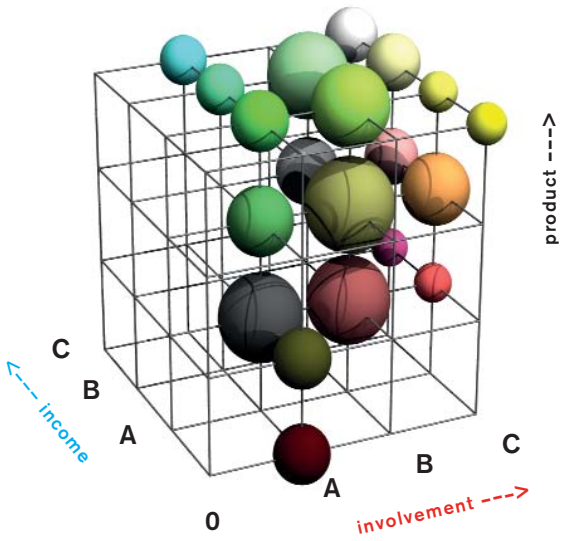


figure 8 **Sum of IPR for 1999**

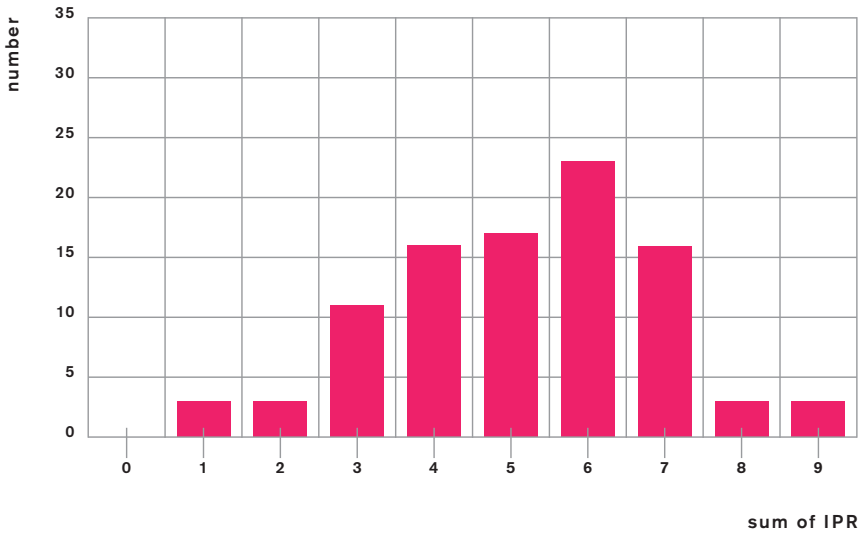


figure 9 **Sum of IPR corrected for the number of permutations per sum, for 1999**

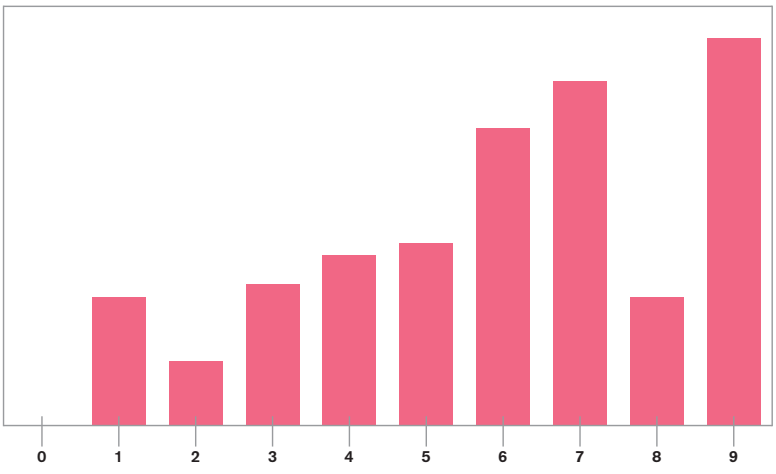


figure 10 **Utilisation projects started in 2004**

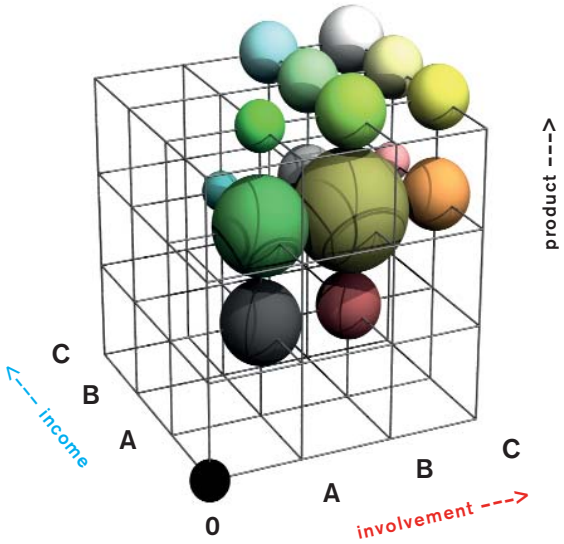


figure 11 **Sum of IPR for 2004**

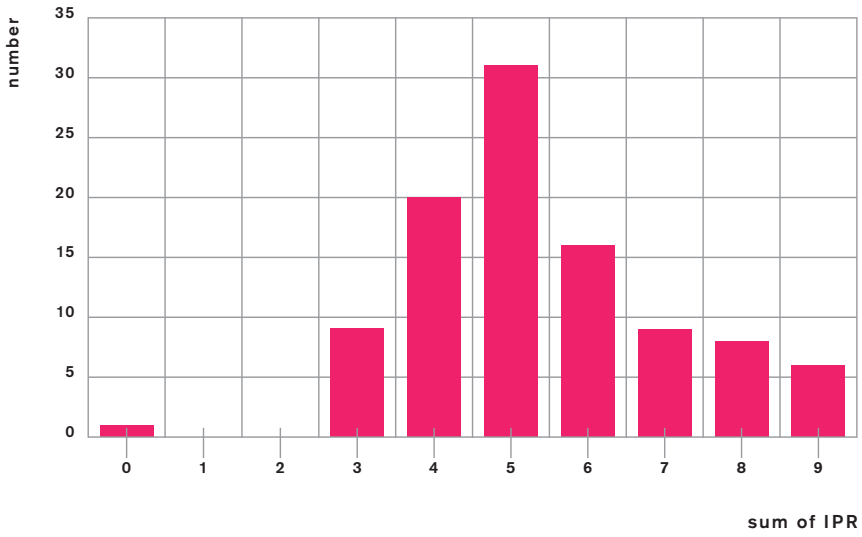
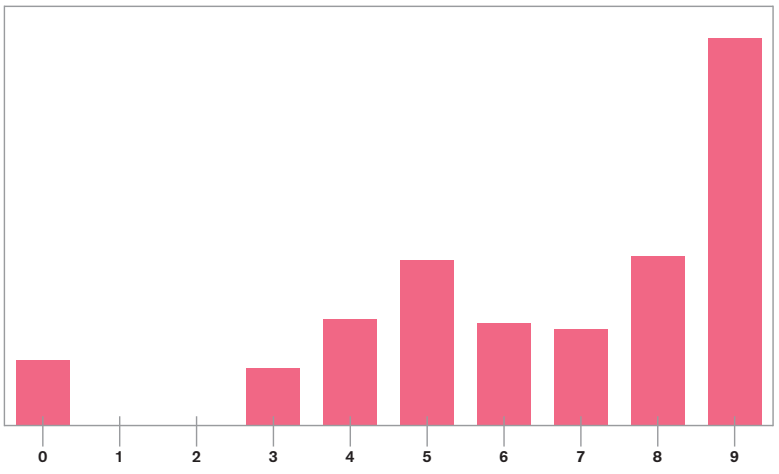


figure 12 **Sum of IPR corrected for the number of permutations per sum, for 2004**



The purpose of the Technology Foundation STW is described in its articles as: to promote science and technology research and its practical application for the general good and for that of scientific education. This purpose is pursued by stimulating and supporting science and technology research particularly in the various institutions for scientific education, using funding made available by NWO, the Netherlands Organisation for Scientific Research, (Ministry of Education, Culture and Science) and the Ministry of Economic Affairs. Furthermore, the foundation contributes to the promotion of research coordination and putting the results to practical use.

The Technology Foundation STW funds research that is selected on the grounds of scientific quality and utilisation. This latter term refers to the likelihood of users actually applying the results of the research. The |likelihood of use can be large in two ways. Firstly, when users can be identified at the start who are genuinely interested, and secondly when results indicate a probable wide range of applications, even though definite users may not yet be indicated.

STW will at the same time act to stimulate and initiate in priority areas where, on the grounds of social and/or scientific developments, there is a clear indication of (para) academic research potential.

In this report, you will find the utilisation of the STW projects that started in 1999, together with the interim report covering the projects started in 2004.