CWI (Centre for Mathematics and Computer Science) has followed a dual mission since its foundation in 1946. Our pioneering mathematics and computer science research, of the highest international calibre, continues today, for instance in the promising areas of hypermedia, software engineering, bio-mathematics and visualisation. However, at the same time we aim to put our discoveries at the disposal of society.

Today, giant leaps forward in high technology are proving to be the main key to prosperity. We ensure that the innovative technology we develop in this competitive area is transferred straight to the heart of our country’s economy.

The institute publishes more than 500 professional papers annually and enjoys productive contacts with many existing enterprising companies. However, one of our most effective ‘windows to the market’ is a growing panel of successful spin-off businesses. Our aim is to create an environment where our 210 employees have every opportunity to become successful entrepreneurs.

In the following pages, we show how many of our key research projects have developed into powerful independent trading companies, some of which have achieved a worldwide impact.

We wholeheartedly welcome their success as part of a two-way process. Operating at the forefront of change, our spin-offs are well placed to feed back to us further pacesetting research projects, supporting the innovations of tomorrow. At the same time, we are happy to see a steady flow of our researchers joining young, expanding companies and putting their ideas into practice. This may seem surprising, until one realises that some people now join CWI precisely because they have every opportunity to become entrepreneurs!

Our relationships with these visionary enterprises take several forms. Whilst we often hold a financial shareholding at the beginning, some companies move on to become major partners in high-profile mergers and buy outs. Others deliberately foster continuing research links with us as one of their prime strengths. A number operate independently, happy to cooperate with us in a variety of ways as they grow.

Now we are changing gear. In 2000, we are launching CWI incubator BV, a totally independent highway to the high-tech market – designed to create at least one new company every year.

Dr Gerard van Oortmerssen, Director CWI
Amsterdam
We are establishing a dedicated company with the aim of providing an ideal environment for researchers to measure their abilities in the business world with minimum early risk, and for successful ventures to accelerate on a firm foothold into the mainstream of world commerce.

The role of CWI Incubator BV is to be the fertile seedbed where sound new ideas can be prepared to succeed in rapidly advancing, but fiercely competitive, high-tech marketplaces.

One of the main objectives of the new parent company is to provide complete financial transparency. This will demonstrate that start-up companies are genuinely economically sustainable - enjoying plenty of professional support, but no direct subsidy.

Such independence will also assist the young companies themselves in proving to their clients, merger partners, banks, financial backers and markets that they are viable in their own right.

CWI will remain closely involved with its fledgling start-ups. We will continue to take a minority shareholding in many spin-offs and will usually hold an active seat on the board of directors. CWI Incubator BV will act as a holding company through which this financial investment can be kept distinct, and will show a clear audit process.

It will also enable us to strengthen the support we can extend to entrepreneurs as they venture away from familiar research systems. At the same time, it will provide a channel for unimpeded feedback from their commercial contacts that will lead to further original research work.

This is the central premise of our spin-off philosophy. In order to generate a growing number of enterprises, we need to increase still further the research base of CWI. The income generated by our shareholdings in spin-offs will be used to invest in innovative, high-risk, fundamental research.

Fostering a spin-off culture is a central tenet of CWI's policy at every level. We routinely review the scope of our current - and proposed - research strategy. An aspect that receives structural attention is possible spin-off generation, particularly with an eye to the needs of the national economy tomorrow - and far beyond.

Researchers are encouraged to think in terms of realistic spin-off potential as an intrinsic part of their research approach - and so feel confident to discuss concerns and opportunities.

Whenever possible, we help to offset worries when researchers decide to change career paths. By going "into business" they are obliged to resign their posts within CWI. To reduce their uncertainty, we offer flexible employment clauses, e.g. research positions are kept available for some years of corporate life when young companies may face failure.

One of CWI's most significant contributions to eager young companies is the sheer breadth of our professional network. This can put them in contact with potential customers and other research organisations.

We can also provide contacts for different forms of professional support, such as legal advice, employment law and all areas of general administration. Being part of a network is also very valuable when raising venture capital. And, of course, our computer facilities are a major resource that could otherwise become a major financial liability on hard-pressed, young cash flows.

The net advantage for our spin-offs is a significant reduction in initial investment costs and risk at a time of greatest vulnerability. At the same time, we take care not to shield them from the unavoidable rigours of market competition.

Our Amsterdam location is ideal: at the science park WTCW (Science and Technology Center Amsterdam), in the direct vicinity of many research institutes, the Twinning Center and one of the most important Internet hubs in Europe. We are in the nation's heart of ICT and multimedia activities, and close to Schiphol International Airport.

We believe that the launching of CWI Incubator BV is a statement of CWI's faith in the pioneering role The Netherlands is now poised to play.
The public flotation in February 2000 of the former General Design BV as part of a major merger with Helsinki-based Satama to form the internationally focused Satama Interactive perhaps marks the ultimate success of a young spin-off company.

General Design was founded in 1994 at CWI to close, what was then, a global gap in user-friendly computer applications. "We wanted to make computer access user-not technology-driven," says General Design founder, and now Satama Interactive country manager, Eddy Boeve. It soon gravitated to the Internet, intranets and extranets. Now the company specialises in website solutions for the rapidly emerging mobile communications industry – WAP technology, mobile phones, laptops, public data services and broadband digital television.

Principal clients include Nokia and Sonera. However, most design work remains at the very high-quality end of the 'conventional' website market serving The Netherlands' leading 500 companies, including Schiphol, ABN AMRO, Lucent Technologies and Honig.

"One of our key strengths is in combining consultancy with strategy, design and technology," says Boeve. This has led to the company opening offices in major cities of every country where its mobile technology clients operate, including Dallas, London, Düsseldorf, Amsterdam, Stockholm and Helsinki.

Boeve also sees the mobile communications interface design market continuing to grow strongly. With the pressure on technology companies to develop the hardware, Satama Interactive is ideally placed as a software provider of choice.

The mobile phone challenge, for example, requires mastering a small screen where finite data can be displayed at once, but where a great depth of information has to be easily available on demand.

"WAP-LOOK is the company's own internal business information service for websites and includes the ability to trade on-line. Meanwhile, major effort continues to go into related projects such as an Internet publicity system to give companies the ability to post their own financial data on line."

"Because we hold the source codes, our products work perfectly for all our customers," asserts Boeve.

Eddy Boeve still has to complete the interface technology PhD with CWI, he set aside to become an entrepreneur. "Being part of the CWI network was vital for us and we still retain links with other spinoff companies," he says. "It was while researching interface systems that I saw the commercial potential. It was a natural process at CWI to develop this, and that strong relationship has continued."

Until the merger and the stockmarket flotation of Satama Interactive, CWI held a seat on the board of directors.
Data Distilleries, a classic case of technology transfer from the CWI stable, where an original research concept flourished in the pro-enterprise culture to become a forerunner in the modern, electronically connected world market, according to Dick Jan Hoekstra. CWI’s renowned research facilities continue to lie behind the company’s accelerating success. Strong support in establishing a corporate structure, and extensive access to the institute’s influential network were also vital.

The high-tech, data-mining software company, Data Distilleries, is a world leader in its booming financial sector niche market.

Preparing for a potentially multi-billion-dollar stockmarket flotation, helping major companies achieve up to hundred-fold sales increases and opening offices on both sides of the Atlantic – the company has done well since starting life as a fledgling spin-off at CWI in 1995.

The key to success was the discovery made by founder, Marcel Holsheimer, during PhD work at CWI. He has taken data mining from being a science-oriented research tool and applied it with incredible success to the financial world where it is used to predict and respond to the needs of millions of public customers worldwide.

The service is two-fold. Firstly, Data Distilleries software identifies complex behavioural trends in customer databases based on lifestyle information. Secondly, wherever individual customers contact their financial service providers, they are provided with a suite of purchase proposals, such as investment instruments and insurance products, which appear to be totally personalised for their specific circumstances.

Providing meaningful communication to customers across a full range of media – or ‘touchpoint’ – is the core of the offer, according to Dick Jan Hoekstra, marketing vice-president. Feedback is so sophisticated and immediate that, if the customer accesses a website moments after declining an offer by another touchpoint, he or she will not be antagonised by a repetition of the same purchase offer.

The big shift into modelling customer behaviour came in 1998 with the development of customer behaviour modelling (CBM) software, followed by customer relationship management (CRM), and finally multi-touchpoint personalisation (MTP).

“Through training courses and software solutions tailored to specific analytical problems, we have fulfilled our brief of a decade ago to bring effective high-end computer algebra to both academia and commercial research communities,” says Verkerk.

CANdiensten’s software packages support fundamental research in international, industrial companies based in The Netherlands – including Philips, Shell and chemical giant, AKZO.

In the important Dutch financial sector, its packages are increasingly being used in cutting-edge projects such as derivatives modelling, option pricing and risk analysis. Current clients include ABN AMRO, ING and the Netherlands’ banking group, Rabobank.

A major pharmaceutical company recently needed to satisfy US Food and Drug Administration (FDA) legal requirements for its products. CANdiensten’s response was an advanced statistical solution based on an internet.

In a completely different area, the company worked on a special statistical software solution to monitor the welfare and distribution of sea birds in the North Sea. This project was carried out for the government agency, Rijkswaterstaat.

“Our vision has been to make high-quality analytical software tools affordable for routine research. Today they are widely known in the Benelux. More than 90% of our higher education institutions are now using advanced Mathematica, Maple and S-PLUS programs supplied by us,” says Verkerk.

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In a world of increasing financial risk in fast, complex, global markets, Financiële Wiskunde Amsterdam (FWA) is a new conduit to attack real business problems with powerful mathematical research tools. CWI, the University of Amsterdam and the Vrije Universiteit (Amsterdam) are FWA's co-founders. The body liaises with commercial organisations through high-level lectures, training and one-to-one consulting.

"Quantifying risk management within the international financial industry is one such area," says Dr Gerard van Oortmerssen. "Here, the volatility, size, global spread and sheer competitiveness of markets are stimulating new thinking not only in the banking sector, but also in insurance and other related areas."

This is reflected in high demand for recent lectures covering advanced financial engineering, such as ‘modelling stock market fluctuations’, and ‘the pricing structure of derivatives’.

"We believe that there is a wealth of scientific knowledge and research with the potential to benefit the financial industry but a synergy does not occur by itself. You have to make it happen and that is what we have to do," says Johan Vos, Director of Technology Transfer, the University of Amsterdam.

However, the link between research and practical application is unlikely to stop there. "We live in an increasingly mathematically orientated world and the financial industry is no exception," says Van Oortmerssen. "We expect to be very much involved with this sector in the future."

In a high-tech world where ensuring the absolutely secure transfer of electronic information – including e-money – is a prerequisite to sustainable commerce, Unipay is actively helping to build confidence.

Founder Ray Hirschfeld focuses his work on consumer transactions where billions of future payments will depend upon electronic authentication that is as reliable as tried-and-tested paper signatures are today. For ordinary citizens, defence against fraud and assurance of privacy will be paramount.

Unipay evolved from Hirschfeld’s encryption research at CWI. This work found algorithms that can be used to verify the credentials of electronic message senders and recipients.

"In the absence of tamper-resistant hardware, Internet security requires building assured conduits that are proof against attack," he says. "Unfortunately, it is impossible to guarantee that any system is secure. It is far easier to demonstrate that it is insecure."

As concepts of cash, trade and personal finance mutate rapidly in the booming electronic environment, Hirschfeld’s future aim is to research a bridge between the two worlds. "The Internet and electronic purse payments must become interoperable," he says.

Another spin-off aimed at creating ground-breaking technology for securing digital financial transactions is DigiCash. Based on encryption technology, this company invented a form of digital money that combines verifiable authenticity with anonymity.

DigiCash was founded in 1990 by David Chaum. In 1997, the company moved from Amsterdam to Silicon Valley to be better placed for the US market. In 1999, DigiCash’s technology was acquired by the US-based company eCash. The services offered by eCash are based on this technology.

**Unipay Technologies**

Encryption for the billions

Impetus created within CWI was a major motivation for turning an academic line of investigation into a viable commercial activity. Having evolved from an institute line of research, Unipay continues to make extensive use of contacts established through the institute’s participation in national and international research projects. "Over the years the institute has consolidated a considerable family of close contacts sharing mutual interests that are of exceptional use to young, up-and-coming companies," says founder Ray Hirschfeld.

Digicash

Option price as a function of stock price and time to maturity
Few four-person, start-up companies can claim to have radically affected the world in just two years. Oratrix, founded in early 1999, is one of the exceptions. It specializes in multimedia authoring software.

“We don’t help you make a video but we do help you integrate it into a streaming media presentation,” says founder and managing director, Dick Bulterman.

The initial breakthrough came when the web monitoring body – the World Wide Web Consortium (W3C) – introduced SMIL (Synchronised Multimedia Integration Language) as the Internet standard in 1998. SMIL is based largely on CWI’s CMIF (CWI’s Multimedia Interchange Format). The language is now the world’s accepted descriptive base across a host of electronic communications outlets.

“The language you give away free of charge,” says Bulterman. “However, it does enable us to sell our accompanying tools, GRANS.”

From a quiet Amsterdam suburb, the company’s products now reside on hard drives around the world.

“We went from being first kids on the block, to delivering the standard used on 120 million desktops across the world. “Our material is used by the Salvation Army, the Ministry of Defence and the BBC. We plan to be a 100 million dollar company within three years of start-up,” says Bulterman.

The Oratrix concept began when he headed CWI’s Multimedia and Human–Computer Interaction research project and decided the team must reach far beyond the latest innovation of the time – CD ROMs. “To really reach the audience, the media has to adapt to meet the recipient, and not the other way round,” he says.

“We looked at the problem from the perspective of network operating systems and concluded that presentation design and delivery were governed by available bandwidth. In a similar vein, to reach a world audience you need to include multiple languages and levels of customisation. Our systems are uniquely geared to help our users create these adaptive presentations. GRANS removes any excuse for making a bad presentation,” he adds impishly.

Bulterman is fiercely upbeat about Oratrix’ Amsterdam role. “We work here to promote high-tech employment in The Netherlands. Undoubtedly our commercial activity will spread to North America but our fundamental research will remain here.”

Eidetica highlights a fundamental principle for the entrepreneur determined to create a successful high-tech company based on a concept drawn from advanced research. Annius Groenink, managing director of the text data mining and text hosting company that he founded in 1998, explains, “We realised we could achieve our business aims by adopting fairly simple technology and not following research to an advanced state for its own sake. We switched from being research-driven to picking out problems from market segments that fit our specialty.”

Through its t.repository software, Eidetica provides a unique, computerised auto-classification route for sorting and condensing text-based passages, titles and authoring information as an alternative to the human hand and eye. The software breakthrough came from research at CWI. It treats conventional database information and raw text as equals so that companies can provide their information as a numerical code rather than as open and confidential text.

In extensive live projects, the software’s ability to assess huge test volumes and suggest cataloguing solutions has been 70% accurate – directly on a par with human ability.

Eidetica products have established business-to-business uses associated with libraries and publications. A major project has been for PCM Interactive Media which is responsible for Internet activities of five of The Netherlands’ leading newspapers. The task of categorising archives and magazines covering 15 years was completed in two months in early 2000. Part of the high-tech magic here, includes the ability to suggest additional key search words from trends the software identifies as it processes.

Future options for the technology could include the computerised selection of e-mail messages to be forwarded to the new generation of WAP mobile phones.

“In a few years’ time, auto-classification will be perfect. Development will then focus on presentation to the user,” says Groenink. “But we always remind our clients as an article of faith that computers will never supersede human beings as decision makers!”

Simply quoting CWI’s name and being associated with the organisation has, in itself, been a major benefit in business development,” says Annius Groenink. “That’s the real strength of a brand” CWI’s network and practical support in personnel management issues was also crucial as he and his colleagues turned their attention from academic to commercial horizons. “It is very important to be near the scientific institution where you were ‘born,’” he adds. The institute’s philosophy of allowing research members to transfer gradually away from academic to commercial horizons “is very important to be near the scientific institution where you were ‘born,’” he adds.

“Eidetica” is a composite of the Greek words “eidos” (form) and “techne” (art). It is a word that describes a creative approach to research, and which is now an integral part of the CWI identity. CWI’s attitude to technology transfer through spin-off subsidiaries “remind our clients as an article of faith that computers will never supersede human beings as decision makers!”

As with other spin-off entrepreneurs, Dick Bulterman exchanged a promising research future at CWI for the opportunity to become a formative force in the world’s evolving communications infrastructure – with no regrets. “Oratrix is a pure product of CWI’s attitude to technology transfer through subsidiary spin-offs,” he says. Admitting that Amsterdam is the perfect cradle to meet the unfolding electronic communications revolution he adds, “CWI makes it the ideal place to be.”
How can you upgrade and continue to operate 30,000 or more outmoded (sometimes unknown) but essential computer programs that still handle hundreds of millions of dollars of financial business?

The Software Improvement Group (SIG) has developed the answer. The CWI spin-off is now working closely with many blue-chip financial companies to keep vital systems – with little formulation and maintenance history – running and compatible with modern programs.

Software development has isolated many effective but ageing systems that are now only connected by a chain of complex middleware.

The products and services offered by SIG have been developed at CWI since 1996 to recognise and analyse the structure of programs. “Documentation is at best out-of-date, and that costs companies money. Our regeneration means operating manuals are always up-to-date,” says researcher and SIG co-founder, Arie van Deursen.

To present its solutions directly to the market, SIG will become a full trading company in August 2000. It has already talked to some of Europe’s leading corporations. “Our strategy is to open offices abroad in cooperation with companies in our network in the near future,” general manager, Marjo Wildvank adds.

However, SIG’s philosophy goes far beyond simply offering novel software solutions to IT clients. “Where companies and corporations are willing to allow SIG to understand their business problems, the group sees its core role as applying fundamental research to contemporary problems such as software transformation,” says Steven Klusener, a former CWI researcher. At the same time it wants to maintain its original links with CWI.

SIG is a new kind of spin-off. It is developing long-term relationships with major international organisations while reinforcing its ties with CWI as a two-way, symbiotic exchange, joining the commercial world to fundamental research. “CWI played a crucial role in establishing SIG, in facilitating the start of the company”, says Tobias Kipers.

“CWI is the powerhouse of some of our most innovative ideas. When clients have specific problems that call for fundamental thinking, an organisation such as CWI is essential. It is a great virtue to be able to call on so powerful a resource,” Leon Moonen adds.