[OBJECTIVE

about innovation and technology

Technolution

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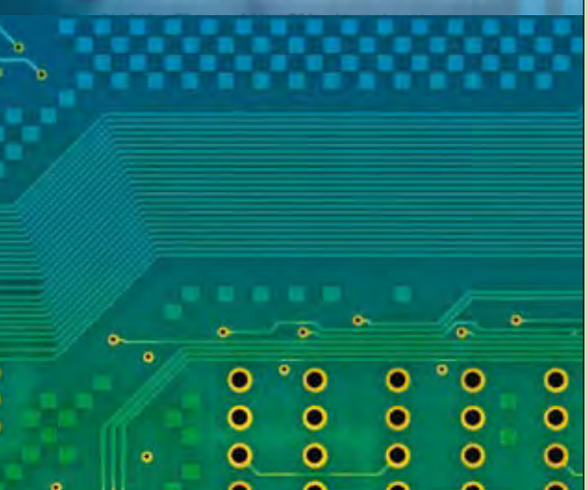


/foreword

More and more technology is being used in products and to facilitate business processes. The scale of these projects is also growing. Organisations can no longer do this themselves – they have to focus on their core activities. Any tasks unrelated to the core activities are outsourced to partners, and as a result, these organisations have less and less intrinsic knowledge of the technology. The goal is to realise a particular function or business objective.

This is not a negative development, as it allows development partners to demonstrate their expertise. However, it does create a knowledge gap between the client and the development partner. Until now, the development partners have been used to receiving detailed specifications for a wide variety of aspects. However, due to changes in the market, clients increasingly lack the technical affinity and knowledge to give specifications, organise and find suitable partners at this level. The two latter aspects in particular create risks.

>>project management is harder than it looks

Due to the continual decline in intrinsic affinity, projects are being managed in a more process-based manner. This can result in less substantive depth and a loss of overall perspective. The consequences are cost overruns, delays and systems that do not cater to the needs of users.

Project management is harder than it looks. Methods or processes do not absolve you of your responsibility to realise a particular objective or solution. Success factors in achieving this include a well-thought-out plan, a good team with broad knowledge of the appropriate subject matter, and solid risk management. The allows project managers to maintain an overview and to manage the expectations of the stakeholders and client.

The provision of project management and the inventory, documentation and validation of system requirements within the overall context of the organisation are therefore increasing in importance. Technolution's sister company Technomanage is a specialist in this field. In the following editions of Objective, we will focus more attention on this expertise. This edition features, amongst other issues, how to handle increasingly large-scale – and hence more risky – tendering processes and outsourcing.

Happy reading!

/technology

Electronlithografy

>>simultaneous control of 13,000 electron beams

Evolution in the chip industry closely corresponds with the development of new production equipment.

Optical lithography suffers with both physical and financial constraints. Electron lithography could provide a

solution. However, how do you switch every electron beam on and off 2.5 billion times per second?

Lithography is the most important step in the production of chips. This process transcribes the chip pattern onto a silicon wafer. On the wafer is a light-sensitive lacquer that is exposed by a wafer stepper (a type of super projector). The wafer stepper projects a slide (known as a mask), then the wafer is moved up a fraction and another mask is projected onto the wafer, and so on until the entire wafer is full. Subsequently, the lacquer is developed and the wafer is etched.

In the computer-chip-manufacturing industry, there is a constant race to make everything smaller: finer details on a chip mean more functionality and greater speed. Wafer-scanner manufacturers come up with all kinds of ideas to project these finer details using light. In order to write finer details, light of a shorter wavelength is necessary. The next generation of wafer scanners will use extreme ultraviolet (EUV) light. The wavelength of EUV light is close to that of X-rays, at just 13.5nm. This requires a complicated and entirely new machine design, using different materials and even more expensive masks..

Lithography using electron beams

Another way to achieve finer details is to use a different ‘light source’. MAPPER Lithography uses electron beams to carry out the ‘exposure’. Electron beams can write smaller structures than light beams. This technique works without masks, which results in considerable savings. Using a raster scan, the pattern is written onto the wafer by a large number of electron beams.

Experiments with this technique have been performed since as far back as the 1960s. The main obstacle was the speed. At the time, the electron beam functioned as a plotter that wrote patterns at an exasperatingly slow speed. In order to increase the speed, MAPPER developed a device that uses 13,000 beams, each of which writes part of the pattern.

Blanker and beam

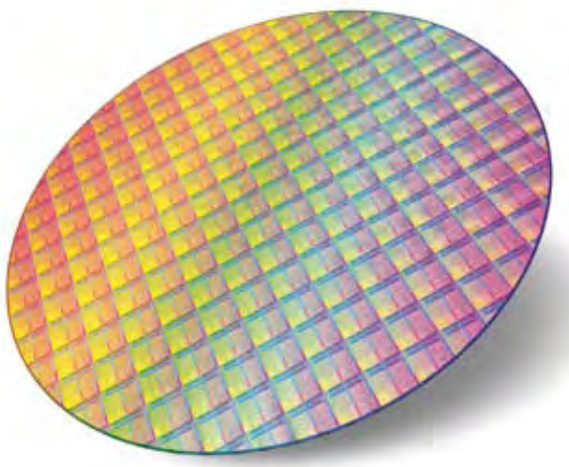
MAPPER creates this large number of beams by aiming one large electron beam at a silicon slice that contains 13,000 holes. Under this slice is the blanker, which is a similar slice containing holes that enables the beams to be switched on and off. The holes in these slices are etched incredibly accurately – to the nanometre – creating 13,000 beams of equal size and therefore equal intensity. Electric lenses bend the beams in one dimension. Every beam can write lines of pixels that are 2µm in length and 3.5nm in width. The wafer moves under this beam, creating a 2µm-wide strip. All 13,000 beams together achieve a maximum chip size of 13,000 x 2µm = 26mm. This is a standard size in the chip industry.
At **www.mapperlithography.com/technology**, you can find an animated film depicting this process.

Exposure and watercolours

Writing a pattern with electrons can be compared to painting with watercolours. Every electron that hits the lacquer leaves a mark. The beam has a diameter of 25nm and can be positioned to an accuracy of 3.5nm. It is like making a finely detailed sketch with a thick paintbrush. This is possible because you are able to push

down slightly harder on the brush for just an instant, then move it slightly and release the pressure again. Only the sum of a number of exposures provides a dose sufficient to make the lacquer dissolve during development. In this way, it is possible to position the image in the wafer's photolacquer to a degree of accuracy greater than 3.5nm.

>>electron beams can write smaller structures than light beams



Pattern Streamer

The electron beams remain permanently switched on, although they can be interrupted by optically driven switches on the blanker. Every beam can be individually switched on or off. By switching the beam on or off at the right moment, a pattern is created. The switches are operated with pulses of light. These are provided by the pattern streamer – a computer that controls all of the electron beams in real time – via an optical fibre. The mask that is projected onto the wafer is saved in the pattern streamer as a bitmap with a size of 1.2 Gbyte per 2µm strip. This original bitmap is corrected for each chip, for example, by shifting or rotating the wafer slightly on the stage. However, the machine itself also has errors, e.g. beams can be slightly crooked. In such cases, the pattern streamer

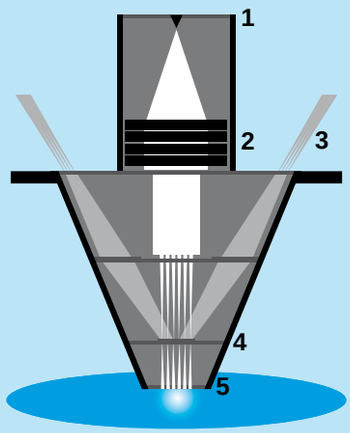
calculates where the crooked beams touched the wafer and which data from the original bitmap is in the correct place. It moves parts of the original bitmap to create a new bitmap. This process is called resampling – an intensive calculation process with a great deal of data (around 2.5 Gbit per second per strip). The very short time between measurement of the errors and the exposure of the corrected bitmap makes it necessary to carry out these calculations in real time.

Redundancy

All material and process attributes will soon be known. These have already been processed during creation of the mask, even before the data is transmitted to the pattern streamer. The streamer processes only real-time corrections for machine-dependent aspects such as temperature and beam errors. When using 13,000 beams, the natural assumption is that one or two will be defective. This is why the number of beams is 2% higher. The machine can work out for itself which ones are defective. The fact that there will be defective beams is combined with another important design choice: around half of the 13,000 beams are controlled using two steps. For the second step, the wafer is shifted slightly from the position in the first step in order to avoid defective beams from the first step during ‘exposure’. An additional advantage is that this halves the size of the pattern streamer, resulting in significant savings.

Calculation power

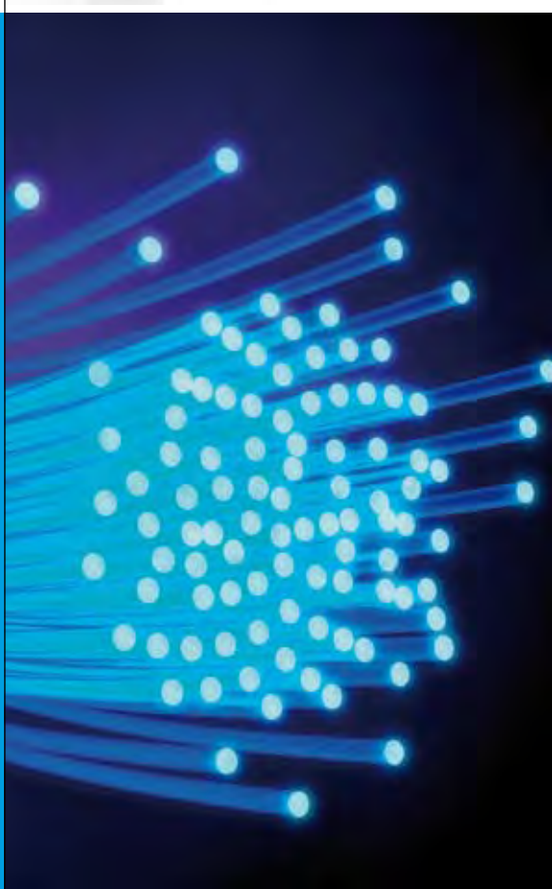
Resampling is carried out using programmable logic (FPGAs), but they cannot handle a speed of 2.4 Gbit per second. This is why the data pad has been divided into twenty parts per electron beam, each of which operates at 125MHz. One FPGA can control five electron beams. You therefore need an enormous amount of electronics to control 13,000 beams, even when using two steps. The pattern streamer the size of two filing cabinets – it is for this reason that the machine was developed in phases.

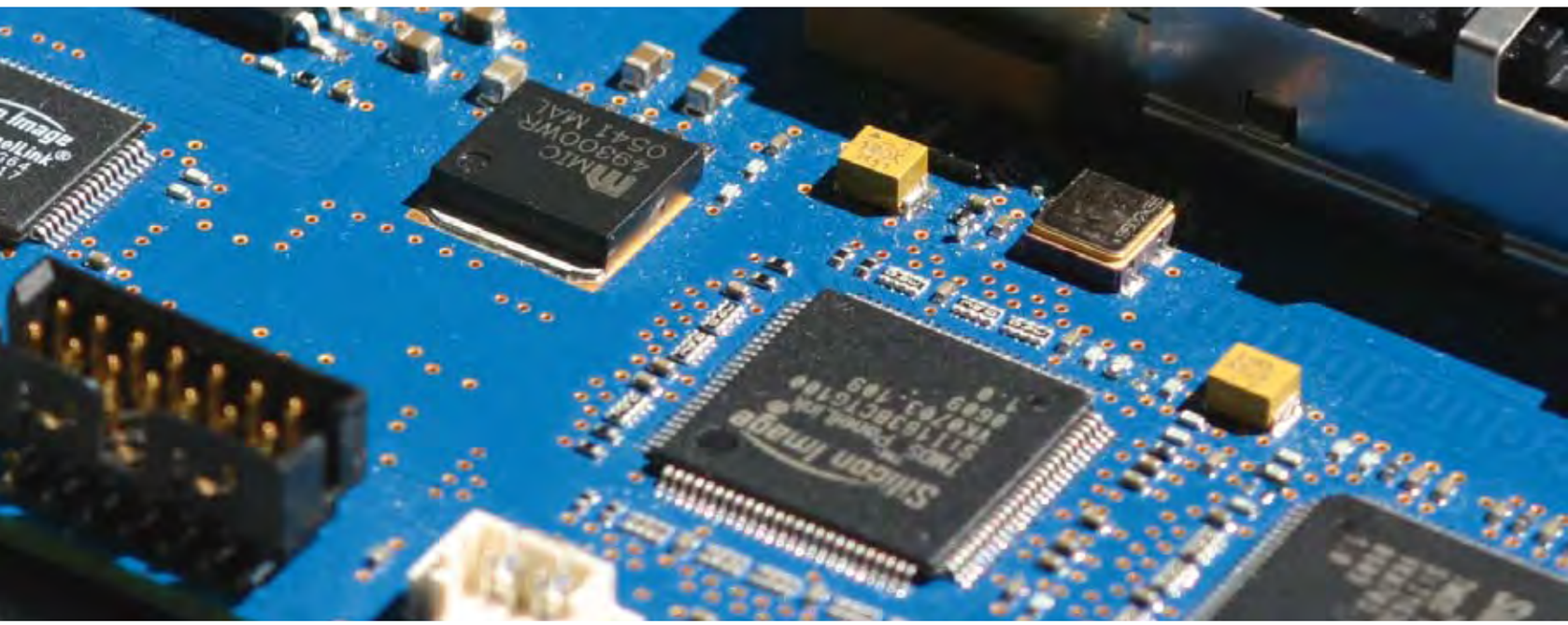


1. Electron source
2. Lens
3. Optical fibre
4. Blanker
5. Wafer

One FPGA can control five electron beams. Twelve FPGAs fit onto one board. Twelve of these boards fit on one rack. Four other boards are then added together with hard disks and a computer in order to control the whole thing. The masks of the chip in production are saved on the hard disks and depending on the step, a specific mask is transferred to the RAM memory.

One rack is sufficient for 720 channels. In order to control half of the 13,000 beams per step, a total of eleven racks are needed. Eleven racks actually gives the pattern streamer over 6,500 channels (the minimum number of channels required). The mapping between the channels and the beams is flexible. By correctly assigning the beams to the channels, it possible to create a complete exposure even if the channels of the pattern streamer or the fibres of the connection are defective.





Demo machines

There are already two demo machines in operation. With 110 channels, these machines are capable of writing small test patterns and are large enough to show that a series of separate beams are capable of writing one coherent pattern (beam stitching). One of these machines is at a research lab in Grenoble, and the other is in a production clean room at TSMC. The second machine in particular is generating a great deal of interest – TSMC is using it to develop opportunities to apply electron lithography to its processes.

>>a machine that surpasses the limits of optical lithography

Scale

Speed is an essential aspect in the production of ICs. One of the most important attributes is the transfer speed of machines (the number of wafers that can be processed per hour). At the moment, MAPPER is working on a machine that can expose ten wafers per hour, named Matrix 10.1. In order to limit initial costs, a 1-wafer-per-hour machine – Matrix 1.1 – is currently being built. This machine's data pad (the pattern streamer and the blanker) has been limited to 1,300 beams. By exposing every wafer 20 times using this machine, a 1-wafer-per-hour machine is created. Eventually, Matrix 10.10 will consist of ten Matrix 10.1 machines side-by-side, each of which will expose a combined total of 100 wafers per hour. Even with all of the peripheral equipment, this is still smaller than an EUV machine.

System design

The pattern streamer's eleven racks for the Matrix 10.1 are roughly the same size as the rest of the e-beam machine. Therefore, with ten machines, you have ten pattern streamers. They will be stored in the service area above or below the clean room, where a less strict chemical classification applies. A thick bundle of 7,800 optical fibres will run through the floor to the machine.
The other electronic equipment required to operate the machine must be kept as close as possible: if the distance between them is too great, the signals from these measuring and regulating devices are delayed. Distance does not affect the pattern streamer, as all of the signals from the pattern streamer are subject to the same delay, which the machine's main control unit corrects. This tells the wafer stage and the pattern streamer what to do. A precise clock provides the basis for the actions: you begin at this time, and you begin ten milliseconds later.

Multi-stage development

Multi-stage development spreads the risk. Furthermore, an entire machine with all of these parts would be too expensive. Costly FPGAs and memories are currently essential to achieving these speeds. However, the developers know that over time, prices fall and performance increases: a universal law of nature in the chip industry. By the time that MAPPER starts building Matrix 10.10, other FPGAs will have been developed that can do more and cost less. And for the fully developed machine, you could even use ASICs (application-specific integrated circuits). By using a step-by-step approach, this innovative technology will help develop a machine that transcends the limitations of optical lithography.

/case

Speed lock:
permanently within the speed

Speeding is a thing of the past with the Speed Lock. The Speed Lock is being tested to see if it can keep habitual speeders within the speed limit. The system monitors vehicle speed and intervenes if the speed limit is broken by limiting the vehicle's speed to the legal maximum. A variety of the Speed Lock is the Speed Monitor, that simply advises drivers of the correct speed.

Dutch government testing of the Speed Lock

The Dutch government is currently looking for a way to address the problem of habitual speeders. The Speed Lock can play a useful role in this matter. The Ministry of Infrastructure and the Environment is currently testing the Speed Lock and the Speed Monitor to find out whether or not they can change the behaviour of habitual speeders by legally obliging them to drive with this device for a period of time. Participants in the trials have been divided into two groups. One group will drive with the Speed Lock, which prevents the car from breaking the speed limit. The other group will use the Speed Monitor. These cars can go faster than the speed limit, but frequent speeding will result in the lock function being deployed.

Operation via in-car platform

The system is based on the MobiBoxx. This is a computer platform for automotive applications with a wide range of interfaces, sensors, free programmability and communication facilities. The MobiBoxx software determines the functionality. In this case, it measures the speed and intervenes if necessary. Via a separate touch screen, the speed limit is displayed for the driver to see. Whether or not the system intervenes is governed by configurable algorithms prescribed by the Directorate-General for Public Works and Water Management and implemented into the software by Technolution.

Intervention at the accelerator

The speed limit is determined by establishing the car's GPS position on the integrated maps. The speed of the car is read by the CAN-bus – the car's communication network. The messages transmitted are part standardised and part car-specific. In order to decipher the latter type, a CAN tool has been developed that can determine what data the speed displays for every type of car. Intervention via the accelerator then takes place via a built-in speed limiter device. The speed limiter is installed between the accelerator and the engine and limits the speed by maintaining a fixed pressure. This pressure corresponds to the local speed limit.

Maps

In order for the Speed Lock to work properly, the machine must know what the local speed limit is. However, good quality maps that feature speed limits for all Dutch roads did not exist. The material that was available was used as a basis to develop our speed limit map. The developers then conducted test drives to check and refine the application. A method was also developed to allow users to give feedback regarding incorrectly designated speed limits. The result of these efforts was a new and adjusted speed-limit map that was forwarded to all participants. Gradually, the speed-limit map built up an accuracy level of at least 95% of all kilometres driven. The first month of the trials also allowed us to gather a baseline measurement for driving behaviour. We then conducted another

series of measurements upon completion of the trials. The difference between these two measurements will indicate whether or not the system has caused users to change their behaviour.

Emergency button

Following this adjustment period, the lock will be activated and no more GPS data will be gathered. In emergencies, or if the speed limit is incorrect, the user can press the emergency button. The GPS route just before and just after the moment that the button is pushed will then – and only then – be sent for analysis. At the end of the journey, the driver will indicate why he/she pressed the emergency button. Sometimes, the problem can be solved simply by checking Google Maps. There is also a help desk that can contact the user and ask why it was necessary to press the emergency button. You can then indicate that the speed limit entered for the route in question is too low, causing you problems when you try to accelerate.

Speed lock or speed monitor?

It is still too early to report results of the trials. Results from earlier trials in London indicate that the speed monitor has a positive effect on driving behaviour. It helps you to keep an eye on your speed, which is helpful due to the many different speed limits and types of road in the Netherlands. For example, there are A-roads with speed limits of 80km/h, and other roads with speed limits of 60 or 70. A speed monitor can accurately remind you of the local speed limit, ensuring optimal safety.

ISA London

Technolution has already carried out trials with Intelligent Speed Adaption (ISA) in London. The MobiBoxx was also used as a basis for this system. The English trials provided knowledge and experience that can also be used in the Dutch trials. The experiment with ISA in London showed that users' reactions to the speed advice system were positive; so much so that the majority would be in favour of wide-scale implementation. One reason for this could be that in England, a penalty-points driving licence is used. If you accumulate more than 12 points within 3 years, your driving licence is suspended for 6 months. Minor speeding offences result in 3 penalty points, and more serious offences can even result in an immediate ban.

MobiBoxx as platform

The back-office server that processes the maps is an essential component of the MobiBoxx platform. It is a generic environment that can be adapted for each project in order to collect and process data, share software, communicate etc. It is for this reason that the entire incident-management system of the Dutch Directorate-General of Public Works and Water Management runs on the MobiBoxx platform. The system is integrated into 500 service vehicles. The driver can log on via a screen in the vehicle so that the system knows who is driving the vehicle. If there is an incident on the motorway, the system can therefore to determine which vehicle is closest to the incident. This vehicle will then be instructed by MobiBoxx to attend the incident. Via the same screen, the driver can also operate the flashing lights and the warning sign in the pick-up bed. The MobiBoxx therefore acts as the spider in the web.

/vision

Early involvement is the first step to successful tendering processes

>>limiting project risks

Tendering processes are becoming larger and more complex, and this is often also the case for **maintenance and financing. As a result, the risks** increase exponentially. How do you deal with this?

Involvement of the end user

ICT projects have a negative image. They seem to go wrong more often than other types of project. The main cause of these failures tend to be insufficient input and involvement from the end user. Clients and development partners consult with each other, but end users are rarely consulted, and when they are, it is limited to a questionnaire or a brief interview.

In major projects, it can often take months to determine specifications. If end users actively participate in this process, they can give their opinions at critical moments with regard to aspects such as usability. The development partner can also play a useful role in the establishment of specifications by contributing his/her own knowledge in order to realise the best possible solution. Unfortunately, during many tendering processes, the specifications have already been determined in detail by the time the person responsible for the construction comes on board. This results in very little room for manoeuvre and prevents the addition of any completely new functionalities.

Wishes and requirements

It has often been assumed that early involvement of the end user in the project involves risks, for example, overstrain. User and client will have to find a happy medium: what is essential and what would be ‘nice’? This sort of list of wishes and requirements is also a way that providers can distinguish themselves by clarifying, for example, what they offer and for what price. These days, there is a tendency to simply look at the price, which often does not ensure an optimal solution or an advantageous price-quality ratio.

Tendering processes are growing in scale

A current trend amongst big businesses and government institutions is to reduce the retention of expensive knowledge in house. Less people must do the same work. Anything that does not belong to the core tasks is outsourced. As a result, tendering processes are constantly growing in scale. They do not only involve the design and the construction, but also the financing and maintenance over a period of, for example, 30 years. It is an entire life cycle in one contract: Design, Build, Finance, Maintain (DBFM). These kinds of projects are so sizeable that there are practically no single entities that have all of the relevant expertise under one roof.

DBFM demands sustainability

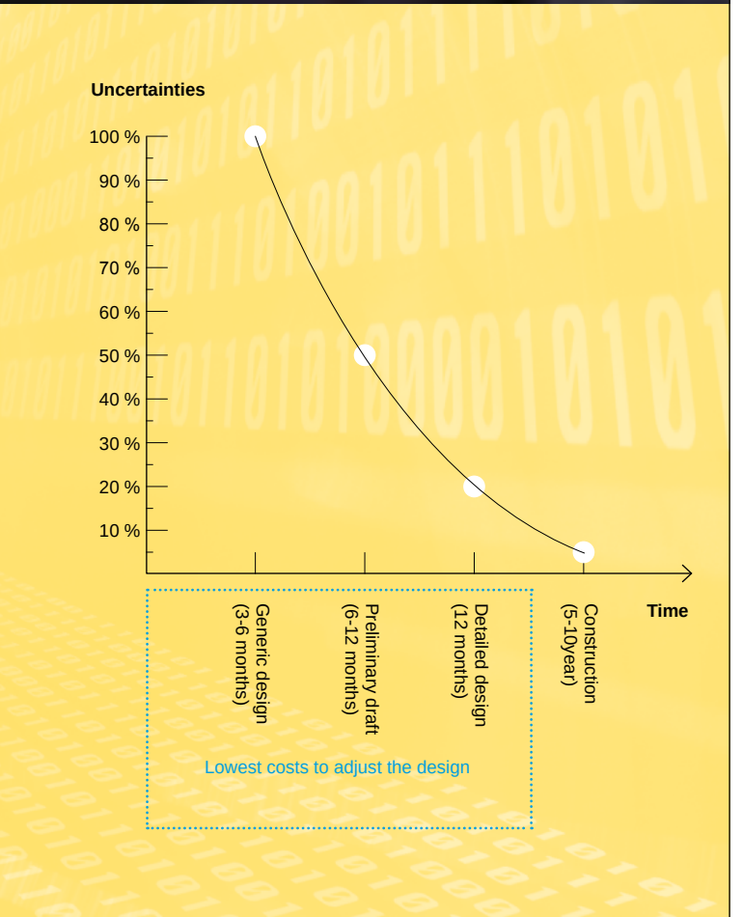
A DBFM contract has one important advantage: builders have a vested interest in the aspects of sustainability and maintainability. After all, if they create a substandard product, they will then have to spend a great deal of time and money on maintenance. The crux of the matter is the end of the contract. What should remain at the end of the contract period: a completely worn-out and redundant system or a system that can be used for another 10-20 years?

Risks during ICT development

Projects that include a development aspect will always involve risk, and this is often the case for ICT projects. During this kind of project, something new is created, so it can only be understood to a limited degree. There is a major contrast within civil engineering projects: we have been constructing buildings since the start of recorded history, while we have only been making software for a few decades. This is clear to see during major construction projects such as railway lines or tunnels. The physical construction is completed on time, but the ICT causes delay. The demands regarding safety and availability turn out to be insufficiently defined. Discussions are started about what the exact definition of safety and accessibility is and how the demands for both should be interpreted, resulting in delay to the project due to redesigns.

Technomanage

This article was written in collaboration with our sister company, Technomanage.



Professionalisation

The ICT world is becoming increasingly professional. The working processes and the development methods are well defined. A great deal is being done to optimise the processes and to improve predictability, although process monitoring is no guarantee of a good product. The client often possesses insufficient knowledge to accurately assess this. One option is an independent test – a kind of KEMA quality mark for software. This is a challenge: after all, how easy will it be to find a software company that would be willing or able to independently approve another company's software? A better solution would be to give the party responsible an assignment with clear functional specifications. However, the developer can never view things completely from the user's perspective: the user will always have to check whether or not he/she is satisfied with the product and whether everything he/she wanted has been provided. The developer and user must communicate on a functional level with regard to this matter. It may be frustrating if problems surface during development, although this situation is always preferable to discovering the problems during usage.

Management rather than pot luck

The main problem of ICT projects is uncertainty: the specifications and the solutions only become clear as you go along. By splitting this process up into various projects, the risks are reduced. A first step in this could be competition-oriented dialogue, in which the client makes the specifications clear to a number of market players. Together, they can examine factors such as whether all requirements have been defined, whether differing interpretations can occur, whether everybody understands the situation and whether it is feasible.

Competition-oriented dialogue is good, but it is not enough on its own. Even with clear specifications, the uncertainty is still significant. This can be solved by breaking the process up into bite-sized chunks, for example, by making the design process a separate project and putting all of the knowledge from this phase onto the market. You should then call for tenders from every interested party: not only the party responsible for the design, but also other involved parties. The results of this are more efficient tenders with a clearer end result and a more competitive price. An alternative to this is a collective development process based on a partnership. With this structure, the client and the contractor conduct the design process together. The price for the whole project is only determined once the preliminary draft is complete. Both approaches reduce risks and increase the chances of a suitable end result. This is effective management rather than just pot luck.

/customer interview

OV-chipkaart: nearly 30 million transactions per week via more than 30 different types of machine

The OV-chipkaart (Public Transport Chip Card) is the national electronic payment system for all public transport in the Netherlands. It is a complex system with multiple participants, each of which purchase their own equipment from various independent suppliers. In order to ensure smooth operations, effective organisation is necessary. This is provided by Trans Link Systems (TLS).

The OV-chipkaart was gradually introduced in the Netherlands in 2005. The card can now be used in public transport throughout the country. We are therefore the first country in the world with a single electronic payment system for all types of public transport. And while the card is simple to use, the underlying system is extremely complex. The OV-chipkaart system is a decentralised system. Every transport company has their own sales equipment, inspection equipment and check-in/out points or gates. These are then connected to a central computer within the company. These computers are then connected to Trans Link Systems' central system.

Trans Link Systems was set up in 2001 by five major public-transport companies in order to set up and maintain the OV-chipkaart system in the Netherlands. The organisation is at the top of the OV-chipkaart pyramid. It processes all transactions conducted in the Netherlands and divides up the money collected (clearing & settlement). This currently adds up to nearly 30 million transactions per week, a number that continues to rise. TLS also controls card distribution. Finally, TLS determines rules to maintain and improve manageability of the system. To use the language of the trade, TLS is the scheme provider. "This term originates from the financial world", explains Bram Schot, Scheme Manager for TLS. "A scheme is a set of rules and agreements about how parties interact with each other and how equipment is supposed to function. For example, there are PIN schemes and credit-card schemes."

Open architecture

The OV-chipkaart scheme involves a wide variety of equipment produced by many different suppliers. For this reason, TLS has set up a strict list of specifications, known as the System Documentation for Open Architecture (SDOA). "This contains a description of the functionality of equipment", explains Schot. "Which interfaces there are and what conducts (use cases) are possible. All equipment must comply with the SDOA."

TLS monitors compliance of the scheme via certification, amongst other methods. "Once a supplier has achieved this certification, access to our architecture specifications (SDOA) is granted. They then develop the equipment based on these specifications", explains Scheme Expert Peter Schonewille. "The supplier then submits this equipment for certification, as we need to ensure that it complies with our specifications. The tests for this certification are conducted for us by Technolution. Officially, we are the certification body, although we have outsourced all of the tests to Technolution."

Technolution tests all equipment that is used in the scheme, i.e. all of the equipment that consumers will encounter. "Technolution has developed everything about the testing process themselves, including the tools. Furthermore, they have built up a great deal of knowledge that can also be applied in other areas", says Schot.

Continually in development

Although the OV-chipkaart is fully in operation, developments have not ceased. New functionalities are still being added using existing and new equipment. "The number of physical sales points is falling as sale via the internet is increasing. As a result, new machines are necessary in stores – as well as buses – where internet orders can be picked up. A recent development is the use of the OV-chipkaart in the Regiotaxi minibus service, for which new machines are also currently in development. The scheme is continually on the go; it is a never-ending process", says Schot.

Use cases

Within the OV-chipkaart scheme, every participant has a degree of autonomy. Everybody has the opportunity to devise something new, often in conjunction with the suppliers. TLS is involved in this process in order to test that everything fits within the framework of the scheme. “We like to be involved at as early a stage as possible”, emphasises Schot, “this enables us to contribute to the thought process.” Every new machine or every software/hardware adjustment must be certified before it is deployed. The supplier indicates which use cases are supported by the equipment. “A use case is an exact description of a function, and what the machine must do in that particular situation”, explains Schonewille. For example, if you chose an automatic-recharge card, the equipment will ensure that an amount is automatically loaded onto the OV-chipkaart if the balance drops below a particular level. “And that is what we test: whether the machine complies with the use cases and interfaces, or whether it performs the correct steps. Technolution then compiles the results in a report and records any problems encountered during the tests. We assess this report and assign a rating of satisfactory, minor problem, medium problem or major problem. The report is then shown to the supplier, who can then solve any problems that may have cropped up. If no problems need to be addressed, then a certificate is awarded for the machine.”

Test kit

To give suppliers a helping hand, Technolution developed a set of testing tools. This allows suppliers to test the product for themselves before submitting it to TLS. “The test kit has helped increase quality enormously”, says Schonewille. “Previously, a rejected product would have to be sent back to the supplier, who would make changes and resubmit it for testing. This process would often have to be conducted twice or three times. That is inefficient and costly. The test kit enables suppliers to make many changes before they submit the machine for certification.”

Support

Schot: “Technolution’s most important service to us is certification. However, they also have a great deal of knowledge and can answer any questions we may have. We have a close relationship that dates back a long time. They helped us in the creation of the system documentation, and thanks to their tests, which allow us to continually improve the specifications, they continue to help us optimise it in a specific and measurable manner.

“It is important to cardholders that the OV-chipkaart works at all times”, summarises Schot. “That’s the difficult part: we have to keep it simple. The card must be compatible with all of the different types of machine. The situation that one particular machine registers (check-in/check-out) must correspond to the situation at the previous machine. You do not see this process, but it is essential that it works correctly. This is what makes it so complex. The easier it seems from the outside, the more difficult it is on the inside. This is what makes these certification tests so important: they guarantee this certainty so that we can build upon it.

Scheme Manager Bram Schot (left) and Scheme Expert Peter Schonewille

/trends & hypes

Mobility management: from punishment to reward

>>alternative methods for behavioural change

Too many drivers are making use of the roads at the same time. However, road pricing is a controversial **political issue. Furthermore, an indirect approach has been shown to be more efficient: if you give commuters a mobility budget, reliable information and flexible working hours/workplaces, then mobility can be much more efficiently spread.**

In the daily struggle to organise a seemingly never-ending series of activities and responsibilities into your diary, the importance of predictable and reliable journeys is becoming ever greater. The chances of achieving a reliable journey time are getting smaller due to congested crossroads, traffic jams on main roads, road works and traffic incidents. The broadening of motorways provides some respite, although it does little to combat problems such as waiting times at traffic lights or time spent searching for a parking spot. In both cases, the responsibility for solutions lies with the road authorities. However, what can drivers themselves do?

Charging for usage of cars/roads

Drivers can be encouraged to avoid the rush hour by imposing road pricing during the rush hour. You could even supplement this by converting the fixed road tax for car owners into a variable charge based on car usage. This will encourage drivers to seriously consider taking public transport or going by bike instead of driving. Various governments have attempted to introduce similar price incentives, such as rush-hour stickers, road pricing, kilometre levy etc. The main disadvantage of approaches such as these is that they are effectively government-imposed punishments for drivers. Although charges are the means rather than the end and they are not strictly intended as punishments, they are perceived as such by driver. Drivers complain about the charges, saying that they have no choice other than to take the car during the rush hour. However, do they truly have no choice?

Rewards for avoiding the rush hour

The previous Dutch cabinet initiated a series of regional mobility projects. These projects involved incentives rather than charges. Drivers that participated in the project were rewarded with a small payment for every time that they avoided taking the car during the rush hour. Paying money is seen as punishment, while receiving money is a reward, which is much a more effective tool. Furthermore, once the driver is given reliable information about alternative transport methods, it turns out that there are far more alternatives than was first thought! The SpitsScoren (Rush Hour Reward) project conducted on the A15 near Rotterdam proved that the combination of information and reward really works. Participants were rewarded with €5 every time they avoided this patch of road during the rush hour. Thanks to this trial period, the number of vehicles during the rush hour reduced by 8%, which amounted to 1,900 vehicles. This enables significantly better traffic flow during the rush-hour periods.

Organisation: the New World of Work

These mobility projects clearly show that plenty of drivers actually do have a choice if their environment (employer/family) offers sufficient flexibility. The fundamental discussion is therefore ‘how organised are we in the Netherlands?’ We get up at the same time, we sit in the same traffic jams to get to work, and exactly the same is true when we go home. It is no fluke that a debate is under way in the business sector regarding whether things could be arranged more efficiently. Especially given all of the opportunities offered by modern employment arrangements and modern ICT, also known as the New World of Work. It is technically possible to work completely free of your physical workplace. These days, you can begin your working day at home by dealing with your e-mails, and then set off for work after the rush hour. However, this is not feasible for everybody. The search for the New World of Work and the reward

scheme for avoiding the rush hour are seamlessly combined in regional mobility projects such as SpitsScoren (Rush Hour Reward) and Spitsvrij (Rush Hour Free).

Working, scheduling and travelling require information

Anybody who frequently travels to a variety of destinations will still find it worthwhile to own a car. However, a large number of commuters travel the same route every day. It remains a big step to adjust departure times or to take a different mode of transport. For this reason, information is important. A good web service, app and service desk can help get the info across that is of personal relevance to the user, such as what are the journey times of the various modes of transport and how do they vary throughout the day? The optimum mode of transport could be the train today, but a rental car tomorrow. Mobility management gives a complete picture of your options for transport from your breakfast table to your office.

Other target groups

Road pricing is a typical business-to-business market for technology firms. The broader implementation of mobility management requires different partners such as specialists in recruiting participants via marketing or PR and a professional customer-service department that users can consult if they have any questions or problems. Nowadays, social media are essential in providing information to and linking participants, for example, for car-pooling. During the SpitsScoren project, this intentionally focused on smartphones. This meant that you didn't need built-in equipment in the car, but that you could simply get the information via your mobile phone. It meant that the information was always at the fingertips of the participants, who would register their plans for travel that day. This actively involved people in the management of their own mobility and it is an extremely accessible method.

Government initiative for the business sector

These regional mobility projects were initiated by the government, who also currently provide the financial impetus. However, for it to be a sustainable solution, these projects must be able to be run commercially and independently. The financial impetus must originate from the employers and employees themselves. Employers are increasingly realising either that they have a social responsibility in this issue or they see it as a way to strengthen ties with employees. Not to mention the financial benefits: fewer company cars, fewer parking spaces, less office space and a socially responsible and more sustainable profile.
Examples of incentives include parking spaces next to the front door for car-poolers or a mobility budget to replace company cars, public transport tickets or travel expenses. The latter scheme would enable you to decide for yourself whether to travel by bike, private/company car, train etc.

The conclusion that can be drawn from this is that mobility management is no longer hype, but a trend. The development of services relating to mobility has even resulted in a new profession: mobility agents for businesses. These agents can handle all issues surrounding the creation and execution of mobility plans within businesses.

/employee interview

Erwin Gribnau

*a good user interface matches the way the user thinks

Erwin Gribnau is a senior consultant specialising in technical information **systems. He works mainly with traffic-** management systems based on the MobiMaestro platform.

“Most of the projects I work on are related to MobiMaestro. MobiMaestro was set up to realise our vision with regard to traffic management. This vision is dynamic and is constantly being expanded upon. Gradually, you learn more about this field of expertise as you receive feedback from clients. A good example of this is the VINCE project for the Municipality of Rotterdam. This system enables you to direct traffic flow in the event of, for example, large-scale events or emergencies.

Collaboration

“Our collaboration with the Municipality of Rotterdam as client worked very well. It started as a regular client-contractor relationship. However, as we also invested in the project, the relationship changed. Gradually, we went from working for the municipality to working with the municipality. It was genuine co-operation. People from the municipality came here every two or three weeks to check on the progress. They would sit at the computer to experience for themselves how everything worked and to give feedback. They made suggestions about how to make things more efficient and user-friendly, but they also respected our boundaries regarding what was feasible within the available time.

“In order to create user-friendly and serviceable systems, you must let the users try them out and understand how they work. A good user interface should match the way the user thinks. A traffic expert, for example knows what he wants to achieve. A good system would take him through the process using terminology that he understands and in accordance with his thought process. The terms used must therefore be correct and everything should be arranged in a logical order. It’s always nice when clients compliment us on how user-friendly the systems are.

Know what you have

“One of my tasks is to write quotes. In order to do this, I must know what we have at our disposal. Within MobiMaestro, we never start from scratch. We use existing building blocks and adjust or develop them for specific situations. If you don’t know exactly what you have, your quotes lose touch with reality. For this reason, I always pay attention to my professional development in order to keep up.
‘Knowing what you have’ refers to the projects that we have previously delivered. We adapt the same building blocks for many different situations. If we carry out a project in Deventer and we want to add something extra, I will discuss this with the client and find out what their vision is. You then do your best to develop this vision into something that is workable for all parties and within our abilities.

Consistency and applicability

“It is a considerable challenge to develop solutions for multiple clients based on the same platform. Another challenge is to monitor the consistency and the applicability of MobiMaestro. This prevents us having to completely redesign solutions two weeks before they have to be submitted to the client.

Culture of effectiveness

“What I like about working for Technolution is the pleasant and effectual culture. It is clear what you can and can’t do, although sometimes you don’t realise the freedom you have. For example, the fact that I am allowed to place and sign for orders myself that relate to ongoing projects. The fact that I don’t have to go off and get permission first speeds up the process and ensures a smoothly run project.”

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