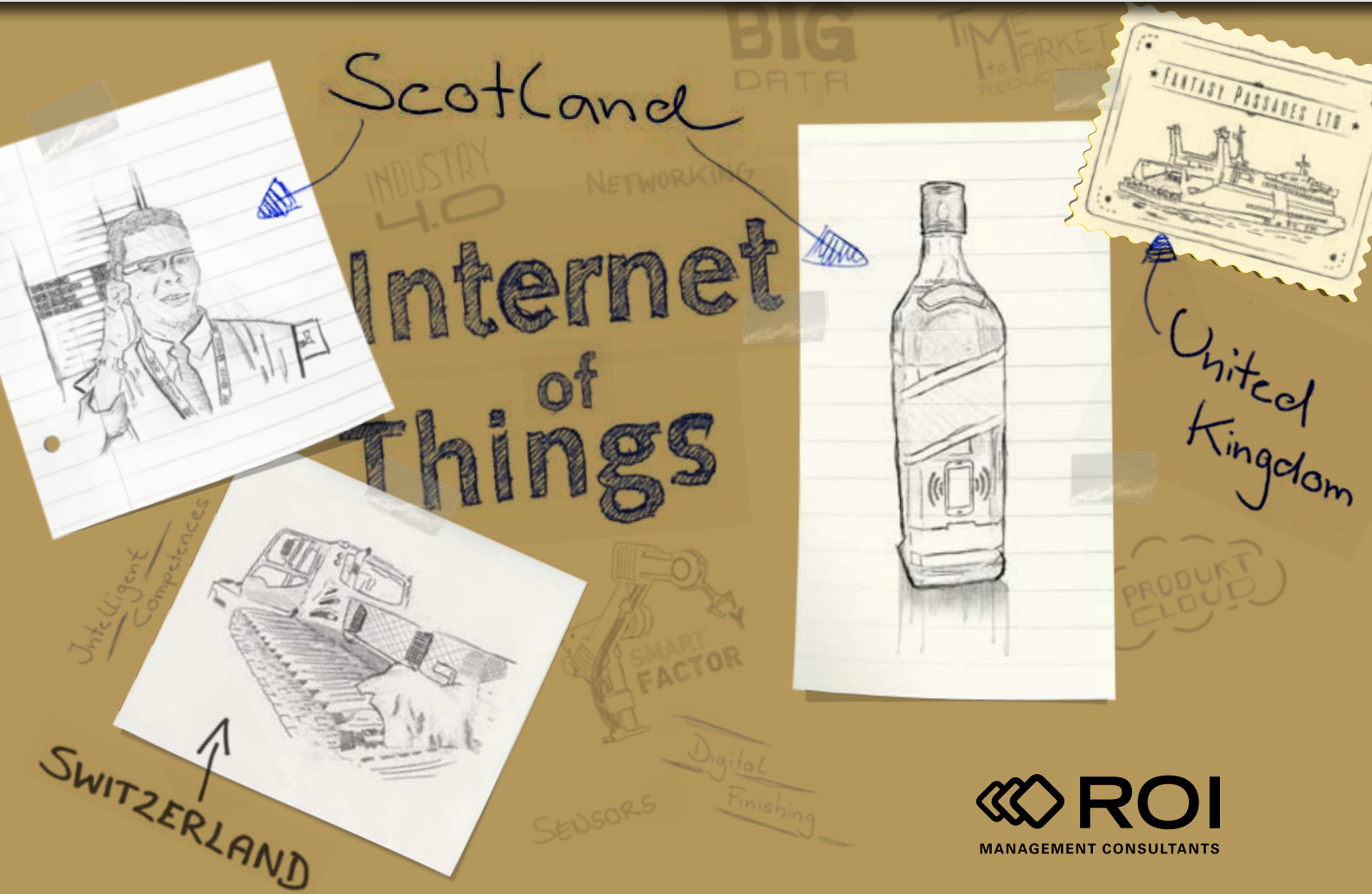


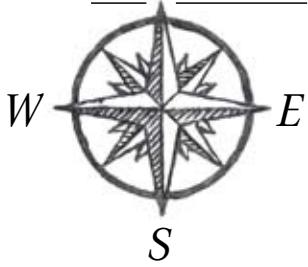
HITCHHIKER'S GUIDE TO THE SMART PRODUCTS ECONOMY

A Journey to the Hotspots of Innovation

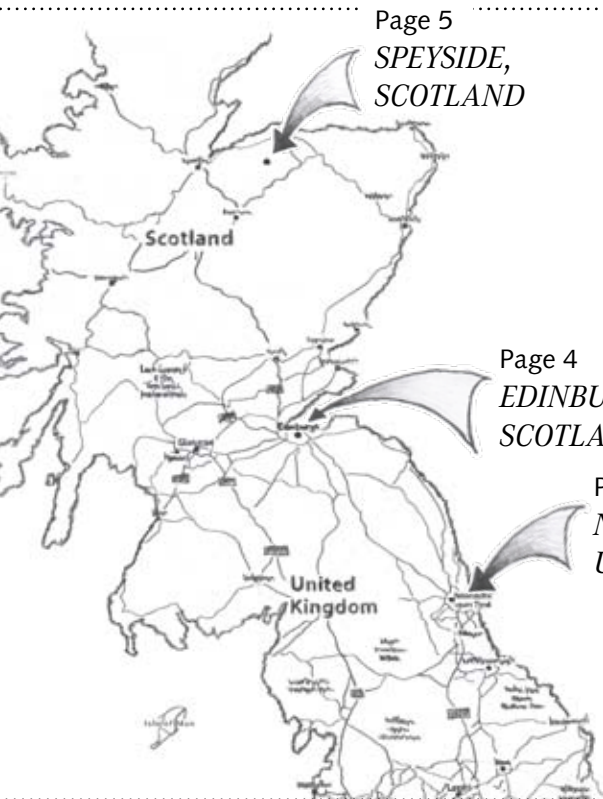
50th ROI DIALOG Travellers EDITION



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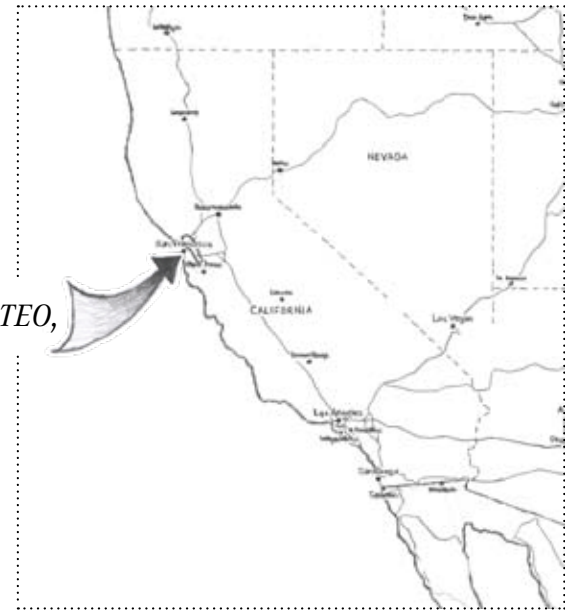
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HITCHHIKER'S GUIDE TO THE SMART PRODUCTS ECONOMY

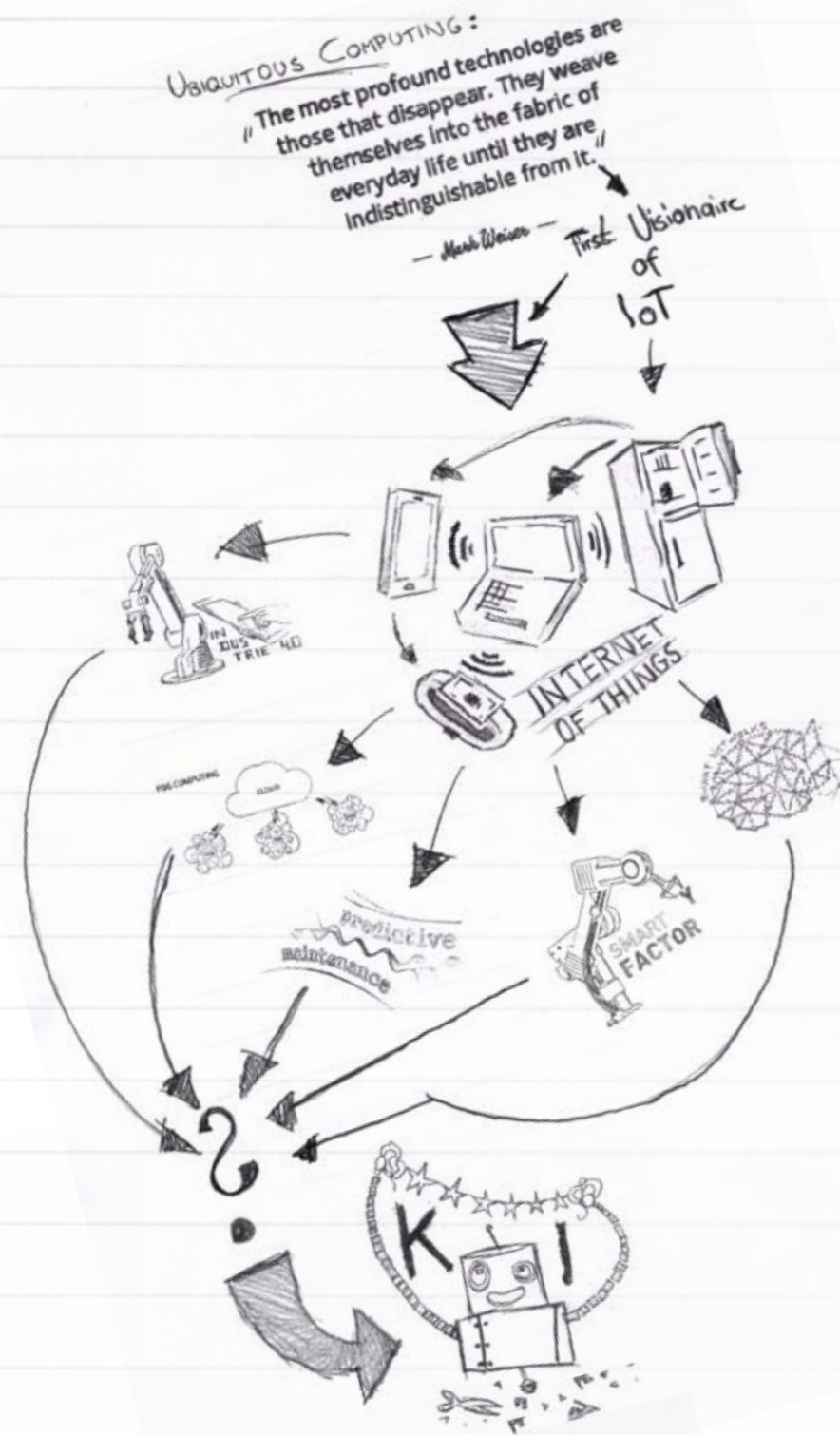
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"The most profound technologies are those that disappear," is how Mark Weiser's now legendary essay "The Computer for the 21st Century" begins. Published 25 years ago, Weiser's vision of the omnipresent computer that is invisible as a separate device and, more importantly, of the pervasive network, has finally become reality. Weiser coined the term "ubiquitous computing" to refer to this. Smart products, the interplay of physical components, connectivity and intelligence, will without exception shape every aspect of our life. The caesura that this will entail could turn out to be far greater than even the commercialization of the Internet, not to mention the current hotly discussed intermediate stage – the Internet of Things (IoT), for in the Internet of Things, objects may be networked – but not necessarily 'smart'.

Nevertheless, the revolution being triggered by smart products will be a quiet one. Smart products – it's the opposite of large product launches, of elegantly designed high-performance computers, smart phones and tablets. Smart products are bringing about change covertly – a bottle is suddenly more than a bottle, and a soap dispenser is more than just a soap dispenser. The networks that integrate billions of smart products into one intelligent overall system will be even more unobtrusive. The intelligence circulating through this network will not only be less visible, it will also be significantly more flexible and autonomous than we are used to – thanks to maximum availability, efficient energy concepts, and connectivity solutions. While cloud computing, which gathers remote data to process centrally, stands for the Internet of Things, fog computing will become the paradigm of the smart product economy – remote data collection and remote data processing. Today we stand on the threshold of the age of "ubiquitous computing".

The smart product economy will thus bring fundamental change to how, where and when we create added value. Factories and server farms, today the gravitational centers of industrial valuechains, will become elements in smart networks that no longer follow linear logic, that have few inherent limits, and that also do not recognize any hierarchy of individual elements. IoT innovations that emerge from a garage in Wisconsin with the help of freely available software and hardware can be immediately adapted in a factory in the Black Forest, or, even better, can be directly connected to it.

This quiet revolution is already under way, which is why it's important for us to keep a watchful eye. And this is exactly what we've done for you in this issue of DIALOG. Let's go.



"Ubiquitous computing does not just mean computers that can be carried to the beach, jungle or airport. Even the most powerful worldwide information network, still focuses attention on a single box. By analogy to writing, carrying a super-laptop is like owning just one very important book. Customizing this book, even writing millions of other books, does not begin to capture the real power of literacy."

- MARC WEISER -

EDINBURGH AIRPORT, SCOTLAND

Hands free

T

The Lufthansa flight from Munich to Edinburgh takes around two and a half hours. This is where our journey through the smart product economy begins. It is no coincidence that the operator of Scotland's most important airport is part of the revolution. The instrument of choice are the Google Glass smart glasses. They are used by the airport's staff to give passengers exact flight details, to inform them of gate changes, to answer questions, and to act as translator.

The product, whose introduction to the mass market was (initially) a failure, seems to have serious potential for processes at airports. It enables airport staff to share text and images, to switch between phone calls, and to access a shared database that allows them to answer passengers' questions quickly and, above all, increasingly better. The smart glasses have proved to be the perfect smart product as they constitute a small lever to make significant workflow changes.

The decisive advantage of using Google Glass from the perspective of the airport's management is, ironically, not even digital. The glasses free up employees' hands, allowing them to help passengers actively and directly, for example

when checking in, enabling them to move more freely and more quickly. The apps, together with additional options customized for the specific requirements of airport operations and synchronized with Google Glass, add value to the process – as does the fact that it only takes one day to learn how to use the smart device.

Hands free! They're not just needed in the departure hall. Walking towards the exit, we imagine just what benefits the analog killer app of the smart glasses could bring to our factory floors. Whether querying flight schedules or setting up tools perfectly, or using augmented reality to coordinate the activities of airport staff in a crisis situation or factory employees in lean projects – deploying Google Glass is a prime example of the “think big, start small” philosophy that is typical of the smart product economy.

There's a great many more things to say about Edinburgh Airport, like it being the first airport in the UK to automate baggage claims using web-based software, thus simplifying the process in such a way that it takes just 30 seconds per passenger. But we need to press on as we have a long journey ahead of us.

SPEYSIDE, SCOTLAND

A wee dram at Cardhu



It's not just the smart products at a modern airport that brought us to Scotland. After a drive of just under four hours through the wonderfully sparse mountain landscape of the Highlands, we arrive in Speyside, the heart of the Scotch whisky industry. Our destination is the Cardhu distillery, which is not only well-known for its smooth and slightly sweet single malts, but also for supplying important ingredients for the best Johnnie Walker blends.

Scotland's largest whisky producer is in the process of becoming a model example for the use of a smart product. Almost two years ago, Johnnie Walker presented its popular Blue Label blend at the Mobile World Congress in Barcelona in a smart bottle. It bears an imprinted sensor with antenna and integrated circuit with an ID number that makes it uniquely identifiable and at the same time serves as copy or piracy protection mechanism. The module recognizes whether the bottle is open or still sealed and can exchange personalized tags with the "user's" smartphone using the NFC (Near Field Communication) standard.

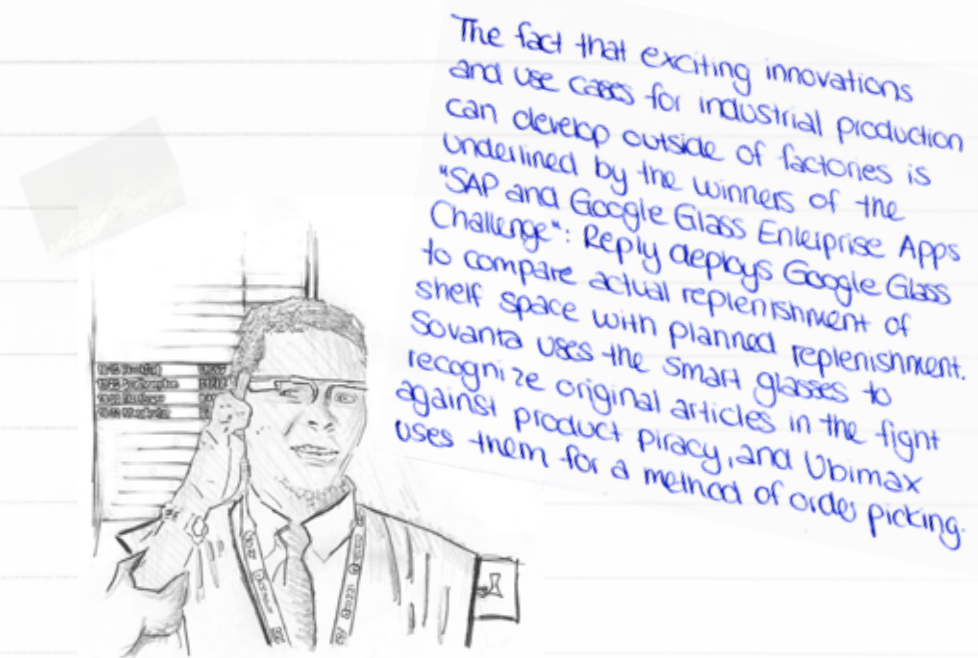
Why did Diageo, the beverages group that also owns a large number of other well-known brands such as Smirnoff and Guinness besides Johnnie Walker, introduce this innovation? The primary reason was to improve the customer experience. The majority of customers look for the appropriate brand of whisky digitally and directly, often with their smartphones standing in front of the shelves – and a product that the customer can reach both physically as well as digitally is an important element in improving this process.

The smart bottle, however, follows an agenda that has been taken a lot further. Communication between the producer and the customer generally ends with the purchase at the checkout counter. And it is this break that Johnnie Walker wishes to bridge. Once the bottle has been opened (which

is indicated by the sensors), the customer no longer needs to be persuaded to buy – the sales process is over. Now it's more a question of turning whisky drinking into a perfect experience. As is well known, this depends on many factors: the quality and the temperature of the glass, the temperature of the whisky, the proportion of soda water, the quantity of ice cubes, and a whole lot more. This is where smart whisky has a role to play.

The intelligence on the bottle thus provides a platform for fascinating options. A virtually infinite number of scenarios can be developed, ranging from an individual alcohol test and the provision of cocktail recipes to the sale of whisky glasses depending on the number of sensors available and the way in which they are integrated using corresponding apps – especially when the intelligent Blue Label bottle becomes an element in a smart network in which it interacts with other intelligent objects and forms shared data structures. Whisky, water and ice box can then collaborate to ensure perfect enjoyment. The tag on the bottle is therefore just the beginning.

However, we do not drink a toast to this with Johnnie Walker, but with a Cardhu Special Cask Reserve, instead, before setting off on our journey again. It would really be a good idea to implement the concept of the custom alcohol test sometime soon...

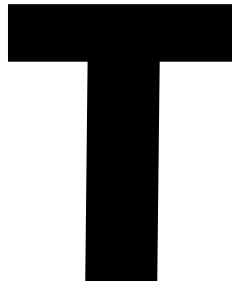


- 1) Smart products are not a privilege reserved for the new economy, as the example of Johnnie Walker shows.
- 2) What is important is not an elaborate and thorough strategy but the willingness for a rapid launch, a readiness to experiment and the ability to think in terms of scenarios.
- 3) Smart products develop their revolutionary effect primarily as an element in a network.



NEWCASTLE UPON TYNE, UK – AMSTERDAM, NL

The Argonauts



The drive from Speyside down to Newcastle upon Tyne – the next stage of our journey – takes almost six hours. Located in the north of England at the terminal point of the Roman Hadrian's Wall, the city of Newcastle has retained the charm of its lively thousand-year history in many places. With typical northern elegance, Newcastle unites its roots with state-of-the-art architecture, like the 50-meter high tilting "Millennium Bridge", which has become the city's new landmark. It is certainly worth spending more time in Newcastle – but this is not on our itinerary.

We return our car at the ferry port and board the 'Argonaut Ferry' – the flagship of ... let's say, Fantasy Passage Ltd., an aspiring transportation start-up that wishes to compete with the incumbent DFDS Seaways on the Newcastle-Amsterdam route.

Fantasy Passage is having to take a new approach in order to be able to compete with its all-powerful rival. And the company is focusing on the "smart ferry" concept to do this. The newcomer has the advantage that the entire technical and logistical infrastructure could be established based on the principles of the smart product economy from the word go. The company first designed a smart, interoperable ticketing system (copied from Sydney Ferries) that makes boarding in Newcastle and Amsterdam – with or without a car – a very simple process that can be performed using a smart phone. The app also assists with any necessary formalities and with planning an onward journey as well as with the appropriate means of transport (an idea swiped from the Berlin start-up Waymate).

Fantasy Passage then introduced a visualization platform (inspired by New York Waterways and Hitachi Data Services) that is able to network and monitor all ships currently in use. Cameras and sensors installed on the ferries supply a constant stream of real-time information and live videos about deviations from the course, weather information for the rough North Sea, fuel losses and even reports on exceptional passenger behavior and other anomalies. The data are combined from public databases, the company's own ticketing system and even with social media feeds. The data are aggregated and analyzed before being integrated into an interactive visual map, allowing the entire fleet to be accurately controlled and rapid and targeted interventions to be made in critical situations. A large number of scenarios, from crisis prevention to predictive maintenance for ships, were developed at the very beginning of the project to form the basis of the

business model – and to make the new ferry line a highly efficient operating company.

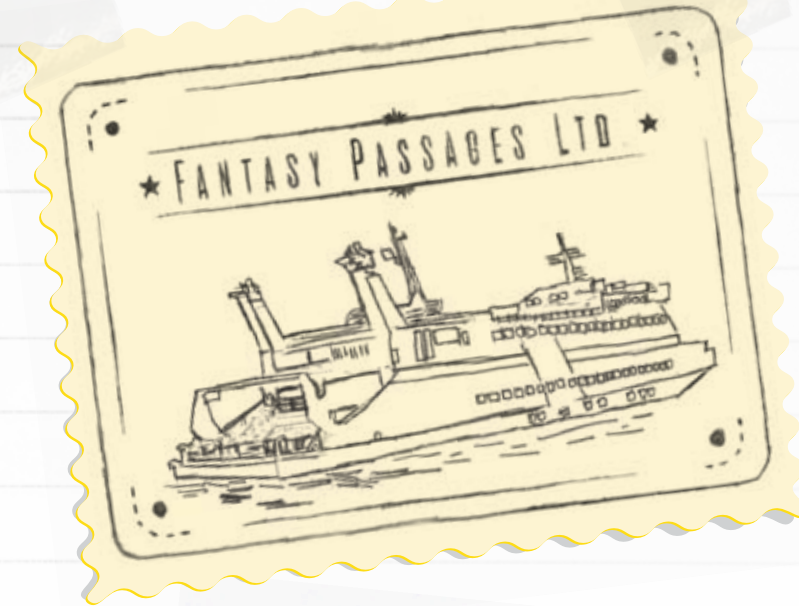
So much for the compulsory part. However, the actual question that really concerned the CEO of Fantasy Passage (whose name we cannot divulge for understandable reasons) was a totally different one. Can a smart product form the core of a company's brand, or at least a key element of its brand? It can. The solution was found, at Wind+Wing Technologies in California, which was founded in 2014 by Jay Gardner – a Bay Area veteran, old salt and experienced entrepreneur. Gardner's ambitious plan calls for equipping ferries with smart wind sails that reduce diesel consumption by up to 40 percent. The impressive, high sails are a lightweight construction made from carbon fiber and are intended to capture the enormous power of the wind and ensure fast, quiet and clean propulsion for ferries – among the dirtiest of vessels that you can travel with today. The sail, which is powered by a solar cell and which is very easy to operate, is a smart product par excellence. It not only has GPS navigation but can also be equipped with microprocessors and a large number of sensors enabling it to align itself and adapt to wind conditions perfectly. At the same time, the

sail records information on the status, fuel consumption and position of the ship.

Innumerable possibilities present themselves – in particular in connection with Fantasy Passage's visualization platform. For instance, the smart sail also houses high-performance antennas that defy the difficult weather conditions and the limited network coverage in the North Sea. However, above all the sail gives the light, elegant ships of Fantasy Passage Ltd. one unmistakable element that the company's CEO proudly calls a "brand shaper".

Businessman and author Chris Anderson says, "You need to build companies in a different way in order to do things in a different way." Fantasy Passage is just such a company. Smart products can also bring to the physical world the approach advanced by Anderson, which claims companies in the digital economy can achieve success not just with best-sellers but also with many niche products that would be unprofitable in the conventional economy, thereby making markets more colorful, innovative and interesting.

"Welkom in Amsterdam!" After a 16-hour North Sea crossing, we finally feel firm ground under our feet.



Smart Products are not just ideal for doing things better or more efficiently.

Their defining characteristics – connecting physical and digital components – means that the principle of conventional and web-based markets merge in the smart product economy.

We therefore need to learn how to develop business models that do justice to this extended playing field.



HEDEMORA, GARPENBERG, SWEDEN

The new Mines of Moria

W

We flew from Amsterdam/Schiphol to Stockholm/Arlanda in two hours, exchanged money, hired a car and now we're already on our way again. The next stop on our journey is the mine at Garpenberg, near the small town of Hedemora situated a good two-and-a-half hours north of Stockholm. Mines have been operated here for almost eight hundred years. However, we haven't come to Garpenberg to discover the history of prospecting but to visit one of the world's most modern mines.

Iron ores have been quarried in Garpenberg for centuries – today it is primarily zinc, lead and silver. Extraction volumes are almost 2.4 million tonnes per year. The mining operation uses so-called flotation cells in which minerals are separated from rock waste by means of a physical-chemical process. The machinery is extremely important for extracting ore – which is why an outage must be avoided. Dozens of flotation cells are used in Garpenberg over an extensive and in parts almost inaccessible terrain, and you can't help being reminded of Tolkien's Mines of Moria. The mine's operators are now concentrating on monitoring using acceleration sensors that measure vibrations and shock pulses and transfer the data to a server, which in turn supplies the control room with aggregated and analyzed information. This enables a large number of potential problems to be recognized early on and remedied. Today, sensor technology no longer monitors just the flotation cells but also other complex machines like ore mills.

Nevertheless, these complex solutions are just one expression of the overall strategy that the mine's operator, Boliden, has developed – in effect a digitalization approach that reaches down a kilometer below ground. Power supply management, predictive maintenance, process automation and the integration of data into a platform developed by ABB are the reason why the mine is today one of the most efficient in the world.

Conveyor ventilation systems, belts and vehicles, maintenance processes and environmental data feeds, emergency alert systems, miners' tablet PCs and caterpillar drives have all become elements in a single giant network that can be organized and optimized remotely. The huge volumes of data that are generated on the mine premises form the basis of complex analytics that enable processes to be continuously improved and resources and assets to be allocated efficiently.

The mine at Garpenberg is today just as much a marvel as the Mines of Moria. However, it is not the fantastic engineering skills of dwarfs that amaze us here, but the digital intelligence that permeates the quarry pits and conveyor system like an additional dimension. In Hedemora we found further evidence that the added value of smart products can be accelerated exponentially as a result of snowball effects. The benefit of each single element in the smart network becomes immediately greater when additional elements are incorporated into the network. Smart products are physical-digital hybrids. However, the smart product economy doesn't follow the logic of scale of conventional industry, but the network logic of the web.

SAN MATEO, CA

Is it the end of the industry as we know it?

S

San Francisco Airport welcomes us in bright sunshine. This time we decide against a hire car in favor of an Uber driver, who takes us to San Mateo just half an hour away. San Mateo is one of the hotspots for start-ups in Silicon Valley, but our destination is neither one of the up-and-coming high-tech forges nor one of the innumerable venture capital companies that have offices in the city. Instead, we alight on Saratoga Drive, where the annual "Maker Faire" is being held in the San Mateo Event Center.

Although the roots of today's maker movement can be traced back to the early 1990s, the phenomenon has really only gained broad public attention in the past ten years. On the one hand, makers are a legacy of DIY culture. On the other hand, they are very much influenced by the self-sufficiency movement, which grew up from a critical stance towards mass consumption and the increasing formation of an oligopoly in the West.

This is exactly the right place to understand the significance of the maker movement for the present and, in particular, for the future. While there are now also maker spaces and maker fairs in Germany and other European countries, they have about as much in common with the event in San Mateo as a Boeing with a Cessna.

In the USA the belief has now taken hold that makers, open innovation and smart products can trigger a revolution – or have already triggered one. One look at the list of sponsors of the Maker Faire shows how seriously it is taken – from Google and Microsoft to Ford and NASA – the "who's who" of the American economy is represented.

With their exuberant creativity, their huge number of unconventional, wacky and ingenious ideas (that you can witness on maker portals like etsy.com), makers have a lot in common with classical after-work handicraft enthusiasts and programmers. But they differ from them in one essential point. Desktop technologies that are available today such as 3D printing, CNC milling or CAD software, together with the possibility of using the Internet to aggregate ideas on a global

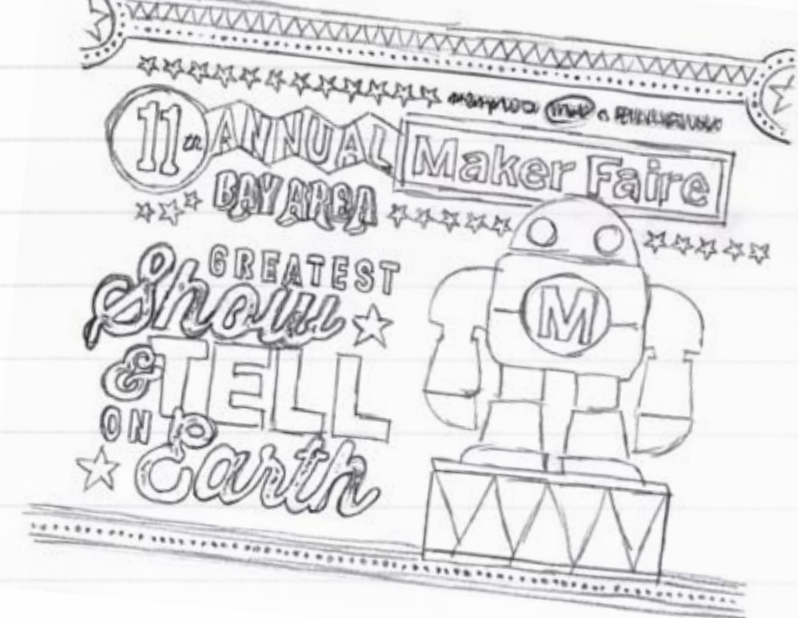
scale to develop products, to produce in very high quality and to distribute them around the world, are challenging the certainties of the established economic order. New, web-based forms of organization and coordination are making it possible to bypass the advantages of scale and size as barriers to market entry and to transpose "garage start-ups" of the digital economy into conventional industry. Companies like Local Motors and 3D Robotics are demonstrating that such an approach is even possible in car manufacturing and machinery production.

The question as to whether the maker movement will actually be able to shatter established structures or merely replace individual industries is totally secondary.

The crucial point is that the smart product economy will run in dramatically faster cycles than the traditional economy, will be open and reach out across sectors, and it will be possible to put crazy ideas into practice and make money from them successfully. No company can cope with this speed and diversity on its own. "I'll never again work for a different organization that employs so many intelligent people like the Federal Government of the United States – just think of DAR-PA. But I can guarantee you that even the US Government will lose out in a comparison with planet earth," says Todd Park, former CTO and current advisor to the White House.

The creativity and originality, unconventional solutions and passion that can be felt all over the Maker Faire should be reason enough to question protective walls at the boundaries of conventional companies. Smart products can only develop their full effect – and be further developed fast enough – in networks. Key to this are global communities that are willing to share their own technologies and assets with their members to a much greater degree than is today the case. Visionary and courageous companies know that they will in future need makers.

We leave San Mateo with the thought that excessive self-certitude, fear and blinkers have never been particularly good counselors for change.



"The actual revolution doesn't just involve advanced technology but also its democratization." Chris Anderson

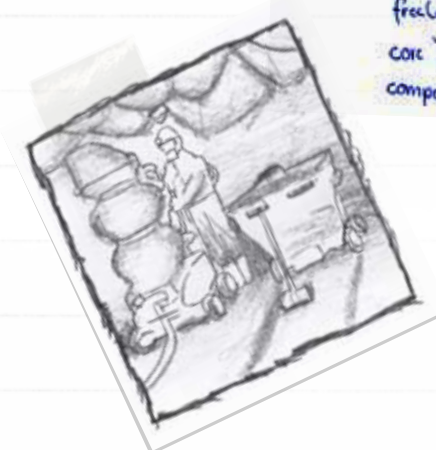
"No matter who you are, most of the smartest people work for someone else. It's better to create an ecology that gets all the world's smartest people toiling in your garden for your goals. If you rely solely on your own employees, you'll never solve all your customers' needs." Bill Joy



① The smart product economy doesn't follow the paradigm of scale but of interconnectivity – the benefit increases exponentially with each additional network element.

② Technologies are already available that enable virtually every object and every person to be integrated into a smart product network across legal, organizational and geographic boundaries.

→ The ability to develop network scenarios freely and unobstructedly is becoming a core strategic competence for industrial companies.



HARSEWINKEL, GERMANY

Farming 4.0



It took us exactly 15 hours to fly from San Francisco to Düsseldorf and drive by car to Harsewinkel. The town on the river Ems is a “one-industry city” – agricultural machinery manufacturer CLAAS has dominated the local economy for almost a century to such a degree that there has been a fierce debate in the town for many years about adding the byname “Harvester City”. We too want to visit CLAAS, because the company is one of the most progressive and innovative players in the global smart product economy.

Generally speaking, agriculture has become a sector globally that has rapidly, courageously and systematically taken the path towards digitalization. Besides CLAAS, this movement also includes giants like John Deere and Bayer Crop Science, as well as highly specialized technology companies and biotech start-ups. This is not surprising as there are few other industries that face the enormous complexity and such fierce competitive pressures as agriculture. Technical, biological, topographical, meteorological, and chemical issues are added to questions regarding organization, process design as well as cost and quality management. Developing agriculture for the 21st century that is both efficient and at the same time sustainable is a huge project that cannot succeed without digitalization.

Work at CLAAS KGaA mbH in this area is driven by the conviction that yields from agricultural production can be increased through the introduction of intelligent and above all interconnected systems over the next 20 years as dramatically as they were through mechanization in the 1950s. CLAAS has a number of intelligent systems in order to improve agricultural processes through the use of digital tools. The company assumes that there are four elements that form the foundations of digitalization in agriculture: global positioning systems (GPS), digital data processing, sensor technology and camera systems, and communications systems. The basis is provided by a mechanical system – a combine harvester or some other agricultural machine – which is developed into a smart product and incorporated into a universal digital system. Networking vehicles along a process chain results in higher capacity utilization of the systems de-ployed, more efficient use and thereby in corresponding cost advantages.

The example of core agricultural processes demonstrates how this works in detail. A central element of this networked architecture is the telemetric solution "Fleet View", which is installed in CLAAS machinery. It allows everyone involved in the harvesting process to view, in real time, who is where and when, or at least should be. This results in combine harvesters being able to operate and be deployed with maximum efficiency without breaks forced on them. However, the coordination of vehicles via a comprehensive telemetric solution is just one element in the digital vision that CLAAS calls "Farming 4.0". The intelligent agricultural machines are also used to gather comprehensive data concerning the environment and yields (in some cases including GPS-based soil sampling) using a large number of sensors and to transmit these to the "farm cloud", where they are consolidated and processed.

The outcome is a complete geo-referenced map of yields and potential – a perfect digital representation of the field that provides information on the vehicle's GPS position, yields and moisture. The constantly updated map makes it possible to work specific subareas of land – for

example spreading fertilizer, irrigating, sowing or selecting the right time to harvest. Seamless tracking by vehicles equipped with intelligence of course also forms the basis for highly efficient technical and economic fleet management – from preventive maintenance and optimized deployment planning and charging to massive fuel savings. Another factor is soil protection thanks to "controlled traffic", where vehicles are controlled very precisely using GPS, keeping vehicle tracks in the field to a minimum. And, last but not least, the system is open for future smart products. Whether sowing robots or drone-based monitoring, autonomous agricultural machinery or machine learning systems – in future it will be possible to integrate them all into the network and to interconnect them with other smart products.

Our travel sketch doesn't really do justice to CLAAS and their vision of Farming 4.0. The list of possibilities that a comprehensive smart product network offers in the agricultural arena could go on and on. But there is another question that goes a great deal farther. Global agriculture is being seen with increasingly critical eyes around the world. Growing

monopolization and concentration, the gradual disappearance of regional suppliers, poor quality controls in international supply chains, the destruction of soils and crop diversity by single-crop farming, pollution from pesticides, and the dramatic loss of biodiversity – you don't have to be an ecological fanatic to view these developments with a feeling of unease. The UN Food and Agricultural Organization (FAO) has been warning for years of an increasing gap between the growing demand for food and serious structural deficits in global agriculture.

Digitalization could speed up the nascent sea change. The enormous boost to efficiency promised by smart products could cancel out the disastrous equation whereby profits from the land can only be secured through the size of operations, standardization, single-crop farming and chemical resources that are ultimately achieved at the cost of sustainability. This would be a digital revolution that really deserved its name. We leave Harsewinkel and head down to the south of Germany.

- Can smart products break the global logic of the effects of scale?
- Can the smart product economy make the world better?
- Can smart products change how we relate to technology?



LOHR AM MAIN, GERMANY

A cordless screwdriver for Snow White



Lohr is an idyllic town in the Spessart hills, characterized by half-timbered houses, the river Main and the legend nurtured successfully by the town's tourist marketing office for the last thirty years that, according to an extremely questionable but absolutely endearing theory, Lohr was the birth town of Snow White. The town is also home to Bosch Rexroth AG. And that's why we have come here.

The smart product that interests us is the "Nexo" cordless screwdriver, developed by Bosch Rexroth. It sounds very mundane, and at the end of the day it is. And yet at the same time the Nexo is one of those tools without which it would be impossible to put many Industry 4.0 concepts into practice. Nexo is a worker. The handheld screwdriver may appear unremarkable, but it is technologically complex and sophisticated. It offers integrated controls, memory, and connectivity, allowing it to be integrated into a superordinate system such as a factory cloud, with its operating software compatible with any popular operating system. The device can measure and store the most important action parameters like torque and angle of rotation and transmit them to a central server or cloud.

These functions give it major benefits in production, as they allow the screw-turning tasks in critical processes, for example in aviation construction, where tightening torque in the assembly of engine

parts, wings, or windows is exactly defined and where it can vary considerably, to be precisely captured and documented. Nexo enables this process, where there is an extremely low degree of fault tolerance, to be greatly simplified and optimized with regard to fault prevention.

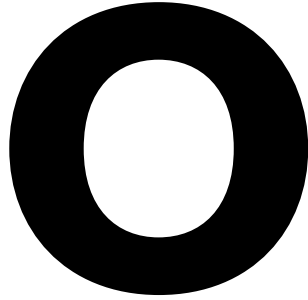
The electronics built into the screwdriver allow its position within the factory hall to be precisely determined, which brings a number of benefits. First, the superordinate monitoring system can determine where a specific screwdriver being used is located and what part or component it is currently working on. Second, the combination of position and action measurements also offers the possibility to determine how long, how often and for what purpose each individual device was deployed. This provides the basis for both proactive maintenance of the tools as well as for performing correlation analyses that give deep insight into production and service processes.

The Nexo cordless screwdriver might appear rather tame compared to a combine harvester or smart carbon sail, but that does not mean it is less effective. Intelligent tools fill a significant space in the overall concept of Industry 4.0. Participants in the "SmartTool" joint project organized by TU Darmstadt call the lack of information transparency in the tool cycle caused by missing or inefficient possibilities to capture data and to interconnect a "central obstacle that has so far prevented existing optimization potential from being achieved". Smart products solve problems – sometimes those that are not considered to be a problem until the solution is available. In this respect, the Nexo cordless screwdriver doesn't need to fear comparison – it is a smart product through and through.

The example of "Nexo", however, shows a further dimension of the smart product economy. Competition in the digital economy is more and more frequently fought between platforms. Companies like Apple and Amazon are creating increasingly closed software systems where they embed their physical and digital solutions. As a consequence, users enjoy significant added value if they use as many of the products and services running on a common platform. In platform-based competition, those companies with both a full range of products and services as well as a rapidly growing community of users will enjoy enormous competitive advantage. The growth of the Internet of Things and the emergence of smart products is also transforming growing numbers of traditional industries into platform markets that resemble oligopolies. Vendors who do not have a full range of products (for example, all the tools required in a factory), or who do not have a successful platform, face existential pressures. The smart product economy offers fascinating opportunities. However, as with every revolution in the history of mankind, it only recognizes winners.

SATTEL-HOCHSTUCKLI, SWITZERLAND

The wonder of the ski slopes



Our journey takes us from Zell am See to another part of the Alps, Sattel-Hochstuckli in Switzerland. After heavy mining vehicles and giant agricultural machinery, we now come across something else that boys both young and old dream of: Kässbohrer's snow groomer 'PistenBully'. As in countless other snow-covered areas of Europe, powerful tracked vehicles ensure perfect snow cover. With its SNOWsat slope management system, Kässbohrer has over the last few years developed a solution that transforms all the PistenBullys used in a particular ski area into a fleet of intelligent smart products. Using a highly complex digital terrain model and a satellite-based communications system, the system informs the control room and the snow groomer drivers to within centimeters where the vehicles in the fleet are located and how much snow there is under their tracks, enabling them to plan their routes perfectly even in difficult topography. Direct benefits for drivers, fleet supervisors and operations managers include a high level of safety and efficiency, and cost savings thanks to optimized operations, fuel consumption and artificial snow production.

The SNOWsat system is a prime example of how a conventional product – the PistenBully – can be transformed into a smart product. But how does such a transformation come about? And what was the initial impetus for developing the system? Jens Rottmair, CEO of Kässbohrer Geländefahrzeug AG, sees the starting point in the customers' situation, "Increasing numbers of ski areas are equipped with expensive artificial snow-making systems. In discussions with customers, the question was frequently raised about how to run professional snow management, i.e. how to combine artificial snow production and spread it on the slopes in an efficient manner. About seven years ago, this led to the idea of offering a practical tool for the purpose. First using radar, and for the last four years based on GPS and Glonass." The division that started out as a one-man show employs 20 people today. "We are now the world leader," says Rottmair, pointing out the development of navigation devices in the car.

The intelligent PistenBully is, however, a good example of the networking effect of the smart economy. SNOWsat networks vehicles in use with the base station (as the connecting element between the vehicles and the navigation satellites) and the user front-end. How important is this system-based thinking for the digital transformation?

Rottmair explains that SNOWsat was originally only intended for the PistenBully. However, Kässbohrer can now also install it in vehicles from competitors. "That was the beginning of an open system," Rottmair says. "Many ski areas have exact GIS data as well as providing WiFi and other information systems. Lift masts, snow cannon locations, shafts, power lines – all of these are nowadays digitally captured. And our software enables us to supply exact data to the artificial snow systems, making it possible to produce snow exactly where it is needed. We can also inform ski tourists where ski slopes have been groomed and what snow conditions are like. We can also supply data on closed slopes electronically. And we are thinking about what additional benefits we can offer our customers. We really are thinking in terms of open systems. We ultimately want satisfied guests in the skiing areas who not only get a perfectly groomed piste but also receive interesting and important information."

The new scenarios that SNOWsat makes possible lead us to a subject that interested us during our journey, namely, what are the ramifications of introducing a system like SNOWsat for the definition of the core competences and the culture of a company like Kässbohrer? We used the discussion with Jens Rottmair to delve into this question.

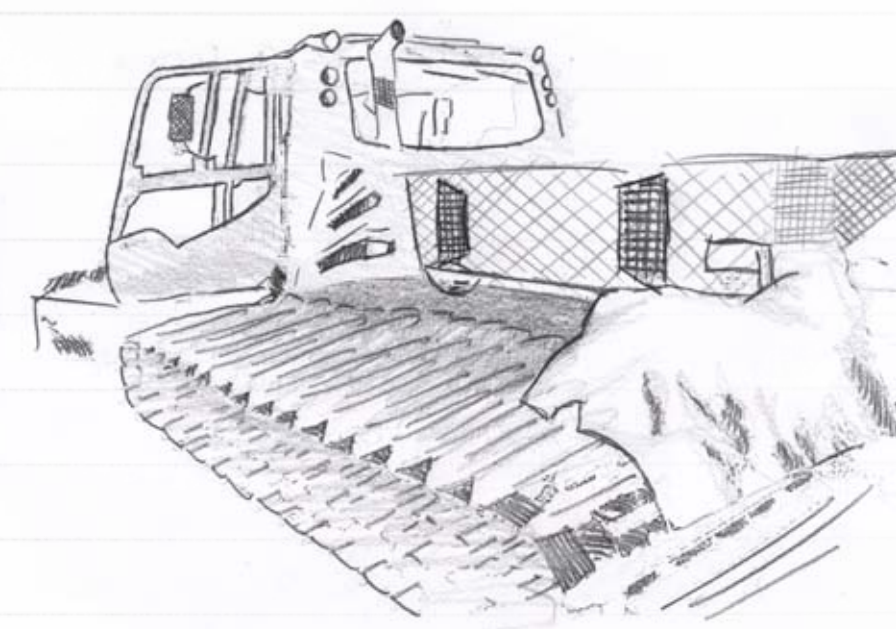
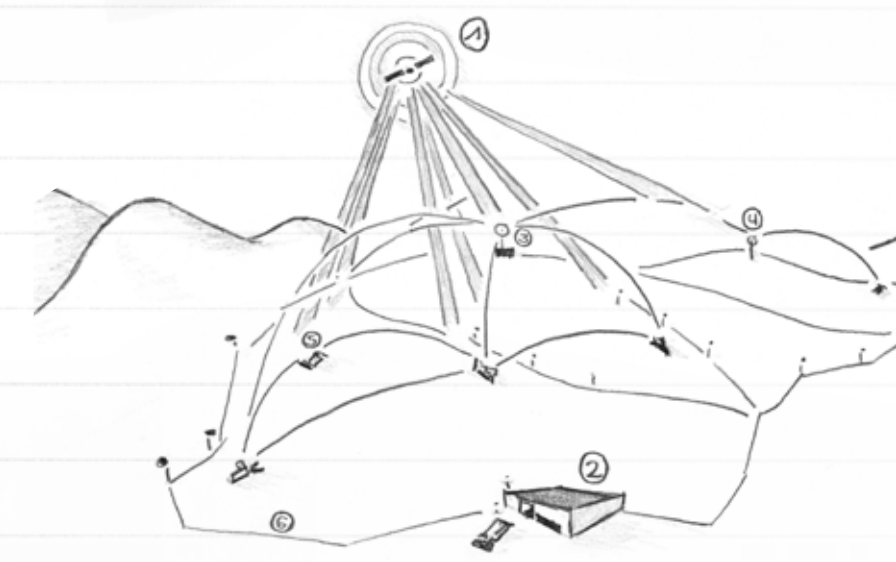
"Our core competence remains vehicle construction. We grew up with the hardware and we will continue our strategy in future with an additional type of vehicle in addition to the PistenBully that is not for use on the ski slopes. The aim here is

to reduce our dependence on winter business," Rottmair states. "As for culture, it took a certain time until this type of new product was also accepted within the company. But that's normal, I think. SNOWsat is today part of our daily work and is valued by all our staff as much as it is by our customers."

But can software excite and generate the same emotions as hardware? According to Rottmair, that depends on how well the system works. And this is the case with SNOWsat. The product is networked in the skiing area, works by radio and GSM, allowing vehicles to communicate with one another in the skiing area in real time. Web applications and large amounts of data are available to customers, such as measurements of the exact depth of snow with a maximum deviation of 3 centimeters. "That's why software can also trigger emotions," Rottmair is convinced.

That may be so, we think. But even the best software has no tracks. We take one last wistful glance at the PistenBullys and set off down into the valley and towards Munich.

- ① Satellite-guided position determination
- ② Mainstation with WiFi-accesspoint and server
- ③ Base-station
- ④ Repeater
- ⑤ foreign vehicle



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