Scandinavian-Polish Chamber of Commerce

NORDIC INSIGHTS

TRENDS SHAPING THE FUTURE OF BUSINESS

Content partner infuture hatalska foresight institute

Strategic partner SIGMA Connectivity

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Trends shaping the future of business

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infuture hatalska foresight institute

For the purpose of this report infuture hatalska foresight institute has carried out a research based on signal based forecasting method, the aim of which was to search for trends related to the most popular innovations currently being developed on the Scandinavian market. Each identified trend has been described by the institute and enriched with case studies, indicating the real operation of companies in this area. In addition, the infuture institute conducted a survey (CAWI) among 73 member companies of the Scandinavian-Polish Chamber of Commerce, which aim was to assess their attitudes towards identified trends.

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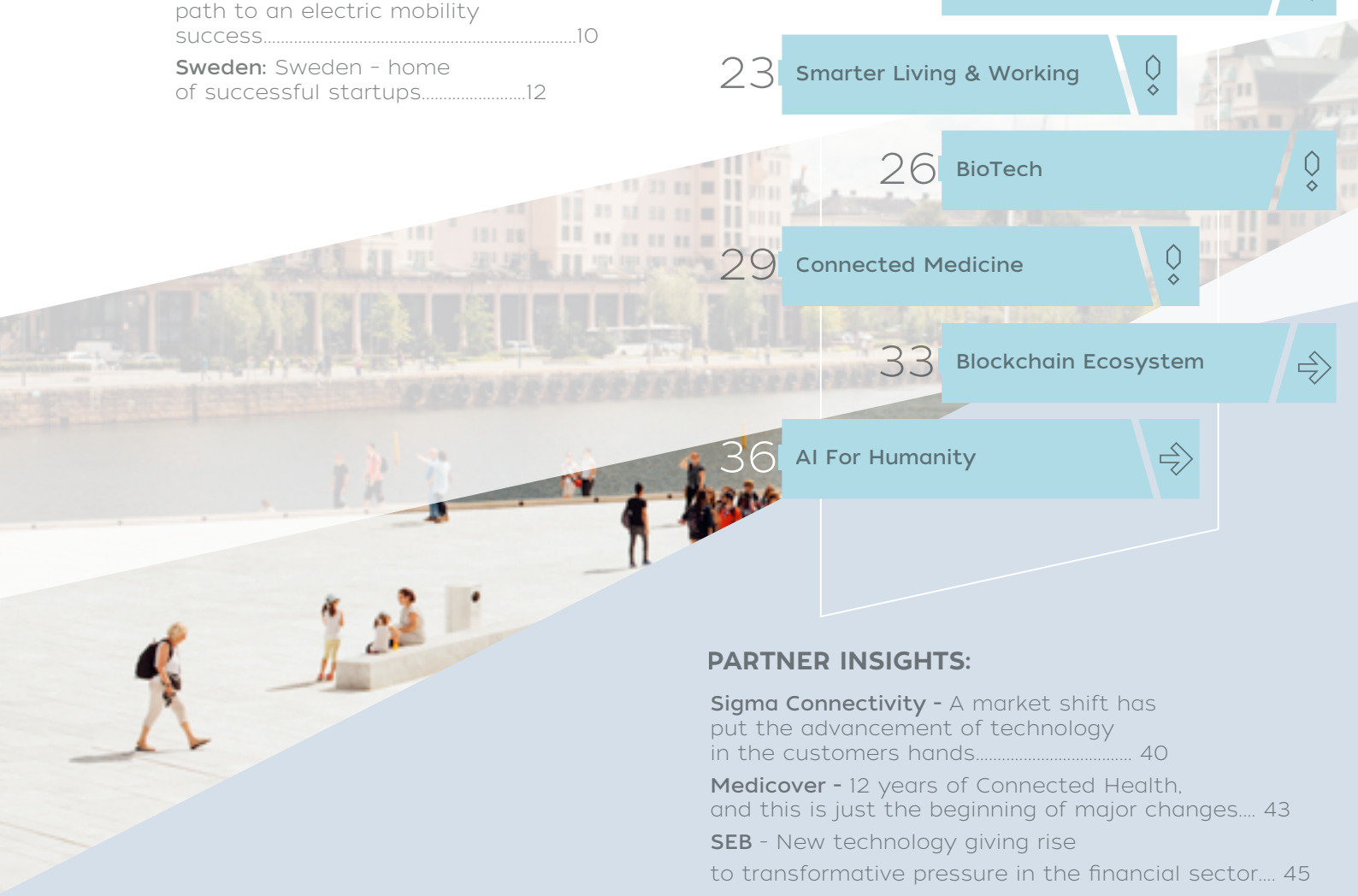

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TIME PERSPECTIVE FOR THE TREND now new next

Forewords

Scandinavian-Polish CHAMBER OF COMMERCE

We are all witnessing transformation of the world to the extent never seen before. Contemporary societies face new challenges - the current world population is growing and is projected to increase, more and more people will move to cities. That phenomenon imposes new solutions regarding construction and agglomerations management. Western societies are in the process of aging, which intensifies the need of implementing innovations supporting daily lives and day-to-day functioning of the increasing number of the elderly. The pace of changes taking place in the digital world results in expanding new analytical tools and innovative use of big data. Parallel to the aging of society, we are bound to face the challenge of labor shortage with the negative effects to be mitigated with an Artificial Intelligence (AI).

Competitiveness of companies and states will depend on the level of their adaptation to the transformations or even more - on their ability to foresee future changes, engage non-standard thinking, developing a vision and enhance an effective collaboration.

Having considered the above challenges, The Scandinavian-Polish Chamber of Commerce (SPCC) provides you with ***"Nordic Insights - trends shaping the future of business"*** report prepared in cooperation with the infuture hatalska foresight institute. This publication is our common effort to identify key business trends in Scandinavia in a broader perspective of the global changes influencing cooperation between Scandinavia and Poland. The Scandinavians are the leaders in a variety of key areas of life, they stand out from the other nations and rank highly in respect of innovativeness, competitiveness and digitalization of society. Our report presents a breakdown of the trends in three areas: Economy and Technology, Environment and Sustainability and Society & Work. It also describes several interesting solutions implemented by Scandinavian businesses, including the ones having operations in Poland. We believe the cases demonstrated herein will provide you with a valuable reading, and we hope that the outlined trends will inspire Polish organizations to seek further growth.

We wish to express our gratitude to the Embassies of Denmark, Finland, Norway and Sweden for taking over the Honorary Patronage and for sharing in detail their experiences with the innovative projects which have been success stories in their countries: smart city solutions in Denmark, circular economy in Finland, electromobility in Norway, and start-ups & innovations in Sweden.

We are also grateful to the our Strategic Partner - Sigma Connectivity, as well as our other partners: IKEA, Kinnarps, Medicover, SEB and Stena Recycling for their support, commitment and contribution into our report.

Agnieszka Zielińska, Managing Director
Carsten Nilsen, Chairman

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Innovation and openness. These words are used very often when talking about Scandinavian countries. They define not only the ways in which companies and institutions operate. They also became an idea that the Scandinavians follow in their everyday life. This is manifested in many areas, from attempting to solve global problems, through improving the quality of life and health of residents, building an innovative economy, up to and including an inclusive education. Thus, the Scandinavian countries set the direction of change and development that should become an inspiration for others. Encouragement to draw knowledge and inspiration from the leaders of positive change is also one of the main messages of the „Nordic Insights - trends shaping the future of business" report.

Among the 14 trends selected for the report are those already important today (NOW), those in the initial stage of development (NEW) and those that can currently be observed in the form of significant changes, but with a small range (NEXT). Each of the trends has been enriched with case studies, pointing to the real operations of brands, companies and institutions in accordance with specific trends.

In addition, as part of the work on the report, we conducted a survey (CAWI) among 73 member companies of the Scandinavian-Polish Chamber of Commerce, which aim was to define their attitudes towards specific trends. The study shows, among others, that 73% of surveyed companies consider trends tracking as an extremely important or very important factor shaping the company's development. More conclusions from the study can be found in the report.

We hope that it will provide you with a lot of knowledge and inspiration.

Wishing you nice reading,
infuture hatalska foresight institute

Smart Cities - Denmark

Ole Egberg Mikkelsen, Danish Ambassador to Poland

According to the forecast by 2030, six out of ten world-inhabitants will be living in urban areas. By 2050, it might be seven. Investments in a number of areas need to be made if we are to meet the challenges of urbanization and climate change.

Danish cities have very long tradition for implementing smart cities concept through long term planning which includes dialogue between environment, people and businesses. The key element for creating cities built on smart city model is sustainable approaches across urban mobility, water, climate adaptation and intelligent energy.

Danish towns are very ambitious about climate and energy programs implementation. This process is stimulated by ambitious national local municipal programs and high level of society awareness. Everyone would like to live in a clean and healthy environment and everyone needs to take care about it in order to achieve the common goal. Education of society starts at early stage engagement of young people by active involvement showing economic and social benefits.

One of the example of climate adaptation project which is a part of smart city concept, is Project Zero with the pioneering Danish municipality of Sønderborg. Project Zero was established 10 years ago as a public -private partnership by the Danish municipality Sønderborg and a group of Danish companies - leaders in energy optimalisation. The goal of project Zero is making the area of Sønderborg CO_2 neutral by 2029. Despite its relatively modest size, Sønderborg has achieved far more than many larger municipalities. The project includes energy optimalisation in buildings, conversion of energy sources to renewables: a house that produces more energy than its residents are able to consume, green district heating and ZERO+ companies, shops and schools are some of examples of the

photo Janusz Sytek

new solutions created in this municipality. Inhabitants of Sønderborg are collaborating on new green investments, while farmers are erecting their own wind turbines, demonstrating the broad support for the ProjectZero vision. Education for the project starts at early stage at kindergarten level. As a part of the project, students of all local public schools in the municipality learned about sustainable development as a part of the UN-cooperation Unesco Global Network of Learning Cities.

All is being achieved by participation of all stakeholders to reach the ambitious goal: CO_2- neutral growth and sustainable urban development.

Sonderborg is expanding the project's scope today by incorporating several of the United Nation's Sustainable Development Goals and sharing its experience, especially with energy optimalisation and renewable sources inside and outside the country.

The capital - Copenhagen is a good example of the city implementing smart city model. The municipalities of Copenhagen and Frederiksberg can expect the population to grow by 20 percent by 2031, according to a prognosis. All these inhabitants will need clean air, fresh water, energy efficient housing, waste management, efficient transportation, parking, street light, green areas, leisure activities etc.

The City Council is now financing a smart parking solution, with the purpose of making it easier to find an available parking space, thereby reducing search traffic, CO_2 emission and air pollution.

A project to map indoor climate in the municipality´s buildings has been endorsed, starting with schools and kindergartens, as children are more sensitive to moisture, noise, temperature and CO_2-level, and as it is scientifically proven, that it effects their learning capabilities. On an outdoor level, Copenhagen and Google Map just started measuring air quality, street by street, in order to provide citizens and politicians knowledge about air pollution, and where to do what.

In the city of Aarhus, the latest 4 km stretch of bicycle super highway was recently inaugurated. One of the side effects of the new bicycle highways are that the number of cyclists have increased by 61 per cent in Copenhagen between 2013 and 2016. Others include decrease of sick days among employees, less traffic congestion and reduction of CO_2 emissions. Cycle lanes are expensive, but the investments might pay off.

So does proper handling of waste. Currently, solid waste landfills in and around cities are contributing to high levels of air pollution around the globe, which has a negative effect on the health of millions of people. But urban waste also represents a largely untapped source of recyclable materials for production, reusable goods, heat and electricity when properly used.

Some of this we started doing at Amager Bakke incinerator. In due time there will be a ski slope and a restaurant at top of the incinerator, and a 80 meter high climbing wall at the side. Of course it is not called a landfill. It is called Amager Ressource Centre.

Buildings are one of society´s greatest energy consumers representing almost 40 percent of all energy used. Green Lighhouse, a faculty building at the University of Copenhagen, completed in 2009, was Denmark´s first certified sustainable building. It was designed to optimize the well-being of the people working there as well as being CO_2-neutral.

Circular Economy, Finland: Experiences and hopes for the Future

Juha Ottman, Ambassador of Finland to Poland

The circular economy is a hot topic globally and is expected to have huge economic potential. According to estimates by the Ellen MacArthur Foundation, the global circular economy markets are worth more than one thousand billion dollars. Together with McKinsey, the Finnish Innovation Fund Sitra has conducted the first assessment of the circular economy's potential for Finland: even conservative estimates value such potential at around EUR 1.5-2.5 billion.

Circular economy is an indispensable move due to the earth's shrinking capacity, the climate change and because of the fact that the development is not currently on a sustainable base. Circular economy saves non-renewable resources, increases corporate self-sufficiency and helps companies prepare for the scarcity of raw materials and the rise in prices.

The circular economy has become a major theme in Finland since Sitra published its report on the topic in November 2014. It was selected as one of the spearhead projects of Prime Minister Juha Sipilä's government programme, which involves a Government investment of EUR 40 million in the circular economy. The related actions are mainly targeted at further improvement of the good ecological status of the Baltic Sea, reduction of the nutrient load in waterways in general, enhancing the nutrient

photo Magdalena Grochowska

and energy self-sufficiency of agriculture, the growth of circular economy businesses, and the creation of new jobs in general. Meanwhile, the European Union is preparing a new, more ambitious Circular Economy Package aimed at creating an operating environment enabling the transfer to a circular economy.

Finland is the forerunner of bio- and circular economy and clean technologies. With the development, introduction and export of sustainable solutions, we have improved the current account, increased self-sufficiency, created new jobs and already achieved our climate goals and the good ecological status of the Baltic Sea. We have started a strong development of the circular economy, where the traditional industry has also participated.

In a study made in 2015 Sitra focuses on five sectors based on their economic weighting and circular economy potential (value of raw materials and potential for tighter loops). These five sectors are:

1. Manufacture of machinery and equipment: The machinery and equipment industry plays a major role in Finland's national economy and the creation of wellbeing. Many companies in the industry are also global leaders in their segments and have already embraced some of the opportunities presented by the circular economy.

2. The forestry-wood chain, from forest management to paper production: Forest industry products form one of two major Finnish exports. In the forest industry, side stream volumes account for a large share of material flows.

3. The food chain, from agriculture to retail and restaurant services: The degree of domestic origin means that Finland's food chain is ideally placed to foster the circular economy at local level.

4. Construction: The construction sector is second only to the mining industry in terms of waste generation. A major part of society's raw materials is tied to construction. Construction waste is a significant source of scrap metal.

5. Private consumption: A major part of material flows belongs to private consumption. Post-consumer waste is the type of waste most likely to be sent to landfills unsorted.

According to estimates, the circular economy is a great business opportunity for Europe. It can bring annual net cost savings of up to EUR 600 billion and create millions of new jobs in Europe. Finland now has the opportunity to take the lead as a catalyst for a more efficient and sustainable economy and raise the carbon neutral circular economy as the top priority theme of its EU Presidency.

Widespread promotion of the circular economy on global arenas, political commitment to development, the growth of the entire age group into the thinking of circular economy and the education at all grades are examples of Finland's groundbreaking work, that creates a natural foundation for the EU Presidency's top priority theme. Finland would then have the opportunity to highlight the solutions and operating models developed in Finland, to challenge the EU to make more ambitious goals and to see the potential of circular economy.

Going green! Norway's path to an electric mobility success

Olav Myklebust, Ambassador of Norway to Poland

Norway is going green! Currently Norway has the highest number of electric vehicles (EVs) per capita globally. It has been an effect of a long-term ambition of the Norwegian governments for more than two decades to drive up the use of renewable electricity and reduce the GHG emissions by the transport sector. Various incentives have been introduced to promote electric vehicles.

Development of electric mobility in Norway

Norway is a country with a population of 5.3 million people and 2.7 million cars[1]. 200 000 vehicles were Battery Electric Vehicles (BEVs) and Plug-in hybrids (PIEVs) in 2017.[2] The share of newly purchased electric vehicles reached 39% in 2017. This makes Norway the number one country globally in terms of electric vehicles.

The demand for new EVs is so high in the country that in some places there are months-long waiting lists for new models. Historically, Norwegian brands like Think, Kewet and Buddy used to be popular, but with the global players' entering into the market, the situation has shifted. Nowadays, the most popular brands include Volkswagen, Toyota, Nissan and Tesla. The Norwegian buyers tend to pick compact and larger vehicles.

The popularity of electric vehicles, especially after 2010, has required a sufficient charging infrastructure. The government has invested in the development of normal charging stations; by mid-2017, there were 4400 publically available socket charging stations.[3] In 2015, the state enterprise Enova – a governmental enterprise, began a programme aimed at upgrading major Norwegian roads with fast charging stations every 50 km. In large cities, the programme is purely driven by commercial entities.

Why are electric vehicles so popular in Norway? First, prices of electricity are among the cheapest in Europe. Most of Norway's electric energy comes from renewable energy sources, whereas fossil fuel costs are among the most expensive in Europe. Moreover, the affluence of the country and the population's willingness

photo Zbigniew Klenowicz

[1] https://www.ssb.no/en/transport-og-reiseliv/statistikker/bilreg/aar
[2] https://elbil.no/english/norwegian-ev-market/
[3] "Charging Infrastructure experience in Norway – the worlds most advanced EV market." Paper by Erik Lorentzen, Petter Haugneland, Christina Bu and Espen Hauge.

to adopt new technologies enables the fast implementation of new technological solutions. Norway's cold climate has both a negative and positive effect on electric vehicles development. Cold weather reduces the range of batteries, but the cool summers help to keep the duration of batteries. The incentive package is generous and includes fiscal incentives, direct subsidies and user privileges.

Fiscal incentives. The first fiscal incentive was introduced as early as in 1990. It was a tax registration exemption. Then, the government reduced the annual vehicle license fee. Exemptions from company car tax and VAT tax (25%) were introduced at the beginning of the millennium. The final fiscal incentive is the exemption from re-registration tax.

Direct subsidies for users. First subsidies - complete exemption from toll on roads - were introduced in 1997. In 2009 the government decided to reduce toll on ferries. Additionally, it introduced a financial support mechanism to support the development of charging stations. In 2011, financial support was launched for fast charging stations.

User privileges. BEV users have been entitled to free parking since 1999. This saves time and costs, especially in areas where parking spaces are scarce and expensive. The possibility to use bus lanes during rush hours is another privilege. Some municipalities also offer free charging.

Some incentives will cease by 2020. For example, exemption from registration tax and VAT will only be continued until 2020. Some privileges will be regulated at a local, municipal level. The idea is to continue access of battery electric vehicles to bus lanes on the national level, but local authorities will be able to restrict this if buses are delayed.

Future plans and goals

Norway has ambitious goals regarding electric vehicles. The government has presented its goals related to low-and zero-emission technologies. They include:

- After 2025, new private cars, city buses and light vans are to be zero-emission vehicles
- By 2030, new heavy vans, 75 % of new long-distance buses, and 50 % of new lorries are to be zero-emission vehicles
- By 2030, goods distribution in major urban centers is to be almost emission free
- By 2025, shore side electrical power and charging power are to be available for ships in major ports.[4]

The Norwegian market is at an early majority stage, according to the Norwegian EV Association.[5] Most EVs owners would buy again an electric car. They are motivated by the lower exploitation costs, concerns for the environment and the availability of incentives. Simultaneously, the market offer becomes more sophisticated. New and second-generation models, including longer-range versions of electric cars will become available in the next few years.[6]

The constant development of the EV market will have a positive effect on researchers and businesses. University research on more efficient batteries can provide a base for innovative companies. Currently, a number of new entreprises working on the development of flexible charging solutions and fast chargers, are present on the Norwegian market.

Conclusions

Norway has been a great test bed for the early adoption of electric vehicles. The combination of restrictions on fossil fuels and incentives for EVs linked with ambitious environmental goals has created the right environment for the development of electric mobility in Norway. The Norwegian experience is an excellent example of how the government, businesses and consumers in partnership can effectively adopt environment-friendly innovations in a successful manner. We are indeed going green!

[4] https://www.innovasjonnorge.no/en/start-page/invest-in-norway/industries/electric-mobility/
[5] «The Norwegian EV Success» Presentation by Christina Bu, Secretary General
[6] «Electromobility status in Norway»(2018) by Erik Figenbaum

Sweden – home of successful startups

Stefan Gullgren, Ambassador of Sweden to Poland

Sweden, and Stockholm in particular, offers one of the most dynamic and competitive locations in the world for start-ups. Stockholm hosts the second largest number of unicorns, i.e. high-tech startup companies that achieve a valuation of USD 1 billion within 10 years, per capita in the world, second only to Silicon Valley. Sweden tops rankings when it comes to perceptions of opportunity. Around 65 percent of Swedes (age 18-64) believe that there are good opportunities to start a company where they live. The limited size of the Swedish market, in comparison with other European markets, provides a strong incentive for new companies to adopt a global outlook, and to focus on innovation and competitiveness from the start, which then often leads to rapid growth.

So, what has Sweden been doing right? In the early 1990s, the Swedish economy experienced a deep real estate and banking crisis, leading to a contraction of the Swedish GDP by 6 percent in three years and to unemployment growing from 3 to 12 percent during the same period. To kickstart the economy, the Swedish government introduced deregulations, a strict fiscal and monetary policy framework and legislation to promote competition and entrepreneurship, which inter alia led to new companies entering and growing on the Swedish market. Another important factor was the decision by Sweden to apply for membership of the European Union. Sweden joined the EU on 1 January 1995.

Sweden has a long history of a providing a favorable business climate, which has led to multinational success stories such as Ericsson, Atlas Copco , and others, being founded in the late 1800s, or H&M and IKEA in the 1940s. The Swedish business culture continues to be characterized by empowerment, thereby stimulating creativity and innovation. Add to

photo Ewa Rzepa

that a strong tradition of heavy and consistent investments in research and development, often in close collaboration between private business, academia and Government, as a necessary means to maintain Sweden's and Swedish industry's competitiveness on the global market.

In the early 1990s, the Government implemented a comprehensive program to promote the use of personal computers in households and schools. It led to there being at least one computer with an internet connection in almost every household in Sweden. The IT-boom which followed, with skyrocketing valuations of previously unknown IT companies, turned into a sharp downturn when expectations turned out the be unrealistic, but helped the business community and others to gain valuable experience.

An important part of the Swedish success story is the combination of Government policies which stimulate entrepreneurship and legislation which provide a safety net that encourages and allows entrepreneurs to take risks and try out new ideas. Other key components are access to funding through private equity companies specializing in new technologies, as well as Government-funded coaching programs and technology clusters centered around Sweden's leading universities. Today, in Stockholm alone, there are more than 20 000 technology companies, which employ some 18% of the city's total workforce. In 2016, one in three investments in the Nordic region in technology were made in Stockholm.

New technologies can help us change the way we manage a key part of our lives: our health. The Swedish Government has recently set the goal that Sweden should become the world's leading country in e-health by 2025. Several prerequisites will be needed and elaborated for implementing a digital transformation of health care. Artificial Intelligence is quickly becoming a key factor in Health Tech. Ericsson named AI as number one in their "10 hot consumer trends 2017"-report. The Swedish startup company Coala Life uses AI to analyze heart sounds and ECG. Smart algorithms allow 10 common cardiac arrhythmias to be detected earlier than otherwise would be possible. By using health tech to treat people with chronic diseases, which account for a significant part of Sweden's health care costs, great savings can be made. Estimates indicate that an extended use of AI in the health sector could prevent 11 000 deaths per year in Sweden.

Sweden's success in the startup sector is not a result of a single factor, but a combination of a set of policies, implemented through legislation and other measures, and a business climate that promotes innovation, entrepreneurship and includes a safety net. Minister for Enterprise and Innovation, Mikael Damberg, summarized it in these words in an article in "The Atlantic" in 2017: *"If you want to be an innovative country, you have to give people security so they dare to take risks. "Even if you fail, even if you file for bankruptcy, Sweden has a well-known and ambitious safety net."*

TREND ADAPTATION LEVEL IN MEMBER COMPANIES OF THE SCANDINAVIAN-POLISH CHAMBER OF COMMERCE

As part of the work on the report, infuture hatalska foresight institute conducted a survey (CAWI) among 73 member companies of the Scandinavian-Polish Chamber of Commerce, which aim was to define their attitudes towards specific trends.

Is it worth keeping up with trends?

An analysis of environmental, technological, social or economic trends in the perspective of next 5 years turns out to be important for the SPCC companies surveyed. Around **73%** (added up answers: "important" and "very important") of the companies surveyed believe that it is worth keeping up with trends.

Implementation of solutions based on trends surveyed in SPCC member companies

Among the companies surveyed, trends based on cooperation and networking are currently the most common ones. As many as **70%** of companies surveyed have solutions allowing cooperation or networking within the company at their disposal. A similar number of companies (62%) have solutions enabling them to cooperate and network with other businesses/ organisations (trend: **Hub Ecosystem**).

Another important trend which is found in **half** of the companies surveyed is the overall care about employees, their wellbeing, providing them with solutions supporting mental health and wellbeing (trend: **Work Wellbeing**), and development. One in three businesses surveyed **(34%)** uses new educational technologies (apps, platforms) for training or developmental purposes (trend: **EduTech).**

It can be seen, therefore, that trends connected with ensuring educational or developmental competences and care about employees is already highly advanced in the companies surveyed. Trends that are only just entering other markets have been quite widely adapted among the members of SPCC taking part in the survey.

Nearly one in three **(29%)** businesses surveyed has been implementing trends based on recycling and on the closed-loop economy recycling previously produced but no longer used products or raw materials (trend: **No Trace**).

And **26%** of the SPCC companies taking part in the survey are already using solutions based on artificial intelligence (AI) / machine learning / robotics, whereas 15% are willing to start implementing this solution in the nearest future (trend: **AI For Humanity**).

One in five companies surveyed (21%) uses renewable energy in the production process to provide services or in products offered (trend: **Fossil Fuel Free**).

And **15%** of businesses covered by the survey use intelligent IoT (Internet of Things) devices in the production process and operation of the company / presentation of the offer (trend: **Smarter Living & Working**). The same percentage of SPCC companies (15%) declare that they have been implementing solutions based on AR (augmented reality), VR (virtual reality), MR (mixed reality) in order to support the operation of their company or presentation of their offer (trend: **Immersive Experiences**).

The smallest percentage of survey participants **(14%)** indicated that they use a decentralised database (blockchain) in internal company structures (**Blockchain Ecosystem**).

Perspective for the next 5 years

Answering the question which of the activities mentioned were the most important for the development of the company in the next 5 years[1] the largest share of the SPCC businesses surveyed - nearly half **(48%)** - selected further development of solutions enabling them to **cooperate and network with other businesses /organisations.**

The attitude to **using new educational technologies (apps, platforms)** for training or developmental purposes came second, but with a very small difference in percentage **(47%)**.

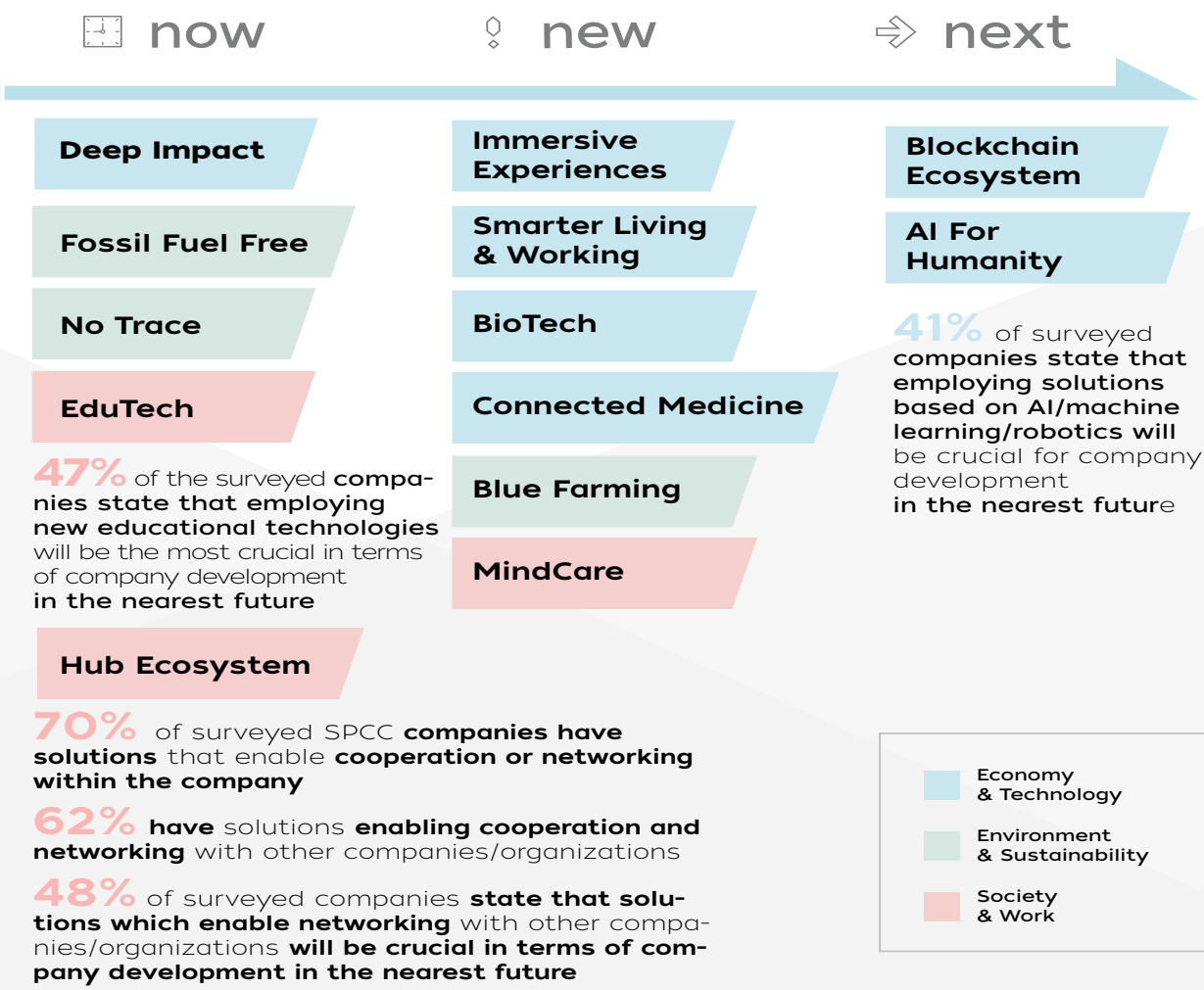
Ensuring solutions allowing cooperation, and **networking inside the company (42%).** was third.

An only slightly lower number **(41%)** of answers referred to the use of solutions based on **artificial intelligence (AI)** / machine learning / robotics. Therefore, within 5 years' time, according to survey participants, solutions based on AI will become quite popular in their companies - according to SPCC members taking part in the survey.

One in five businesses surveyed **(20%)** deemed that the use of renewable energy in the production process/provision of services/ products offered, use of intelligent IoT (Internet of Things) devices in the production process and functioning of the business/presentation of the offer, and ensuring solutions supporting the employee mental health and their wellbeing will be important in the development of their business during the period considered.

The smallest number of businesses surveyed believed that at that time trends based on the use of decentralised database (blockchain) in internal company structures (5%) and the implementation of solutions based on AR (augmented reality), VR (virtual reality), and MR (mixed reality) (7%) will become important in the development of their companies in the next 5 years.

73% of surveyed companies state that trend analysis is important for development of their business



[1] The respondents could choose max.3 answers

Economy & technology

Deep Impact

Deep Impact is a in which start-ups and companies, when developing innovative solutions, try to prevent global problems arising from social, environmental or economic change factors.

We are now facing many challenges. The world is battling against poverty and social inequalities. The consequences of climate change can be already felt today. The excessive greenhouse gas emissions constitute a threat to the entire ecosystem. Over one billion people worldwide are suffering hunger, and over two billion have no access to drinking water where they live.[1]

Scandinavian companies and start-ups are increasingly focusing on designing and implementing innovations which solve problems that we are grappling with today. Denmark, Sweden and Finland lead this year's Commitment to Development Index report. The report evaluates the degree of commitment of 27 wealthiest countries in the world to helping the developing countries. The Index takes seven factors into account - aid, finance, technology, trade, environment, security and migration - adjusting each country's final result by the value of its gross domestic product.[2] SingularityU Nordic is a community whose activity focuses

[1] https://www.unicef.pl/Centrum-prasowe/Informacje-prasowe/2-1-mld-osob-na-swiecie-nie-ma-dostepu-do-wody-pitnej-w-miejscu-zamieszkania-a-ponad-dwa-razy-wiecej-pozbawionych-jest-odpowiednich-warunkow-sanitarnych
[2] https://www.cgdev.org/commitment-development-index-2018

on education about new technologies and how they can have a beneficial impact on global problems. In order to implement innovations, it is using technologies that are growing in popularity today, including nanotechnology, blockchain technology, or artificial intelligence. Nordic Impact, in turn, is a company for which the main driver of changes taking place in the society is technology. The company has been investing in start-ups at an early development stage, operating in the area of technology, whose goals is to have a positive impact on the society.

One of the areas in which the Deep Impact is manifested is sustainable growth. Sustainia, an organisation supporting cities, companies and NGOs in achieving sustainable growth goals, is based in Copenhagen. In 2016, Swedish start-ups from the energy efficiency area included nearly 20% of all start-ups from the CleanTech sector.[3] Data centres are one of the largest energy consumers in the world (it is costly and has a negative impact on the environment). In a bid to counteract this problem, an ecological data centre was established in the Swedish town of Falun, where electricity is provided from sources with extremely low CO_2 emissions and is fully renewable. In turn, APR Technologies adapted the technology used in spacecraft. Introduction of non-conductive coolant into the battery systems in electric cars allows the reduction in battery wear, and thus reduction in energy consumption. Meanwhile, the Swedish company Solvatten developed a solution constituting an answer to the problem of polluted water in developing countries (the company designed a device which uses sunlight to purify water with organic contaminants).

Innovative Scandinavian solutions may also be seen in the area connected with sustainable food production. A Finnish company Solar Foods Oy has been producing a completely new type of nutrient-rich protein, using air and electricity as the main production source. Which is important, the impact of production on the environment will be 10 - 100 times lower than in the case of production of meat products or their substitutes. Solar Foods' concept therefore redefines the basis of food production because it is independent of agriculture, weather or climate. Oumph, in turn, is a new method of food production that does not leave any trace (either in the form of carbon dioxide or used resources). 100% plant-based, Oumph comes in different shapes and consistencies. This soya protein constitutes an excellent source of folic acid and iron. Additionally, it is low in calories and almost fat-free. Oumph has the lowest GMO value in the world (0.1%) and does not contain any modified ingredients.

[3] https://ec.europa.eu/environment/ecoap/sites/ecoap_stayconnected/files/field/field-country-files/sweden_eco-innovation_2015.pdf

Welcome App

Emma Rosman is the originator of the Welcome application which constitutes an answer to the refugee crisis which started in 2015. In the last few years, this application enabled thousands of refugees to meet with inhabitants all over Sweden. The application is translated into four languages: Arabic, Farsi, Swedish and English, thanks to which people can communicate regardless of the language barrier.

Karma

Karma is an application which helps restaurants, grocery stores and coffee shops reduce food wastage, selling the surplus to consumers at reduced prices. The application acts as an exchange platform between catering establishments and shops - and users. Karmalicious AB was founded in 2015 and is based in Stockholm in Sweden.

Solvatten

Solvatten was designed by a Swedish inventor and environmental activist, Petra Wadström. Solvatten is a canister which redefines the method of sterilisation of drinking water in developing countries. The construction of the canister, after it has been filled with water, makes it possible to take it apart. After the canister is placed in a sunny location, the acrylic surface lets in ultraviolet sunlight which destroys DNA bonds in microorganisms in the water (causing the contamination), preventing their multiplication, and in consequence - destroying them completely.

Immersive Experiences

Immersive Experiences is a trend which includes solutions using Cross Reality (XR), i.e. the whole of immersive technologies - VR (virtual reality in which the world is fully computer-generated), AR (augmented reality in which elements of the virtual world are superimposed on real world), MR (mixed reality), as well as tactile technologies which enable the user to get to know the digital world using many senses. In the physical world, however, Immersive Experiences are all those solutions which involve the sense of taste, smell, touch, hearing in the experience.

More and more varied devices and equipment providing engrossing experiences have been appearing on the market. Human senses are the interface for perceiving the world. People are spending more and more time in the digital world. They increasingly expect the world to involve all of their senses, not just their sight. Therefore, it is no wonder that the number of VR, AR and AI users is expected to grow twofold from 57 million in 2017 to 114 million in 2018 on the global scale[4], and the market value of the VR/AR sector is to reach 162 billion dollars in 2020.[5] This is because they constitute a development opportunity not just for the entertainment industry but also for architecture, the industrial sector, healthcare or education. In the internal structures of a company they allow the development of a growth concept,

[4] „Number of Active Virtual Reality Users Worldwide from 2014 to 2018 (in Millions)", Statista, [online] https://www.statista.com/statistics/426469/active-virtual-reality-users-worldwide/ [data dostępu: 17.09.2018].
[5] https://www.businessinsider.com/virtual-and-augmented-reality-markets-will-reach-162-billion-by-2020-2016-8?IR=T

clarification of product assumptions, or training of employees. Also, in the Nordic countries the willingness to develop solutions based on new technologies is apparent.

The large potential for the XR market has undoubtedly been noticed by Finland. Over the last three years (2015 - 2018) this area has flourished - more and more businesses and start-ups have started working on this type of solutions. 40% of Finnish companies interested in the XR area started operating after 2016 (when Oculus Rift and HTC Vive entered the market)[6].

Solutions using virtual reality or augmented reality are implemented in Nordic countries in many areas, from entertainment, to education, to architecture. Mimerse is a Swedish start-up who created a game called Itsy which, thanks to the use of virtual reality, helps users battle arachnophobia. Evocat, in turn, has been developing VR games which may be played by several people at the same time, thus refuting the stereotype that entertainment available in virtual reality isolates and reduces interpersonal contacts. Osgenic develops solutions for surgical training, enabling students and young doctors to conduct surgical procedures in virtual reality, thus ensuring improvement of patient safety. AVAINS OY offers non-standard courses and training sessions for the industrial sector. The IoT data are visualised using a 3D model, making it possible to conduct a work simulation. Courses are short and can be provided at any time and place. Additionally, thanks to the use of gamification the user feels more like a computer game character and not a course participant. The School of Architecture and Design from Oslo has been pointing to a number of solutions which may be provided by the use of new technologies (VR, AR) in the design and spatial planning (for example transferring and testing digital models in the physical world, or easier adaptation of new spaces in the landscape found). In turn, the Finnish company Senseg has been working on the implementation of haptic feedback (feedback response which enables the user to feel textured surface) on touch screens. Using the electrostatic force on the surface of the screen, Senseg is working on creating sensations of different textures.

Solutions allowing immersive experiencing in the physical world are also being developed. SENSE-GARDEN is a Norwegian platform which, thanks to the delivery of stimuli for experiencing different senses (sight, touch, hearing, smell, balance), supports people with dementia. The platform may be filled with well-known music, photos, with dispersed smell, creating personalised space connected with those areas in the memory of people with dementia which we want to reconstruct. Such actions help people with dementia describe objects, places, people and feelings, thus uncovering their memories, whereas a Swedish agency Brand, together with companies Radon and Hi-Fi Technics, created an album entitled "Scandinavian Sounds of Summer" combining field-recording with elements of ambient and drone music. Thanks to the use of the Technics SC-C70 system, recordings provide rich, immersive, high-quality sound, enabling the listener to literally get transported to the place they are listening to.

[6] https://www.slideshare.net/Tekesslide/vr-ar-industry-of-finland-82375717

Case Studies

The Future Group

The Future Group is a Norwegian technology company developing solutions in the area of mixed reality (MR). The Future Group provides its clients with tools in order to enhance content using AR, transporting a TV studio to the world of computer games. The company's objective is to create new ways in which their client can interact with the content, and to enable recipients in front of cameras, to interact with objects in the virtual world. The technology used by The Future Group is Interactive Mixed Reality™ (IMR) - a new technology which enables TV audiences to participate in the same virtual world as people in the TV studio via a mobile phone or tablet. IMR is developed in many formats - in games, e-sports, as well as commercial applications.

Khora

Khora is a production house dealing with augmented reality (AR) and virtual reality (VR) solutions, and an innovation centre for these technologies. Khora is aiming to integrate people of any ages, coming from different backgrounds, who share an interest in this developing technology. In 2016, in Copenhagen, Khora opened the world's first VR store where customers may not only try out VR goggles and headphone sets, but also buy them or become part of immersive virtual experiences. Khora is very open to cooperation - schools and businesses may visit the store to find out more about the potential of virtual reality.

Smarter Living & Working

Smarter Living & Working is a trend which alludes to smart IoT (Internet of Things) solutions which enable the society to function more effectively, more frugally and more efficiently. This refers to both consumer electronics (smart home type devices), smart buildings or smart cities.

In 2018, the revenue on the Smart Home market in Sweden will amount to USD 563 million, in Norway - 418 million.[7] It has been estimated that in 2017 around 8.4 billion of such devices were in use (the population was 7.6 billion at the time). And by 2020 the number of these devices is to increase to 20.4 billion.[8] The development in this area is apparent in the Nordic countries. At the end of 2016, there were on average three connected devices per person in this region. It is estimated that this number will double by 2021 (i.e. around four times more in comparison with other countries).[9]

The factor which is undoubtedly behind the boom of the Smarter Living & Working trend in the Nordic countries is the growth of 5G internet and the launching of innovation programmes from the IoT area. In 2018, prime ministers of Sweden, Norway, Denmark, Finland and Iceland signed a letter of intent in which all these states undertake to create conditions in the public sector, necessary to ensure the development of 5G internet and digitalization. In turn, the European Investment Bank underwrote a loan for EUR 250 million to Ericsson for research and development in

15%

of surveyed companies use intelligent IoT (Internet of Things) devices in the process of production and company functioning/ presentation of the company's offer

13%

are willing to start implementing this solution in the near future.

[7] https://www.statista.com/outlook/279/154/smart-home/sweden
[8] https://www.gartner.com/en/newsroom/press-releases/2017-02-07-gartner-says-8-billion-connected-things-will-be-in-use-in-2017-up-31-percent-from-2016
[9] https://mb.cision.com/Public/40/2203407/bb4409aaefaeb6c2.pdf

Already now there are many devices on the market making our home smart(er). From the most popular SmartTVs through intelligent light bulbs, locks, cameras and other gadgets managed from a smartphone or by voice such as Amazon Alexa.

Soon thanks to machine learning (ML) and artificial intelligence (AI) technology our SmartHome will learn about us. It will detect our mood and emotions, it will define our needs, tone the light, adjust the temperature and play our favorite music from the speakers. It will also remind about upcoming guests visit and after leaving to work it will take care of home safety.

What currently is missing on the market? There is not a mature solution for the entire ecosystem. There are problems with different manufactures device compatibility. Also devices security and data privacy aspects are something to consider.

Tomasz Zygadlo, CEO, Sigma Connectivity Sp z o.o.

the 5G area. It is also worth pointing out it is in Sweden that Ericsson and Telia conducted first field tests of 5G in Europe. One of 17 innovation programmes launched in Sweden is IoT Sweden. The programme involves the industry sector and the academic circles to develop sustainable solutions to social challenges. IoT Sweden takes note of various aspects of the Internet of Things and creates exchange space for businesses, start-ups and stakeholders, aiming to gain maximum knowledge about needs and consumers in this respect. The approach following the Smarter Living & Working trend is visible in the Nordic countries on many levels. Solutions are created which allow smart life and functioning. They are also implemented in workplaces. In November 2017, one of the Stockholm offices implemented the Empathic Building – a IoT solution of the Finnish brand Tieto (more in the case study below). In the city, Smarter Living & Working encompasses smart waste management or smart use of energy. The Enevo start-up optimises the collection of waste by monitoring the level of waste containers thanks to the IoT installed. Thanks to this the software responsible for the planning of routes taken by bin lorries allows a more economical management of cash, equipment and costs of personnel. Smarter Living & Working is also an approach manifested in the method of small steps, on the scale of individual residents – e.g. a Swedish company Ferroamp developed a smart module which regulates and optimises the energy consumption in a household (consumption of renewable energy, charging electric cars or energy storage), the consequence of which is lower energy consumption and lower electricity bills.

Disruptive Technologies

A Norwegian company, Disruptive Technologies, has been developing solutions from the Internet of Things (IoT) area. Products offered by the brand change the way users interact with the world around them. The company has developed wireless sensors which increase the efficiency of the IoT devices. The sensors, after they are placed on the devices, detect touch, distance, temperature or loss of power. They communicate with the Internet in order to pass on the required information to the users, thanks to which it is possible to monitor the IoT devices more effectively.

Tieto

Using IoT sensors, system integration and data analysis, the product by Tieto - Empathic Building - offers a mobile and stationary application which visualises the physical workspace and people within it - all this in real time. It helps the users of an office and visitors to intuitively and instantaneously select their place of work (e.g. on the basis of air quality, noise level, or congestion). Moreover, Tieto Empathic Building provides a tool which enables employees to respond in real time to enquiries concerning their wellbeing and satisfaction.

BioTech

BioTech is a trend referring to the development of the biotechnology industry. Biotechnology is defined as a field in which cellular and molecular processes are used to manufacture products and technologies to improve the quality of life and health.

It is estimated that the world biotechnology market will reach over USD 727 billion by 2025.[10] Biotechnology is used among other things in the development and production of new drugs (including cancer medication), pharmacogenomics (testing the impact of the genome on pharmacotherapy) or genetic testing. According to the database prepared by Nordic Life Sciences, over 900 biotechnological firms are registered in the Nordic countries (293 from the Therapeutics and Diagnostics area, 405 dealing with R&D Services and 226 others).[11] In 2017, USD 2.2 billion was allocated for the financing of Scandinavian businesses operating in the area of the so-called life sciences (sciences focusing on live organisms; biotechnology is one of them).[12]

[10] https://www.grandviewresearch.com/press-release/global-biotechnology-market
[11] http://www.nordic-lifesciences.com/nordic/portal/result_companies.php
[12] https://industrifonden.com/wp-content/uploads/2018/01/Scandinavian-Life-Science-Funding-Report-2017.pdf

For years, the Nordic countries have been accepted as the European centre of biotechnology. Denmark is among the top three countries in which the biotechnology market is developing the most dynamically in the world.[13] The Swedish government decided that the development of investments in three key areas: medicine and life sciences, technology, and climate changes is a strategic decision. Biotechnological firms in the Nordic countries include sectors connected among other things with treatment (19.7%), diagnostics (17.2%), but also agrobiotechnology (2.4%)[14], and their financing comes from different sources (grants, government programmes, private investors, the so-called business angels, incubators). Besides, the selected solution may count on the government support with regard to promotion and communication. The Swedish government decided to allocate two billion krona to international information and marketing activities of Swedish biotechnology. Thanks to the cooperation between Denmark and Sweden, Medicon Valley was established - one of the strongest clusters in the area of life sciences (including biotechnology). It includes 350 businesses from the sectors of biotechnology, pharmacy, and medtech, including large players, such as Lundbeck or Novo Nordisk. Medicon Valley focuses on cooperation, creating conditions for start-ups to facilitate exchange of knowledge and experiences. Entrepreneurs, scientists and researchers form networks in science parks. The data indicate that one of ten companies operating in the area of life sciences is based in a science park.[15]

It should be pointed out that the sector of firms developing therapies to combat diseases has been operating actively in the Nordic countries, with many successes on the world arena. They constitute 19.7%[16] of 924 businesses (according to the Nordic Life Sciences Database) dealing with biotechnology. Emphasis is placed among other things on the development of medication to treat chronic diseases. An example of such company is Cereno Scientific, whose latest product - drug CS1 - is based on an advanced formula of sodium valproate, a substance known from the treatment of epilepsy. Through the stimulation of section of t-PA, a substance thanks to which blood clots are dissolved in the body, at the same time the drug reduces the level of PAI-1, the t-PA inhibitor, thus improving the quality of life with people with thrombosis. Another strength of the sector which includes treatment is the cancer therapy. A Danish biotechnological firm Genmab developed two cancer drugs (more information in the case study below). Johnson & Johnson acquired commercialisation rights to one of them (DARZALEX™). In turn, a Swedish biotechnological firm Aprea Therapeutics, conducting research on cancer drug therapy, received as much as EUR 46 million to work on the drug. This is the highest subsidy in this sector in 2016.

[13] http://www.saworldview.com/scorecard/the-2016-scientific-american-worldview-overall-scores/
[14] http://www.nordic-lifesciences.com/nordic/portal/stats_biotech.php
[15] https://investindk.com/insights/a-life-sciences-hub-across1
[16] http://www.nordic-lifesciences.com/nordic/portal/stats_biotech.php

Case Studies

Cellink

A Swedish start-up, Cellink, is the first company in the world to print in 3D using bioink (liquid substance containing stem cells). Thanks to this, besides the ability to print human organs and tissue models, the company also offers modern methods of conducting cancer research, or testing drugs and cosmetics. The organs and tissues printed by Cellink may be used as research subjects for companies working on innovations in the field of health and medicine. The solution offered by Cellink constitutes also an answer to problems with the lack of organs for transplants. The company is developing dynamically, and their solutions are already available in 25 countries worldwide.

Genmab

A Danish company, Genmab, is one of the most renowned biotechnological companies in Europe. It develops therapies based on antibodies in cancer treatment. Two cancer drugs developed by Genmab are currently available on the market. One of them, DARZALEX™ (daratumumab) has become a popular drug in the treatment of multiple myeloma - the product is produced on Johnson & Johnson's licence. The other one, Arzerra (ofatumumab), is recommended for the treatment of chronic lymphocytic leukaemia. Genmab is also developing new antibodies based on the DuoBody and HexaBody platforms in order to generate, respectively bispecific and hexametric antibodies.

Connected Medicine

In the age of digitalization, thanks to new technologies, medicine is going to a new level, redefining the healthcare system. Connected Medicine is a trend which, in response to the challenges of contemporary society, marks out a new model for healthcare.

Connected Medicine is an inevitable direction. We are facing the problem of an ageing society. By 2050, one in three people in Europe will be over 60. In the future, providing medical care to all elderly persons will not be possible - they will have to function in their own homes - at the moment it is the technology that will come to their aid. Modern-age diseases (depression affects around 300 million people worldwide) and the continuously growing expectations of the society with regard to healthcare resulted in issues connected with health being included in the innovation policy in each of the Nordic states.

In the years 2015-2017, seven Scandinavian projects were financed in order to unify and reinforce the Nordic countries' efforts in the area of health innovations. The e-health market is becoming a priority among other things for the government of Sweden. The state could save 25% of costs allocated to healthcare in the

coming years, which translates into 180 billion krona in 2025.[17]

How advanced Scandinavia is becoming in the area of Connected Medicine is reflected in the digitalization of healthcare. Already in 2016, the Swedish government approved the Vision 2025 project thanks to which Sweden is to become a pioneer in accessibility of high-quality health care, among other things through the opportunities offered by digitisation. Solutions offered by telemedicine have been subjected to large-scale tests. In some regions of Sweden the first digital doctor's appointments have already taken place, enabling patients to consult a doctor via an app. In 2016, the Värmland district council was the first one in the country to pilot digital healthcare for its residents, who can now decide to have an online appointment with a doctor rather than undergo the long-drawn process that we know today. The pilot project is implemented in cooperation with the Swedish healthcare provider KRY. All you needed for the consultation was a tablet or a smartphone with the app installed. In turn, at the initiative of institutions including Mälardalen University in Sweden, SICS Swedish ICT (ICT institute), Danderyd Hospital, the STRADA project was created - its purpose was to develop a system allowing remote rehabilitation thanks to which stroke patients could get treatment at home. Using Kinect controllers, the patient, standing in front of a screen, (which shows his movements as the movements of an avatar, e.g. in a forest environment), is capable of performing exercises independently. The physiotherapist, who is in a completely different location, appears in an inset window on the screen and remotely leads the patient through all exercises in real time. There is no need for a mouse or a keyboard - the patient must only stand or sit in front of the monitor and start moving. Telemedicine-based solutions are therefore inclusive, allowing access to healthcare for a wider group of patients.

Good environment, a certain type of ecosystem based on accelerators, is an extremely important element of the Connected Medicine trend development. In the Nordic countries these accelerators gather start-ups around them, enabling them to network and cooperate. One of them - HealthTech Nordic - accelerates the growth of start-ups and unifies pioneers in the area of digital health. Its objective is the joint development in this area - generating new ideas and, at the same time, stimulating the region and creating new jobs. Hubs also function at the regional level. H2 Health Hub is a meeting place for representatives of the medical technology industry in Stockholm.

Connected Medicine is to provide accessibility, savings and a feeling that each user (thanks to the devices) takes more control of their health. Platforms providing current access to test results and their analysis, applications which

[17] https://www.mckinsey.com/~/media/McKinsey/Industries/Healthcare%20Systems%20and%20Services/Our%20Insights/Digitizing%20healthcare%20in%20Sweden/Digitizing-healthcare-in-Sweden.ashx

allow the measurement of vital parameters constitute an answer to these needs. Wearable devices are created, which help patients function with chronic diseases. An Islandic start-up Medilync, thanks to an application, introduced the machine learning technology into the diabetes treatment area. The Insulync tool and the cloud system Cloudlync allow the synchronisation and analysis of results in a cloud. Many start-ups focus on women's health. Urinkollen helps women who suspect that they might have a urinary tract infection to be diagnosed and have medication prescribed over the phone in less than an hour.

The Corti start-up developed a system based on AI and speech recognition technology, which allows early detection of a cardiac arrest already at the time the patient calls the emergency number. Diversified solutions are developed, including among other things mobile platforms enabling patients to contact their doctors (such as KRY mentioned above). Thanks to Via Min Doktor, patients may consult a GP 24h a day via a chat from any device. After quickly spreading among hospitals and clinics in Sweden, Min Doktor wants to become the leading primary healthcare platform in Europe.

Case Studies

Noomi

A Swedish start-up, Noomi (formerly Aifloo), has developed an intelligent wristband which is to assist care over elderly persons. The wristband is equipped in sensors which collect information about the user's abnormal habits (falls, dietary changes or changes to sleep pattern). The information is sent via sensors into the cloud where the AI technology allows the testing of certain behavioural patterns, and then to carers who, equipped with a set of information, may respond to potential problems.

Noona Health

The systematic remote monitoring of symptoms, wellbeing and quality of life of people with cancer helps anticipate complications and recurrences at a much earlier stage. A Finish start-up, Noona Health, has developed a communication platform between oncology centres and patients which allows the monitoring of the patients' condition in real time. The platform improves the quality of cancer patient care and makes the relationship between the patient and clinic staff more personal. The personnel may respond more quickly to symptoms occurring in a patient and provide better care to a larger number of patients. Noona Health also makes it possible for patients to quickly contact the clinic and to monitor the progress in treatment.

Disior

The Disior start-up developed an innovative tool for AI conversion used to analyse fractured bones or soft tissue injuries, which allows the reduction of the image processing time to between ten and twenty minutes (as compared with standard diagnostic imaging methods). The tool is compatible with all formats of the 3D imaging technology. It provides doctors with a completely new way of obtaining information from medical images. This solution will affect many areas of medicine, including treatment methods optimised for the patient, computing analysis as a tool for making treatment decisions and improvement of the effectiveness of the hospital and costs of care.

Blockchain Ecosystem

Blockchain Ecosystem is a trend which refers to the development of the blockchain technology. Thus, this trend is an inherent part of the FinTech (Financial Technology) category, i.e. innovative financial services which, thanks to the extensive use of technology, constantly become a strong competitor for traditional financial methods.

Blockchain is a decentralised database containing a constantly growing number of records, which form an unbreakable chain (i.e. the blockchain). Because of links between data, it is impossible to make any changes in historic records (without changing the entire transaction history). All data are completely distributed, there is no single large server room, and only users are responsible for their verification, which makes it nearly impossible to intercept data. The blockchain technology also offers a lot of possibilities outside the financial sector - it may be used to authenticate documents and keep various types of records, e.g. in the healthcare sector, power sector or administration. According to the data of the World Economic Forum (WEF), by 2025, as much as 10% of the world GDP is to be transferred using this very technology.[18]

The Nordic countries use the blockchain technology in a wider context, creating the so-called Blockchain Ecosystem. Residents of Scandinavia extremely quickly become accustomed to the cashless payment system and are ready to use innovations in this respect. In Denmark, 88% of Internet users use online banking,[19] in Sweden, as Riksbank (the central bank of Sweden) states, cash is used in just 20% of transactions in shops. According to the data of the Bank of Finland, this country is on track to becoming cashless by 2029. Norway, in turn, is to achieve this goal by 2030.

The blockchain technology is used in Scandinavia on many levels, among other things

[18] http://www3.weforum.org/docs/WEF_Realizing_Potential_Blockchain.pdf
[19] https://www.spcc.pl/images/file/0_2016/SPCC_raport_pazdziernik_PL_161011_Internet.pdf

in health care, insurance, and administration. Blockchain provides users with inclusivity and offers an opportunity for reducing the level of financial exclusion. Already in 2015 the Finnish immigration service, Migri, initiated cooperation with the start-up MONI for the first time. This start-up developed a debit card which bypasses the need to have a bank account or identity documents. The card is linked to a unique digital identity stored in the blockchain system. Under a pilot project, MONI offered refugees the MasterCard prepaid card linked to their digital identity, which made it easier for the immigrants to find employment and helped them pay bills by electronic means. In consequence the entire adaptation process was easier and more user-friendly. Lantmäteriet, the Swedish land registration office, started to test the blockchain technology in 2016, and in 2017 completed the second stage of the pilot project. The purpose of the pilot scheme was to implement the blockchain technology to speed up the land and ownership registration process. The project connected a number of partners, including a Swedish start-up ChromaWay, Telia – a company from the telecom sector, or Kairos – a consultancy firm. In consequence, a comprehensive project was created which, on the one hand uses specialist technology, on the other hand – answers a real problem. This was also ChromaWay which cooperated with Sofitto in order to develop the Swedish e-currency, E-Krona. The work on the project continues, currently it is being verified by Riksbank, the Swedish central bank, which in 2018 keeps working on the concept concerning the E-Krona implementation project (including its properties, proposals concerning the appropriate infrastructure, legal solutions).

In SEB we see many opportunities with Distributed Ledger Technology (aka Blockchain). We are actively exploring how it can be used to develop the financial services of the future. There are many use cases as the future business ecosystems require real time functionality, a trusted mechanism for data sharing and an immutable audit trail. We have already implemented use cases related to cross border payments, trade finance and mutual fund registry.

Robert Pehrson, Head of Business Development, SEB

OpenLedger

OpenLedger is an innovative provider of blockchain services which focuses on the delivery of efficient and comprehensive blockchain solutions for enterprises and start-ups. The company offers consultancy services, research, development, and optimisation of efficiency, as well as individual and private blockchain solutions for corporate clients. OpenLedger offers its clients the personalisation of consensus protocols in the blockchain, implementation of smart contracts, as well as designing and implementation of the transaction fee structure. OpenLedger also has its own decentralised advertising platform for exchange and demand.

Blockchangers AS

A Norwegian firm, Blockchangers AS, helps other companies understand and use the blockchain technology. The Blockchangers team acts to promote blockchain and cooperates with private and public institutions wishing to define the status quo of the technology and its potential for the future. Thus, in line with such strategy, it provides consultancy, lectures and workshops (including the Oslo Blockchain Day event), as well as services which help clients (these include DNB Bank, Lyse, Datatilsynet, Trigger or Kantega) in their development.

Maersk & IBM

In August 2018, IBM and Maersk announced the establishment of a jointly developed platform TradeLens. Its purpose is to use the blockchain technology in the world delivery chain in order to promote transparency, support information exchange, and stimulate the innovation area in the industry. The TradeLens community includes companies (dealing among other things with sea transport), but also ports or customs authorities which provide data for the platform. TradeLens uses the blockchain technology to consolidate, secure and exchange this information.

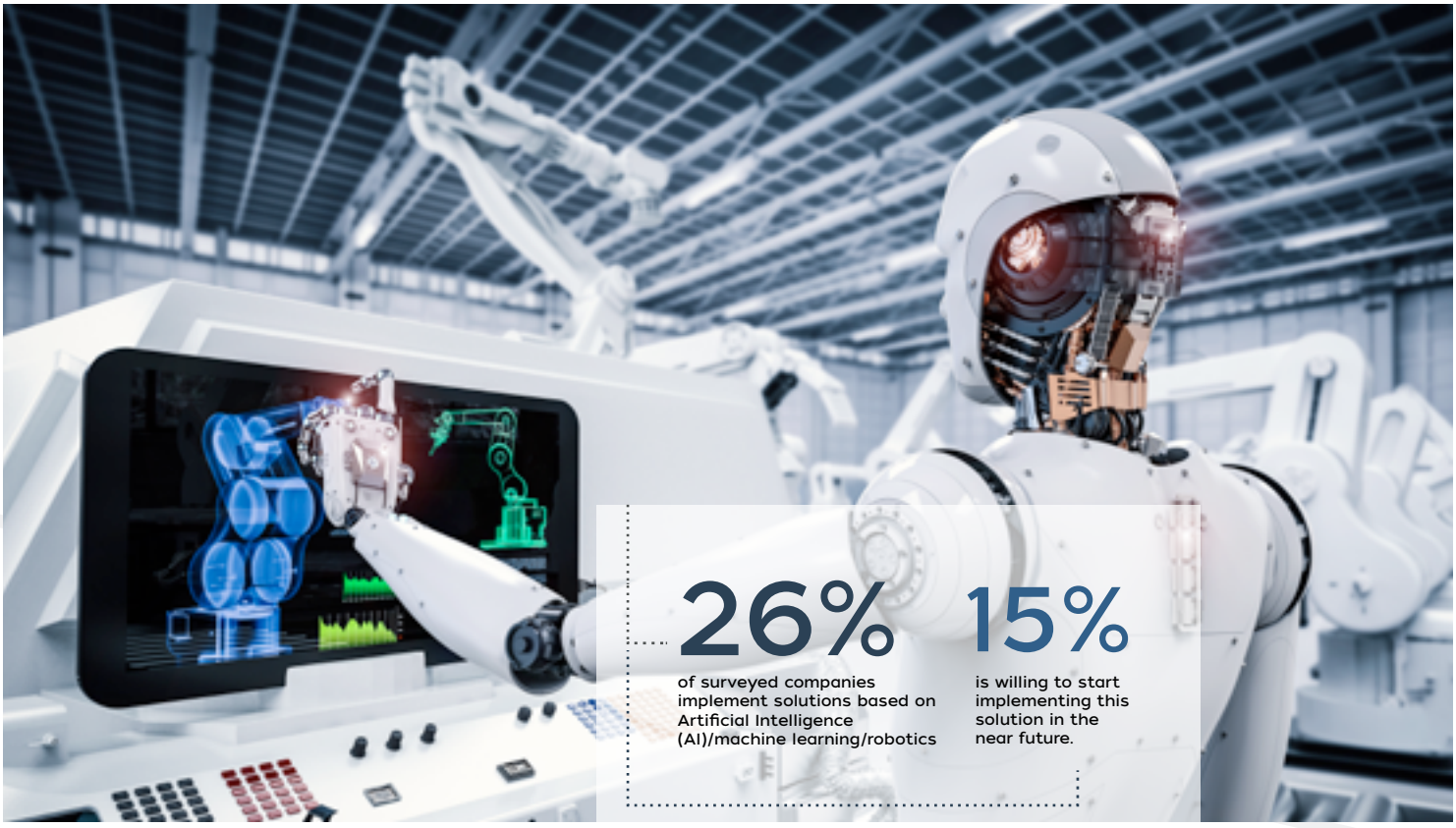
AI For Humanity

The AI For Humanity trend refers to solutions the cohesive objective of which is to improve the quality of life on the basis of solutions from the area of artificial intelligence (AI) or robotics.

Although we are encountering solutions based on artificial intelligence in nearly all areas of our lives, starting from home, to work, to health, ending with entertainment, the trend described below refers to those which place human beings and their needs in the centre.

In the Nordic countries artificial intelligence allows the implementation of solutions aimed not only at work optimisation and streamlining of complicated business processes (in such areas as: health, transport, environment, defence and security), but also improvement of the condition of the society. During the second edition of the AI for Good summit held in May this year in Geneva, the United Nations specified practical uses of artificial intelligence and strategies supporting it in order to improve quality and sustainable development of life on the planet.[20] The market of Nordic start-ups is rich in solutions which serve people and the society.

Investments in the development of artificial intelligence are one of the priorities for Nordic countries. In 2018, the Swedish government



[20] https://news.itu.int/the-ai-for-good-global-summit/

pointed to AI as the subject stimulating the country's development. The Swedish Wallenberg Foundation is planning to invest 2.6 billion Swedish krona (USD 297 million) in enhancing Sweden's competence with regard to, among other things, artificial intelligence. The largest artificial intelligence fund in Norway, Norwegian AI, has funds worth around NOK 1 billion. In the European ranking which calculates the number of AI firms per population size, Finland comes second, and Sweden – fourth. A Swedish company, Starcounter, is among the best-funded European firms dealing with artificial intelligence. Which is important, directions of AI development in Scandinavia are also set by women. One of the leading experts in artificial intelligence is a woman, Prof. Danica Kragic Jensfelt.

The Nordic countries invest in education about AI and robotics by setting up education centres and supporting non-governmental organisations which deal with these subjects. The Nordic AI Institute Nordic Artificial Intelligence Institute is an NGO gathering experts on artificial intelligence (AI) and related areas (machine learning, natural language processing, or robotics). Denmark has an extensive infrastructure concerning education on robotics. EIT Digital, a European educational and research organisation with one of its branches located in Helsinki, created an application based on artificial intelligence which helps refugees learn languages. In 2017, the Capiche application supported German, English, Arabic and Farsi. Work continues on the constant improvement of the system and adding further languages.[21] The AI For Humanity trend is visible among other things in areas covered by Scandinavian start-ups which use new technologies to fight against modern-age diseases, such as loneliness or depression. One of the examples is No Isolation – a Norwegian start-up which, through technology, wants to prevent loneliness and social isolation. Noomi, on the other hand, is a solution (described in more detail in the part devoted to the Connected Medicine trend) based on the AI technology, which makes it possible to research certain behavioural patterns in order to provide better care to the ageing society or chronically ill people. Artificial intelligence also has a great impact on work optimisation. New technologies and AI are decreasingly the subject of social prejudice (a majority of Scandinavian residents have positive attitudes to robots and AI (Denmark 82%, Sweden 80%), and as many as 93% of Swedes believe that robots are necessary because they can carry out tasks that are too difficult or dangerous for people. UR3 robots are capable of handling loads up to three kilograms and may be used in industry or agriculture. Soon, robots will also be able to take the load off people in such work as assembly of small objects, gluing or putting in screws.

[21] https://www.eitdigital.eu/newsroom/news/article/capiche-the-smart-assistant-for-refugees/?utm_source=facebook&utm_medium=social&utm_cont%E2%80%A6%202/4

AI and robotics for better safety

The construction Industry is one of the most dangerous for the employees. Every day a number of dangerous works take places on the construction sites. Such threats can be implemented without the human hand - by robots. That is why Skanska in this frame directs the active R&I projects. The examples are: the robot test in the range of ceiling instalation which we impemented in Warsaw in 2017 on SPARK office project, the robots which prepare the rebars for the projects which we realize in Sweden, semi autnomous machine, low carbon emission wchich could work on the aggregate quarry plant - our common project with Volvo company being realized in Sweden.

Thanks to these projects we can limit the H&S risk to which can be encountered the people working on the building site.

Anna Tryfon-Bojarska, Innovation Manager, Skanska CDE, CEE Market

No Isolation

A Norwegian start-up which - through technology - wants to prevent loneliness and social isolation. So far, they have two products on offer: KOMP and AV1. KOMP is a device for seniors who want to communicate without feeling intimidated by new and unknown technology. AV1 is a solution addressed to children who, due to prolonged illness, have not been attending school for a long period of time. When a pupil cannot attend classes, AV1 takes their place.

Lytics EIR

Lytics is a Swedish firm which uses the artificial intelligence (AI) technology to resolve complex medical and clinical problems. One of the products offered by the firm is LYTICS EIR. The device is used to evaluate the expected results of a patient and, on this basis, recommends the optimum selection of medication and its appropriate doses. Thanks to the analysis of previous recommendations concerning drugs and the results obtained, thanks to the use of special algorithms and the AI technology LYTICS EIR is capable of developing its knowledge and then advising the optimum solution to the patient.

SKANSKA

In 2016, SKANSKA initiated cooperation with Smartvid.io, a company using the machine learning technology to increase safety and productivity in the construction sector. Thanks to the tool, the data collected (in the form of video recordings and photographs) are subject to an analysis. The solution offered by Smartvid.io therefore enables the user to detect any infringements of safety, health and hygiene within the building site. Thus, by using the artificial intelligence (AI) technology in the advanced image analysis, SKANSKA wants to achieve an improvement in its employees' safety.

A market shift has put the advancement of technology in the customers hands

Today's market is shifting fast and as consumer trends drive technology and its development forward - companies are pushed to react, leaving less time to innovate.

Being on the forefront of some of the world's toughest markets means that end consumers expect new products, technologies and services with every new season, companies face pressure to improve time to market and ensure quality. It has lead big companies to partner up with design and development houses with a high expertise in multiple areas, very much needed due to the complexity of today's products and platforms.

No matter how big the ambition is, identifying consumer trends before they happen is hard.

In order to execute successful innovation you must dare and have the courage to take the risks necessary to succeed. Effectively deliver new value and meaning through smart connected solutions while keeping a high level of quality to ensure the best end user experience. During the five years that Sigma Connectivity has been in operation it has provided its clients exactly that.

Sigma Connectivity was founded in 2013 by design and R&D teams from Ericsson and Sony Mobile. It was considered as a start-

up (with 186 employees) and we employ over 500 engineers, designers, developers and strategists. Our client list consists of over 200 companies, from startups, industry leaders and daredevils, covering all areas of Consumer Products, MedTech, CleanTech, IoT and Production Technology. It is a truly unique and independent design house located Lund in Sweden, with offices in Warsaw, San Jose and San Diego.

Though most of Sigma Connectivity's partnerships are matters of confidentiality, the few that aren't are perfect representations of how Sigma Connectivity approaches a projects and deliver experiences. For instance, the risks taken during a project with Sirin Labs, where revolutionary technology and unique craftsmanship was combined, allowed the end product Solarin phone to set a new benchmark in global usability. Developing a revolutionary mobile phone, combining security, confidentiality and seamless connectivity. Resulting in a never before seen integration of traditional craftsmanship and advanced technology by challenging performance connectivity, enabling complex antenna arrangement and pushing data transfer limits. Solarin is a smartphone able to protect sensitive information without compromising on usability, quality or design.

"There have been several technical challenges in creating a product of this kind. We have worked with suppliers that have no experience of working with the mobile phone industry before, used technologies that has barely left the research stage and managed to support every relevant connectivity standard out there." - Truls Persson, Project Manager at Sigma Connectivity

Facing risks and conquering the challenges eventually creates values and meaning, which is the shared goal of all of Sigma Connectivity's clients. Much like the case of Coala Life, a Swedish digital health venture, who successfully launched their first product in 2017. Together with Sigma Connectivity they designed and engineered a product which can predict and aid early detection of heart diseases. It was the first digital ecosystem able to monitor cardiac activity anywhere, anytime. A digital heart monitor with a unique blend of medical and technological performance allowing instant monitoring and analysis of heart activity.

"Requirements for expertise in connectivity, proven IT solutions with high performance, and designing of small power-efficient solutions, was something that early on pointed to Sigma Connectivity as a suitable partner for us." - Johan Siberg, CEO Coala Life

This product did not only bring value to the medical technology movement and its end user but it also challenges the word "product" - as it is consists of a top of the line IoT system providing the user with a service, not only a product. It is a system combining hardware and software, which can be synced with other wireless systems improving and enhancing user experience.

As an industry leader and trendsetter it is important stimulate many ideas and encourage a culture where unsuccessful ideas are as welcome as the successful ones. This approach actually makes it possible to influence trends, and sometimes even set them. Promoting this mindset internally as well as externally has enabled companies like Sigma Connectivity to build a strong brand surrounding their taglines "never work alone" and "life and business depend on better connectivity" - a Nordic brand associated with quality, cutting edge competences, latest technologies and improving user experience though consumer products.

Inadvertently, new experiences is what the customer is looking for. Looking at the leading companies succeeding in today's on-demand and constantly changing market: IKEA, Amazon, Apple - to name a few. What do they all have in common? Consistency-rich experiences. With a experience centric approach and ambition to define next generation technologies, companies like Sigma Connectivity has and will continue to partner up with the most interesting companies world-wide.

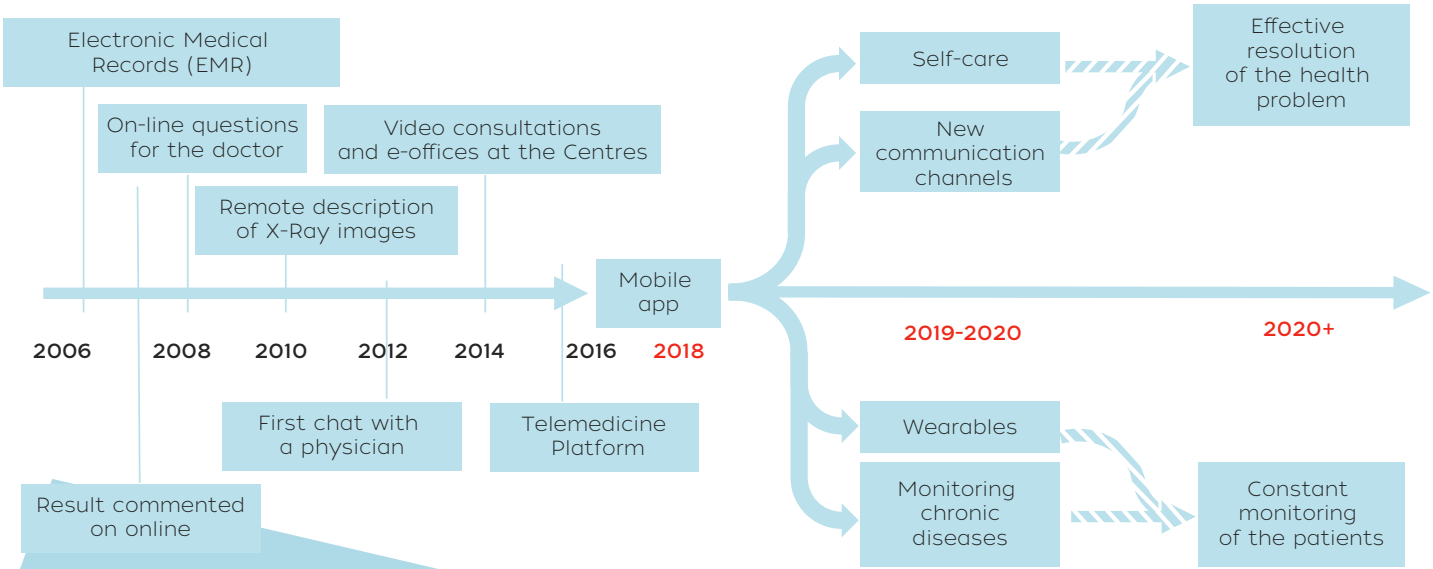
12 years of Connected Health, and this is just the beginning of major changes

Let's have a look at the Medicover story together. As you can see, 12 years ago we started nearly from scratch - from the Electronic Patient Portal and communication with the doctor through messages and comments to the results.

What followed was the development of the Telemedicine Platform, the main part of which were consultations on the phone and e-offices. The most recent milestone was the creation of the mobile app that we are proudly announcing today. It is used by 200,000 patients, and this number grows each month. Although currently over 1/3 of all Medicover visits are via telemedicine channels, where we comment on the results, create descriptions remotely, chat about health problems and hold doctor's visits with the use of a video cam, we know that this is just the beginning, as the Connected Medicine revolution is yet ahead of us.

How will patient care develop going forward? Taking into account the vast range of solutions available on the market: from gadgets to modern and complex medical devices, it is hard to decide on one path of development. The Internet and communication technologies have evolved so much over the past 12 years that you can really let your imagination run wild. Even crazy ideas like holograms, augmented reality or a full "backup" of a human being, which 12 years ago primarily brought science-fiction books to mind, are now gradually being developed, and within 30 to 50 years should become part of our everyday reality.

At Medicover, we are aware of it, but we do not want to focus on dreams. That is why we are considering introducing solutions that can help our patients within 3 to 5 years. We are developing in areas that can quickly help our patients. The value at the heart of our every innovation is undoubtedly the health of the



patient. Both when they do not have that status yet (prophylaxis), as well as when we will be spending much more time together (in connection with chronic diseases).

New functionalities are developed in four major areas: two supporting preventive healthcare and two supporting care for the chronically ill.

Two groups of solutions are in the first category: self-care and new channels of communication. For people who occasionally visit Medicover and want to stay as healthy as possible for as long as possible, these are very important. Both are also necessary for us to be able to create healthcare services focused on quickly solving the problem.

Self-care – it assumes focusing on three areas: patient education about health, facilitating access to the right specialist and effectively solving the problem in the shortest time possible. It may sound like a cliché, but by adopting a methodical approach and using modern solutions based on data analysis, machine learning and smart patient management, we are able to refer patients more quickly and effectively to the right specialist or propose a solution that will help solve the problem quickly.

New communication channels – we know that our society is changing, and the Internet is changing the way we communicate. Looking into the future, we see that more and more people from generations Y and Z require a completely different approach to treatment. They prefer online help and quick response to problems. That is why we consider the development of unconventional methods of communication important. Thanks to chatbots, voice communication and modern video communication methods we are constantly developing, Medicover can be contacted via any channel.

With the chronically ill in mind, we are adding more ways to communicate with Medicover. First of all, we focus on continuous patient monitoring, mainly thanks to two solutions:

Wearables – these devices are an example of the application of the Internet of Things concept in medicine. As a result of the continuous development of smartwatches, wristbands and health trackers, we generate huge amounts of data every day. Medicover is developing systems that can incorporate them and support the doctors in their decision-making process. Thanks to advanced medical solutions, we can already keep in touch with the patient every day. This is important, although it is not necessary in the context of the second area, described below.

Monitoring the chronically ill – a trend initiated a few years ago by introducing remote monitoring of patients, mainly diabetics. In the era of common access to the Internet and the availability of a large number of solutions that monitor life processes, the development of patient monitoring platforms is slowly becoming a standard. This allows doctors to have comprehensive information about the health of their patients before they visit the doctor's office.

To conclude, all Connected Health solutions that I am considering and that we are working on at Medicover focus on having an even better picture of the patient's health, so that the physician that makes decisions has as much information as possible about the patient's health.

New technology giving rise to transformative pressure in the financial sector

Technological development, evolving customer behaviours and new regulations are giving rise to strong transformative pressure in the financial sector. Customers have come to expect convenient and seamless digital services – but also knowledgeable, proactive and personalised advice.

Development is moving towards an increasingly open banking world, where customers can gain access to financial services at places of their own choosing. They no longer need to visit their bank – neither physically nor digitally – to conduct traditional banking services such as payments, savings or loans, or to gain access to advanced advice and research.

This trend, collectively described as "open banking", is affecting banks' business models and entails opportunities as well as challenges.

Large companies and financial institutions have a broad-based interface with banks and are asking for seamless digital integration along with proactive, value-creating advice. They expect that banks will be able to use the wealth of customer data they possess to create customised analyses and recommendations. They put high demands on the banks' advisers to have a high level of industrial knowledge, specialist expertise, and access to sophisticated tools.

The same trend can be seen among small and medium-sized enterprises, which expect both proactive advice and digital services on their own terms. In this segment development is moving fast toward companies being able to handle payments directly in their bookkeeping systems in order to avoid duplicate work.

On the private side, customers today expect services that are smarter, faster, more secure and designed according to their conditions. Among the most sophisticated customers in the private banking segment there is an expectation for personalised advice combined with convenient and sophisticated digital services. Relationship-driven business continues to be important, but customers want transparency and value for money. Industry statistics show that nearly half of high net worth individuals who have switched financial advisers have changed over to entirely digital alternatives.

Among other private customers there is also a preference for more customised advice that is available in the form and channel that customers choose themselves. They put a great deal of trust in banks and are keen to sharing their personal data if it leads to services that simplify daily life.

Openness to digital services is great. Statistics from the UK show that nearly a third of all private persons have switched to new, entirely mobile banks, and the trend in the Nordic countries points in the same direction.

All of these factors together are giving rise to strong transformative pressure on the financial sector. Banks already possess an enormous amount of information about their customers, but they are lagging behind many digital platform companies when it comes to using this information to create customer value. Development is headed toward a more data-driven work approach, where advanced data analysis and artificial intelligence are being used full out to improve advice and service based on individualised solutions.

One example of how SEB is working with product development in this area is Advanced Analytics, a service that is imbedded in the bank's internet service for large corporates, C&I Online. It is an easy-to-use, flexible service with functions for trend analysis, simulations, searches and data mining, where customers can – for example – combine data from the accounts they have at SEB with data from accounts they have with other banks.

One area with major potential is blockchain, a technology that allows all parties in a business arrangement to share data in a joint, encrypted and verified ledger. When a transaction is conducted, it is automatically registered with both the buyer and seller and thus does not need to go through a third party for clearing.

Last year SEB was the first bank in the Nordic countries to put blockchain technology into production for live payments. One of the bank's large corporate customers is now using an internal blockchain for transfers between its SEB accounts in Sweden and New York. This pilot project is promising and shows that it is possible to carry out the entire payment process in just few seconds.

SEB is also conducting several other initiatives to investigate the potential offered by this new technology to streamline financial processes. Last year, together with a dozen or so international banks SEB began work on developing a prototype for using blockchain technology to modernise manual and time-consuming document handling in connection with international trading. SEB has also begun a collaboration with Nasdaq to test a prototype for a new fund trading platform based on blockchain technology.

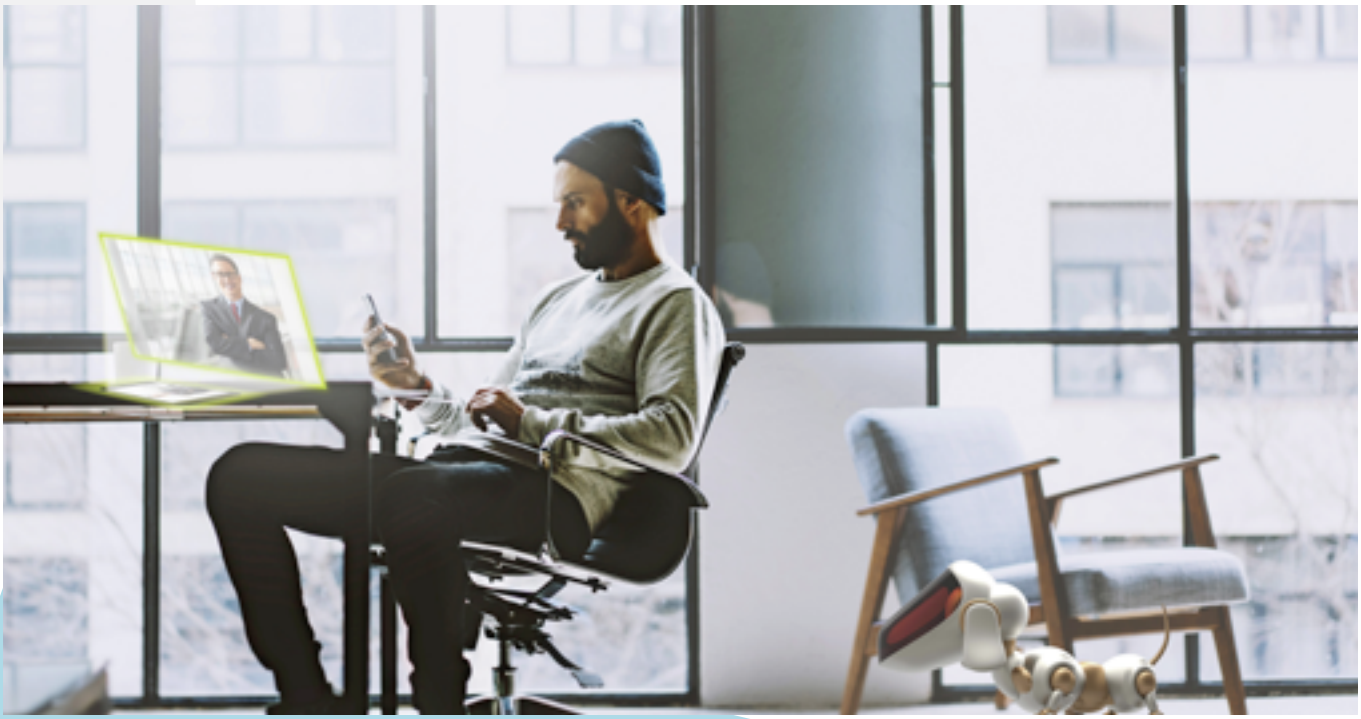
SEB has also become a part-owner in the international blockchain consortium R3 and has invested in the Danish company Coinify, which works with blockchain payments.

The rapid pace of technological development is also putting demands on new models for IT development. The major, large scale IT projects that have been traditionally conducted in the financial sector are becoming more risky and are not sufficiently flexible to meet the emerging needs in a rapidly changing world. New, swift-footed ways of working that are based on agile development and service design in close interaction with customers are under rapid development in the industry.

Customers' expectations for convenient digital services are putting demands on extensive automation and efficiency improvement. Customers want to see shorter lead times and transparent processes in which they themselves can monitor a transaction's path the entire way through the chain.

Digitalisation and competition from new fintech companies that are not weighted down by the banks' historical IT platforms are also putting pressure on costs, giving rise to a need for automated processes and scale economies in transaction-based banking operations.

As more and more services move into the digital realm, customers' expectations for value creation and proactive advice are growing. In this regard, the banks' ability to develop their employees and attract the absolute top talent is a decisive issue for the future.



Environment & sustainability

Fossil Fuel Free

Trend Fossil Fuel Free is based on main assumptions of the sustainability strategy. It encompasses all activities the consequence of which is to become independent of fossil fuels.

Today, the development of the energy sector or work automation are enabled to a considerable degree by energy sources the resources of which are limited. And the burning of these fuels is the cause of irreparable damages not just to the environment but to human health as well. At the moment, Scandinavian countries are among those leading the fight for renewable sources of energy (that is clean and with unlimited resources) and alternative forms of obtaining it. Giving the environment a priority means that huge funds are allocated to fulfil these goals. In 2018, three Scandinavian countries, Sweden, Denmark and Finland, took three consecutive places in the Global SDG Index (Sustainable Development Goals) ranking[1]. It is Denmark's aim to switch exclusively to renewable energy sources by 2040, and as early as in 2050 the state is to become independent of fossil fuels.[2] It is Sweden's intention to have a fleet of vehicles that would be independent of fossil fuels by 2030. It is also anticipated that

21%

of surveyed companies use renewable energy in the production process, to provide services or in the products offered

[1] http://www.sdgindex.org/assets/files/2018/00%20SDGS%202018%20G20%20EDITION%20WEB%20V7%20180718.pdf
[2] http://europa.eu/rapid/press-release_IP-18-5042_en.htm

by 2050 Norway will rely exclusively on clean electricity.

For many years, Scandinavian countries have been leading by example, showing how to invest in solutions from this area. The first and the largest photovoltaic panel installation was erected already in 1997 in IKEA, on the roof of the store in Älmhult. At the moment, the brand, having been investing in solar energy, already has 750,000 installations on the roofs of its stores worldwide (and since 2017 it has been selling them in its stores). Besides, the company has been investing in wind farms composed of 416 wind turbines, and these numbers continue to grow. In 2018, PV panels were installed on the roof of the Royal Castle in Stockholm. Covering as many as one thousand square metres, they are supposed to supplement electricity used by the royal seat.

It is apparent how green energy is implemented in Scandinavian countries both in the national plans but also in new business initiatives or start-up operation areas. A number of solutions are connected with areas of energy generated from air, water or sun. In 2017, 43% of electrical energy consumption in Denmark originated from wind, which became a world record in this area.[3] In Norway, in turn, the focus on hydroelectric power stations is visible. At the moment, as much as 96% of electricity generated in Norway originates from them. As much as 66% of overall energy production in Sweden comes from renewable sources, such as hydroelectric power, geothermal power and biomass (e.g. the Swedish start-up Againity converts waste and biomass into heat, and then into electricity)[4]. The doubtless achievement of Scandinavian countries in this respect is energy generated from hydrogen which, besides its capacity to generate energy, is also its carrier. In June 2018 work started on establishing the first steelworks – to be built in Lulea by 2020 – in which coal and coke will be replaced with hydrogen for the production of tempered steel. The project is costing nearly 1.5 billion Swedish krona (158 million US dollars). This is a joint undertaking of two companies, Vattenfal (an energy company) and SSAB (steel manufacturer). The companies claim that this technology is to help reduce carbon dioxide emissions in Sweden even to 10%. The industrial process is to be implemented by 2035. Thus, the support for innovation through collaboration is obvious. One should remember that innovation is a social process – very often the most effective solutions are created as a result of cooperation between companies from very distant areas.

The role of companies and start-ups from the cleantech industry (technologies focusing on products, services and practices that are environment-friendly) may not be disregarded. For these companies, care for the environment constitutes an integral part of the strategy. Quite often the solutions proposed by them are extremely innovative. A Swedish start-up, Revibe Energy, which uses vibration energy (more in the case study below) may be an example here. A Norwegian start-up, Kube Energy, in turn, provides clean and inexpensive solar energy solution for companies and organisations

[3] https://uk.reuters.com/article/uk-denmark-renewables-windpower/denmark-sets-record-with-43-percent-of-power-from-wind-in-2017-idUKKBN-1F01VD
[4] https://www.business-sweden.se/en/Invest/industries/Manufacturing/sustainability/

operating in Africa where connection to the grid is difficult or non-existent. A Swedish start-up, Ligna Energy, seeking ways to store electrical energy, converts ordinary paper making machines to manufacture large-scale batteries, based on organic electronic polymers and biopolymers from the forest. A Finnish start-up, Wello Oy, manufactures wave energy converters.

The approach of Scandinavian companies and countries shows therefore that appropriate activities concerning renewable energy will change the way the environment works, and which follows - the way societies function.

The search for solutions for a low-emission economy, resulting from the threats caused by climate change, is one of the most important challenges and areas of sustainable development at IKEA. Thanks to investments in renewable energy sources, as of 2016, we produce more electricity in Poland than we consume for our own needs, thus neutralizing our carbon footprint. Annually, our 80 wind turbines generate approximately 470 GWh of electricity, which roughly corresponds to the energy demand of 188,000. households.

The area that we are currently developing is prosumer solar plants and the sale of turnkey solar installations. We are observing the demand for new energy sources, but also the high interest of customers in the ecological lifestyle. Poles want to live in a cleaner environment and more and more often see that renewable energy is a good direction.

Katarzyna Dulko-Gaszyna, Retail Sustainability Manager, IKEA

ReVibe Energy

The ReVibe Energy start-up, thanks to the unique technology for collecting vibration energy, makes it possible to convert vibrations (that occur in most of the industrial environments) into electricity. This energy fully powers sensors and monitoring systems in those environments. In a pilot project implemented together with Deutsche Bahn, ReVibe Energy adapted its devices and placed them on railway tracks in order to collect the vibrations from passing train. This provided power for sensors which transfer information to Deutsche Bahn control centres. The use of the ReVibe product as the source of energy allows the monitoring of railway junctions without the need to keep frequently replacing batteries in the devices.

IFE Hynor Hydrogen Technology Centre

IFE Hynor Hydrogen Technology Centre (IFE Hynor) is a fuel cell and hydrogen technology testing centre which is part of IFE (Institute for Energy Technology). The centre includes a small hydrogen refuelling station (HRS) capable of working under high pressure (700 bars) and fast refuelling (in just 3 minutes) for electric vehicles with fuel cells. It also offers the possibility of delivery of biogas and hydrogen (production on site or bottled gas) and use of advanced equipment for gas analysis. The centre tests the development of high-temperature production of hydrogen and solid oxide fuel cell (SOFC) technology, including the development of a prototype of a reactor which would generate hydrogen through conversion of methane with the simultaneous sorption of CO_2.

No Trace

In the face of the "throwaway consumer culture", the No Trace trend assumes the minimisation of the trace left after goods have been used (used packaging, equipment, or carbon footprint).

The phenomenon of the so-called "throwaway consumer culture" can be observed worldwide. Currently the greatest problem is the growing plague of plastic. 9 billion tonnes of plastic has been manufactured so far (360 million tonnes just this year), 8 million tonnes of plastic waste land in the oceans.[5] Subjects connected with plastic have also been discussed at the largest design festivals. The main motive behind the Brompton Design District was Material Consequences, and during the London Biennale Latvia prepared an exhibition about No Trace, which symbolised human influence on our planet.

No Trace is a trend that is well visible in Nordic countries. It is manifested both in residents' initiatives but also in the state policy and

29%

among surveyed companies implement solutions based on recycling and circular economy - re-processing previously produced, and already not used products or raw materials.

[5] „The Global Risks Report 2018". World Economic Forum [online], https://www.weforum.org/reports/the-global-risks-report-2018 [data dostępu: 18.09.2018].

business – new, pro-ecology solutions are being created by companies and start-ups which fight against the "footprint" left by people on Earth.

In Scandinavia, recycling has become a way of life. In one of Swedish cities, Helsingborg, public waste bins have been equipped with loudspeakers playing music. All this to make recycling a pleasant experience. And it was also in Sweden, in the wake of **lagom** – the life philosophy of Swedes which means "just the right amount", that the idea of plogging was created, i.e. jogging combined with picking up litter in the city.

An optical waste segregation system is gaining popularity in Sweden. A Swedish company Optibag developed a system to automatically sort colour-coded waste bags (green bags contain bio-waste, red bags – paper, etc.) and their automatic sorting. The use of this type of solution would make it possible to reduce the role or even eliminate the need to send waste to sorting plants. In 2016, in turn, in Skedsmokorset in Norway, the world's most efficient, fully automated solid waste recycling plant was opened.

Recycling and all activities connected with the reduction of the amount of waste may be noticed in the functioning of two Scandinavian states in particular – Norway and Sweden.

All stores which sell disposable bottles are obliged to collect them. Larger stores are equipped with machines which scan, crush and pack bottles in order to make it easier to collect them. The deposit money recovered may be donated to charity (an option provided by the machine) or used for further shopping. 97% of plastic drinks bottles in Norway are recycled, and 92% can be processed to such a degree that they return to circulation yet again as bottles (an organisation called Infinitum handles the deposit charges).[6] Packaging manufacturers must pay an ecology tax in order to cover the costs of collection and recycling of their packaging. The tax decreases as the percentage of recycled materials increases, and when packaging recycling exceeds 95%, the manufacturer does not have to pay tax. Additionally, manufacturers must use tested labels, tops and glue in order to make the recycling process more efficient. Some of the plastic packaging has been processed already 50 times. (The United Kingdom is also considering the introduction of this type of solution.)

The No Trace trend is visible also in systemic activities of states. Sweden is an example here as the reduction of the tax on repairs translates into development of other sectors. For example, 50% of the costs of labour may be deducted from tax in the case where large household appliances are repaired (25000 Kr per annum or 50000 Kr for persons over 65).[7] In 2016, in turn, the government introduced an Act reducing VAT from 25% to 12% on repairs of bicycles, clothes and footwear. This allows the repair market to be stimulated and, in consequence, creates workplaces for yet unqualified immigrants the percentage of which continues to grow in Sweden.

Scandinavian countries also attach growing importance to upcycling – processing waste in such a way that results in products with value higher than initially. This is apparent mainly in eco-design, or designing products allowing for their impact on the environment.

[6] https://www.euractiv.com/section/energy-environment/news/norways-crusade-against-plastic-waste-one-bottle-at-a-time/
[7] http://www.rreuse.org/wp-content/uploads/RREUSE-position-on-VAT-2017-Final-website_1.pdf

A Finnish company, Stora Enso, started work on the manufacture of clothes from cellulose – the raw material is used to create the so-called regenerated cellulose fibres[8]. These fibres may be spun into yarn, and then woven or knitted into fabrics used to create a number of stylish products. On the other hand, H&M in cooperation with Hong Kong Research Institute of Textiles and Apparel (HKRITA) developed a chemical process which will allow the separation and sorting of cotton and polyester mixes into new fibres.

The "No trace" trend is an answer to the Circular Economy concept, which involves the rational and efficient use of resources and minimalizing the negative impact of products on the environment. Certainly, the Polish-Scandinavian cooperation in implementing this model of management in enterprises is the most effective way to re-use resources, close the circulation of products and also inspire others to do so.

Lars Ibsen, Managing Director, Stena Recycling

[8] https://www.thelocal.se/20180418/this-nordic-company-wants-you-to-wear-trousers-made-from-trees-stora-enso-tlccu

Case Studies

Tomorrow Machine

A Swedish design company, Tomorrow Machine, having considered the consequences of using plastic in food packaging (long time required for the packaging to decompose and its harmfulness for the environment), has developed a packaging series named This Too Shall Pass. The durability of packaging corresponds to the use by date of its contents (e.g. juice, rice or oil). For example the (edible) oil packaging is made of caramelised sugar covered with beeswax – in contact with water it dissolves. The rice packaging, in turn, is made of biodegradable beeswax. In order to open it, you have to peel it like fruit.

Sulapac

This is a Finnish start-up which has developed a new biodegradable packaging material which fulfils all functions of plastic without even a gram of plastic having been used for the production. This is because it is made of renewable and sustainable resources only. This is the first fully ecological material of this time worldwide. The Sulapac® products are made of a combination of wood and biodegradable binders. The material has plastic properties. It is oil, water and oxygen resistant.

LEGO

By 2030, the Danish brand LEGO intends to manufacture most of its products and packaging from environment-friendly or recycled materials. In 2018, the company made the first step towards this goal by introducing plastic bricks made of plant-based materials – in the shape of plants. The new LEGO bricks are made in 98% of polyethylene which is obtained from sugar cane. The use of sugar cane to produce the material is compliant with the guidelines of LEGO World Wildlife Fund (WWF).

AkkuSer

AkkuSer is a recycling company which processes used batteries into usable materials. Thanks to the Dry-Technology® patented by the company, it is possible to reclaim materials from batteries and rechargeable batteries in as much as 90%. Valuable metals, such as nickel, cobalt or iron, are recycled and may be reused. AkkuSer is also working on the method of recovering materials from alkaline batteries (which would be more environmentally friendly) and on recovering materials from electric car batteries.

Blue Farming

Blue Farming is a trend which redefines the process of using water as a resource. In its complexity, it includes water management on a macroscale – including aquaculture (obtaining food from water environments), but also on a microscale – e.g. hydroponics (plant cultivation based on water media).

One third of farming land worldwide is devastated[9], and agriculture uses around 70% of world fresh water resources[10]. Blue Farming constitutes an answer to challenges connected on the one had with limited resources, and on the other hand with the rising birth rate in the following decades (9.7 billion people in 2050)[11].

In Sweden, probably the only country in the world, the function of the Ambassador for Oceans, Seas and Freshwater exists in the structures of the Ministry of Environment (from 2018, it has been held by Helen Ågren). In 2019, Norway will organise the annual summit "Our Ocean" attended by ministers of foreign affairs, ministers of environment, representatives of science and NGOs. The purpose of the summit is to discuss the condition of oceans and adopt commitments to ensure their sustainable use.

Over 80% of the population in Norway reside less than 20 kilometres from the coast, and the land area of the state is 6 times smaller than the area of the surrounding marine area[12]. Sweden's coastline is 2,000 km long, and the

[9] Land Degradation Assessment, FAO 2016.
[10] Aquastat, FAO 2016.
[11] ibidem
[12] https://www.regjeringen.no/contentassets/00f5d674cb684873844bf3c0b19e0511/the-norwegian-governments-ocean-strategy---new-growth-pro-ud-history.pdf

number of lakes exceeds 100,000[13]. No wonder then that Nordic countries are working on innovative solutions which will enable them to use water in a similar way that land areas are now used - from transport, to food growing, to energy generation. Clean oceans and well-thought-out water management strategy are the main drivers behind sustainable growth and development of foreign policy of Scandinavian countries, and the access to seas and oceans, as well as the innovative approach adopted by Nordic countries, makes this region a leader in the Blue Farming area.

Norway is the world pioneer in aquaculture. There is a growing discussion about seaweed cultivation in this context. The industrial macroalgae cultivation provides possibilities for production of biomass which may be used as the basis for many products and which may contribute to improving Norway's self-sufficiency in the production of food or bio-energy. Norwegian Seaweed Technology Centre is a knowledge platform for the development of technology in the industrial cultivation, sourcing, processing and using seaweed in Norway. Seaweed Energy Solutions (SES), in turn, is a Norwegian company cultivating seaweed. It has patented the first system in the world which allows seaweed cultivation on an industrial scale (more in the case study below).

Blue Farming, using water as the resource, also highlights its important role in the area of energy generation. E.g. ocean waves absorb huge quantities of raw energy and today constitute one of the largest unused sources of renewable energy. Because of this, a Norwegian company Ocean Sun (more information in the case study below) successfully tested a floating solar installation in the sea near Bergen in Norway. The new technology will allow the development of solar energy generation in oceans, lakes and water reservoirs. Since 2 June 2017, Waves4Power (a company using the wave energy - more in the case study below) has been actively providing electricity into the Norwegian power grid.

Activities developed by the Scandinavian countries, focused on the protection of oceans and attention to the quality of waters indicate that in order to be effective, any actions must be systemic. This does not change the fact that the awareness of the value of water has been built by the Scandinavians also on the macroscale, by educating and supporting solutions which may be applied locally. In 2015, IKEA marketed a product under the name of KRYDDA / VÄXER, enabling each consumer to grow plants and herbs using the hydroponic system. In turn, in May 2018, the PU:REST project was launched in Sweden. A type of beer was created on the basis of water reclaimed from recycling. This project is a collaboration of the IVL Swedish Environmental Research Institute, New Carnegie Brewery and Carlsberg Sweden. The main objective of the project is to attract attention to sustainable water management and raising awareness of global water problems and the use of water as a resource.

Blue farming includes also an environmental factor. In order for resources in the form of oceans to be used, their ecosystem must be protected. 80% of waste drifting across oceans originates from land. The Finnish VTT Technical Research Centre has been conducting research on microbes which are to eat plastic, using it as a food source. The PlastBug project is to include a mobile container unit (placed on the coast or on a vessel) in which, thanks to microbes, plastics would be decomposed into valuable products, such as fuel. VTT expects to launch one pilot unit on the Baltic Sea in 2021.

[13] http://www.svensktvattenbruk.se/download/18.65ea4bd915019557221948d4/1443605006808/Swedishaquacultureagreenindustry_w.pdf

Seaweed Energy Solutions (SES)

The Norwegian company Seaweed Energy Solutions (SES) is the leader in seaweed cultivation. Already in 2010 it patented a structure under the name of Seaweed Carrier, and in 2014 SES set up its first farm - the largest seaweed farm in Norway. Seaweed Carrier is the first technology allowing the cultivation of seaweed on an industrial scale in larger and more extensive basins. The farm looks like giant mat on which seedlings are placed (produced throughout the year in a hatchery). The structure is attached to the mooring site and moves freely in the water following the tides. Seaweed cultivated this way may grow to up to 2 metres in 5-6 months.

OceanSun

The technology developed by the Norwegian company Ocean Sun allows the production of solar energy on the surface of water. Currently, there is no large-scale commercial solution for solar power at sea. The Ocean Sun technology is based on modified silica solar modules placed on special floating structures. The increased energy capacity is acquired thanks to the low temperature of cells achieved thanks to the direct transference of heat to water. This is the first such solution that would use water to generate energy.

Waves4Power

A Swedish company Waves4Power has developed a system which allows the innovative generation of energy in water basins. The heart of the system is the WaveEL 3.0 buoy - a an absorber in which wave energy is converted into electrical energy. The entire system is composed of a large number of buoys linked with one another, which makes it possible to generate energy in an optimised manner. The wave energy is the most concentrated form of renewable energy on Earth, with much greater density than wind energy or solar energy. Not to mention that it is much more predictable and consistent than wind or solar energy.

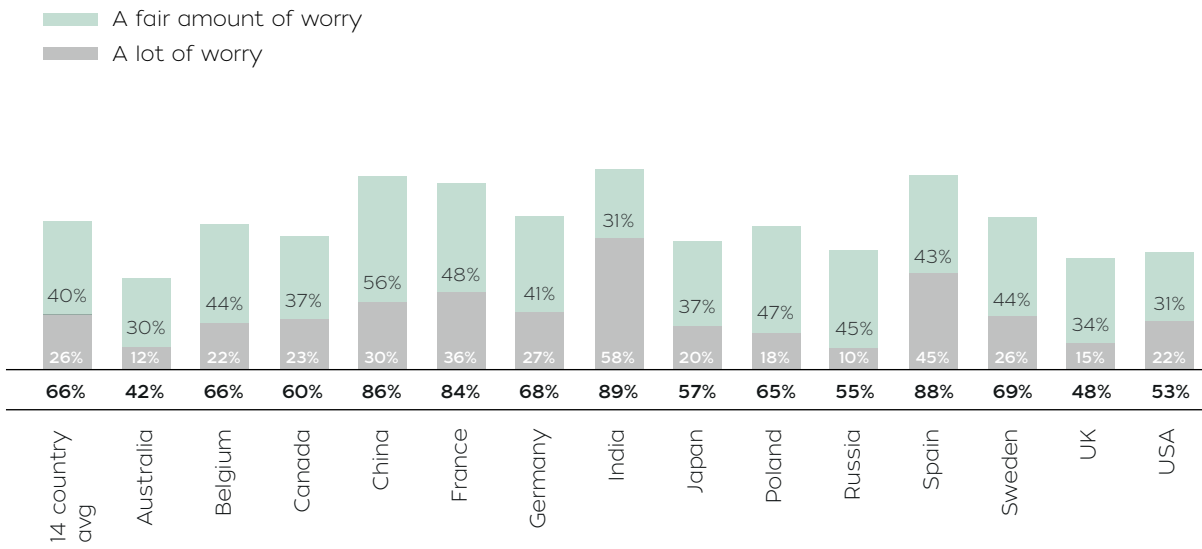
Does society understand climate change?

Climate change is a global problem and concerns everyone. To learn what people think about climate change and what they do to take climate action in their daily lives, IKEA carried out the „Climat action starts at home" study. Over 14,000 people from 14 various countries took part in it. The results obtained can become key pointers for companies, governments, decision makers or activists, on how to motivate society for greater activity.

Climat action starts at home

More than 8/10 respondents acknowledge that humans contribute to climate change, and 2/3 are worried about it. Countries in which the majority of people connect human activities with climate change are China (96%) and Spain (92%). Each community, region or country sees climate change differently and acts differently to prevent it. In order to determine the level of personal involvement in activities against climate change, IKEA has developed the Climate Change Behavior Index. According to that index, recycling and energy saving at home were the actions undertaken most frequently to counteract climate change. Recycling is particularly popular in European countries such as Germany, Belgium, France and where waste recycling infrastructure has been around for decades. Sorting garbage is a common practice in Poland, however, it is a rarer phenomenon in Russia and the USA. The second most frequently mentioned activity in each analyzed country was switching off the lights when leaving a room and using energy-saving light bulbs or devices such as refrigerators and

Level of worry about climate change, by country



How much do you worry about climat change: A lot, a fair amount, a little, or not at all?

Action on climate change, acrosss ten pillars

Each of the ten Action Pillars is an average score out of ten based on how often people take different actions; the higher the score, the more climate-friendly actions people are taking.

ovens. People rarely undertake activities such as avoiding food waste, using more ecological means of transport, a balanced diet, or buying second-hand items.

Polish consumers have one of the most positive results of the climate behavior index. They achieve better than average results in the field of recycling, repairing home equipment, buying second-hand items and using greener means of transport. However, food waste is a weak point in Poland - many people admit to throwing away a lot of food.

The need for support and education

The respondents declare that they are eager to undertake actions aimed at counteracting climate change - but they would do more if they knew exactly what to do, and if they had support and saw the benefits of such action.

There is a belief among the respondents that companies do not do too much when it comes to climate change, which stops people from taking action to protect the environment. The respondents often indicated that their own actions are fruitless when other people, both in their immediate community and globally, make no effort to counteract climate change. There was also a strong conviction among respondents that environmentally friendly behavior is expensive. The key to unlocking the activity of society is convincing it that the actions taken have a real impact on the environment and that they can bring real savings.

Together we can more

Almost 90% of respondents in fourteen countries say they would be willing to make the effort and change their habits. This number is the highest in China, where 98% of respondents are ready to take more action themselves, followed by Spain (95%), France (92%), Germany

and India (90%). Even in Australia and the USA, where the skepticism associated with climate change is quite high, more than three-quarters of people are ready to make changes in their behaviors (76% and 80% respectively).

The study shows that people need practical solutions that will save them money, help improve health and make everyday life easier, and at the same time be environmentally friendly. Examples of what other people, companies and governments are doing, as well as adequate support and infrastructure, would also help to create a belief in the meaningfulness of common actions. It is time for companies, in cooperation with various institutions, both public and private, to become role models in creating practical solutions to combat climate change.

With millions of customers and billions of visitors to IKEA stores and websites each year, we have a huge opportunity to inspire people and show them what it means to live a better and more sustainable life. We already offer products and solutions that enable customers to reduce their negative impact on the climate. For example, to support energy saving since 2015 we only sell LED lighting. In 2017, we sold 85 million LED bulbs worldwide. In our offer in Poland, Belgium, the Netherlands, Switzerland and United Kingdom, we have photovoltaic installations, thanks to which our individual customers can become more self-sufficient and produce their own renewable energy. By 2025, we plan to extend this offer to all 30 markets where we are present. We are also strongly involved in the circular economy, through a range of services such as furniture takeback and textile revival workshops.

You will find the full report here: https://globescan.com/ikea-climate-action-consumer-study/

Polish-Scandinavian circular potential

A Circular Economy (CE) is a fairly popular business model on the Scandinavian market which is dominated by advanced waste management systems. In Poland, CE is only starting to gain traction, but it has been already implemented in some interesting ways. Mutual Polish-Scandinavian inspirations can accelerate the pace of these positive changes and we talk about them with Lars Ibsen, Managing Director of Stena Recycling.

Circular Economy is becoming increasingly popular in Poland, which is reflected in changing business models. What has convinced Polish entrepreneurs to give it a try?

A linear model based on the 'Take it, use it, and throw it away' principle has resulted in generating huge quantities of waste with no reuse potential. The essence of the Circular Economy consists in closing the product life cycle which means e.g. that the waste is limited to the minimum and treated as raw material for further processing. The solutions we provided to SKF, a Swedish ball bearing factory, illustrate very well the potential of CE. Together with SKF, we improved the waste management system of the company, which allowed us to recover as much as 96% swarf generated by sanding. It is an important change, as the production in question uses a total of 400,000 tonnes of steel worldwide. The Circular Economy is also associated with environmental, business and social benefits. The European Union noted that it brings about such positive effects as reduction of greenhouse gas emissions by 2-4% per year, savings of EUR 600 billion for the European enterprises, reduction of the waste quantity, and 2 million more jobs within the EU territory. Another essential benefit consists in increased competitiveness - for example PLASTAL, a manufacturer of plastic components, was able to increase its recovery rate and production efficiency, and to train its employees on what to recycle, where and how. The company quickly felt the real benefits resulting from the change of its economic habits.

Is it true that if we want to create a sustainable society, do have to think in the long term about the products and what happens to them?

Already at the product design stage, entrepreneurs should select reusable materials. Most of all, one has to adjust the purchased products to the real demand and analyse the generated waste, which will facilitate optimisation of its management. Thinking about the future motivated Stena to establish in Halmstad the most modern recycling facility in Scandinavia - Stena Nordic Recycling Center. It is a huge production hall of the size of 80 football fields and it employs around 200 people. Combination of proven technology and innovation allows us to handle

95% recycling rates for scrapped cars, without having to send materials long distances for further processing.

Closing the cycle is not only about implementing new solutions, but also about sharing knowledge. How does Stena Recycling educate others in this regard?

On a global stage, we take part in such initiatives as the Volvo Ocean Race Sustainability Programme, where we research methods to decrease plastic pollution in our seas. In Poland, we are one of the initiators of the RECONOMY Coalition for the Circular Economy which brings together entities involved in promoting the idea of sustainable development and CE. In 2017, we began to organise an annual contest for companies and students called Stena Circular Economy Award (SCEA) - Leader of the Circular Economy, which functions as a platform for exchange of knowledge and good circular practices. In addition, we organise many meetings for companies during which we provide information about the optimisation of waste management systems in enterprises and possibilities of implementing the CE principles.

Do Polish enterprises have a chance to become CE-aware producers?

Polish enterprises have a lot of potential in terms of the Circular Economy, but they need to be encouraged to adjust their business attitudes to match the CE principles. It is worth emphasizing the environmental, economic and social benefits resulting from a circular economy business model. The most important are: waste minimization, greenhouse gas emissions reduction by 2-4% per year, protect from resource scarcity and price volatility, increased competitiveness of companies, 2 million more jobs in the European Union, 600 billion euros savings for European enterprises. These are concrete, real benefits follow the implementation of the Circular Economy solutions. Thanks to them, Polish companies have a chance to become a leader in their industry - stand out on the market and reduce operating costs while improving the quality of services provided.

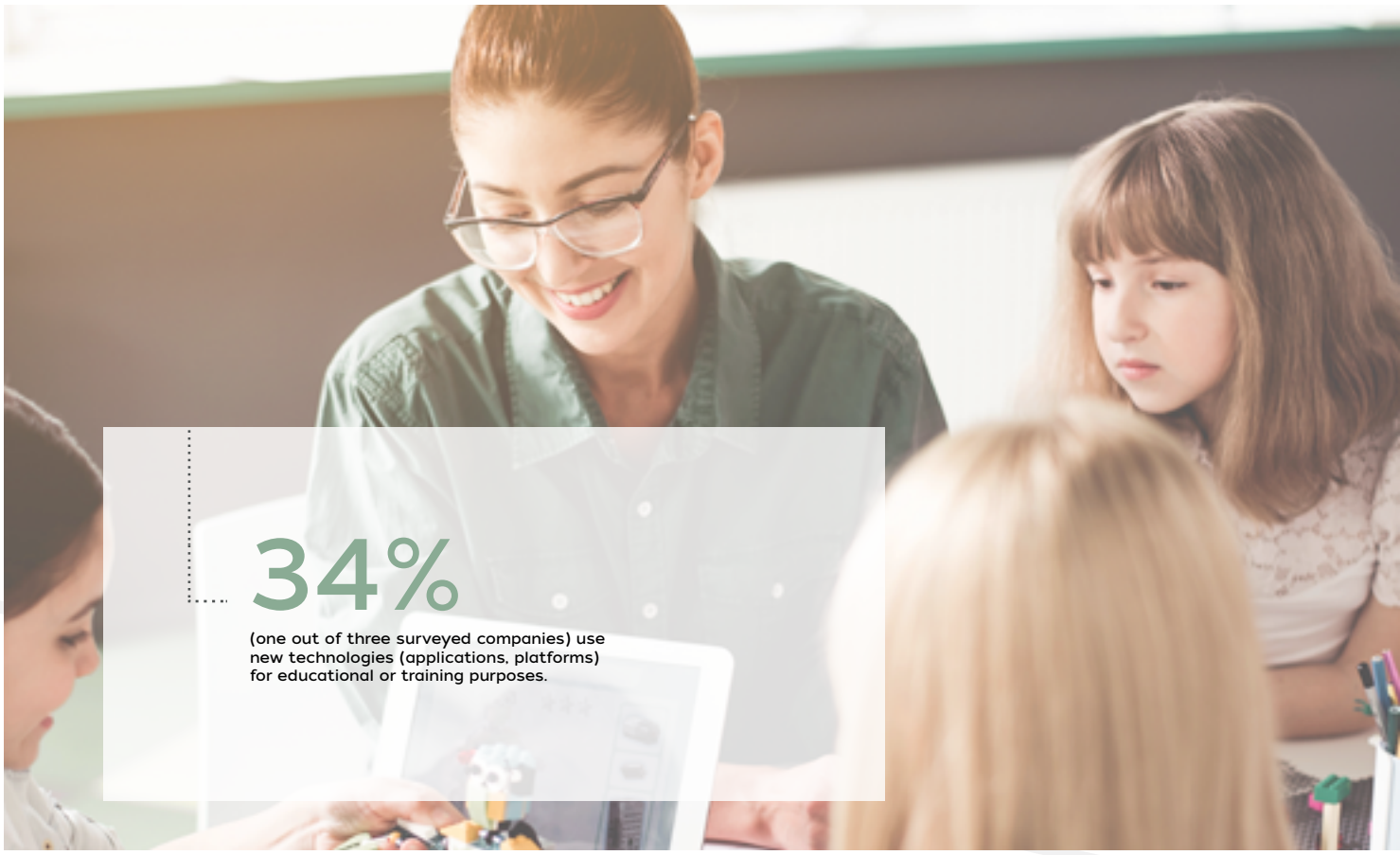
Society & work

EduTech

EduTech is a trend in which new technologies are used to build an inclusive model of education, based on interaction, creativity and broadening your horizons. For effective learning, EduTech uses among other things robots, AI, drones, 3D printing, continuing to expand the area connected with the broadly understood online education.

The education systems in the Nordic countries for years have been used as an example of modern education. The Scandinavian education is based to a large degree on teamwork and knowledge sharing. The standard approach to subjects and assessments has been given up in this model in favour of creative thinking and practical application (e.g. Hellerup Skole, one of Danish schools, uses half of its school year for learning through projects). The Scandinavian model is aimed more at "teaching of learning" and critical approach to knowledge than assimilation of knowledge a such.

Thanks to solutions favouring critical thinking and variety, EduTech enters not only schools and universities, but solutions in this area may be used practically in any place and at any time. New technologies, by becoming part of national curricula, on the one hand



[1] http://www.oecd.org/pisa/
[2] https://www.brighteyevc.com/single-post/2018/03/21/Part-I-The-coming-wave-of-Edtech-in-Europe

make it possible to develop skills of the future (e.g. from 2016, the teaching programme in Finland includes the learning of coding). On the other hand, they are the source of immersive experiences thanks to which the learning process becomes virtually invisible. The learning through play, teamwork and communication based on trust and equality make the assimilation and sharing of knowledge more effective. This is also confirmed by the data from the Programme for International Student Assessment of 2015. The ranking created by the Organisation for Economic Cooperation and Development, summarising pupils' achievements in maths, reading and natural sciences, invariably places the Scandinavian countries in the lead.[1]

Funds allocated to the development of the EduTech area point to the important role attached to education in the Nordic countries. In the years 2017-2018, investments in EduTech in Scandinavia amounted to: in Denmark – EUR 40 million, in Norway – EUR 14.5 million, in Sweden – EUR 18 million, in Finland – EUR 6.8 million (additionally, over the past four years, the greatest increase in investment has been noted).[2]

The ecosystem of clusters and accelerators operating in this area constitutes an extremely important factor which affects the development of EduTech in Scandinavia. And so, the Swedish Tech Industry's goal is to build a dynamic and stable ecosystem for stakeholders and players from the EduTech industry through gaining knowledge, understanding market trends and offering opportunities for initiating contacts, and the Education Finland cluster plays the role of a national international cooperation programme in the education area. The xEdu accelerator located in Helsinki offers assistance in testing EduTech solutions under real conditions. Nordic EdTech Forum (N8), in turn, is the hub for founders of businesses dealing with EduTech innovations, who have a significant impact on the education landscape in 8 countries of northern Europe: Iceland, Denmark, Norway, Sweden, Finland, Estonia, Latvia and Lithuania. The main objective of this informal organisation is to develop a platform for exchange of experiences and information, and to support its members.

Solutions from the EduTech area allow the development of creativity, social and emotional skills, or decision making. All these functions will be fulfilled, with inclusivity being simultaneously taken into account (Norway has adopted a goal to be a country allowing for needs of all social groups in its planning by 2025). At this year's Biennale in London, Norway's installation was devoted to nothing other than inclusive education. One of the examples of an EduTech solution based on inclusivity is Privatliv. It is an application addressed mainly to disabled people, with an aim to provide sexual education based on tolerance and trust. Thanks to the application, users learn about their bodies and emotions. The possibility of using the app on the phone, without the need to hold through conversations on a forum, builds the feeling of intimacy and opportunity for gaining knowledge at your own pace, without feeling rejected. Seppo, in turn, is a tool which helps teachers design teaching games for their pupils, and Mightifier application is a communication tool for children which enables them to socialise in a group, develop empathy and build the feeling of one's own worth. The application has been

[1] http://www.oecd.org/pisa/
[2] https://www.brighteyevc.com/single-post/2018/03/21/Part-I-The-coming-wave-of-Edtech-in-Europe

created in cooperation with Finnish teachers and pupils. Mightifier makes it possible for children to exchange positive feedback. They can show appreciation of their peers (of their kindness, curiosity, generosity, honesty). Book Bites is another application which, on the one hand, is a digital library, and on the other hand - a system motivating children to read frequently. Thanks to gamification, reading becomes an interesting, engrossing experience, and individual matching of the reading matter and ability to track progress and statistics, increase the motivation to learn.

Case Studies

Lexplore

Lexplore is a tool which allows the evaluation of the reading skills in children. It uses the eye-tracking technology and AI in order to diagnose the reading skills, and the related risk of dyslexia or the fluency level. A child is asked to read two short paragraphs (the level of difficulty is age-specific) which are displayed on the test screen. At the same time, the eye-tracking technology records eye movements (the data collected reflect cognitive processes in the brain). The data collected are sent to the platform (cloud-based) and are subject to an analysis thanks to the AI technology. Lexplore provides a sound recording and visualisation of the child's cognitive process (which shows on which elements the child held their eyes longer).

3D Bear

3D Bear is innovative software resembling a game, using new technologies (AR, VR and 3D printing). The work on the tool was based on four basic pillars: creativity, critical thinking, communication and cooperation. 3D Bear reinforces competences of the 21st century and constitutes a transfer between different areas of knowledge and skills. 3D Bear is a tool addressed mainly to teachers and pupils, but even five-year-olds that can already use the software.
Pupils using 3D Bear not only learn the functions and applications of such technologies as AR and 3D, but thanks to visual communication can share their thoughts, ideas and solutions via the Augmented Reality. 3D Bear teaches the basics of 3D modelling, AR, 3D printing and robotics. Pupils may for example recreate a historic scene (use of AR), design and print their own board game, build a drone or a robot (3D printing).

Labster

The Labster start-up has been developing its solutions in the EduTech area since 2012. The start-up has developed a platform which makes it possible to conduct laboratory classes in VR (virtual reality). By implementing virtual simulations, it wants to replace the traditional form of education. Labster launched its first simulation in 2013 and is currently offering the choice of over 70 laboratories in chemistry, physics, engineering and biology. The start-up has clients in over 150 institutions in more than 25 countries. Some of their partner universities are Stanford, Harvard or MIT.

Hub Ecosystem

A trend which points to innovation as a social process, requiring the exchange of experience and cooperation among different companies. In Nordic countries it is very apparent due to the existing growth platforms, hubs or accelerators.

The Hub Ecosystem trend requires the brands to be extremely open - to other industries, other cultures, other communities and their needs. Thus, solutions allowing networking and exchange of experience are created. Cooperation takes place at the international as well as local level - both at the level of cooperation between companies, and in the company itself, among employees. Additionally, what supports the Scandinavian innovation and startup culture are the good conditions for testing new ideas. A small market combined with openness and support significantly change the way the Scandinavian countries' economy functions. The Scandinavian innovation culture is driven more by the rule "don't be afraid and act", promoting trust-based cooperation models among startups.

Sweden is the leader among the most enterprising countries in Scandinavia. It is said to be the Silicon Valley of Europe and a hotspot for tech startups. In Stockholm itself, around 8,000 startups operate, employing nearly 52,000 employees. 5 of 10 fastest developing firms in Europe originate from Stockholm, and 18% of all employees are connected with the technology sector.[3] The global success of such brands as Spotify, Skype or Minecraft, and the general startup-friendly environment constitutes the result of a number of activities around the unique Swedish social and corporate infrastructure.

According to the report entitled "Intrapreneurship in Sweden: an international perspective", the three most enterprising countries in the world are Denmark, Sweden and Norway.[4] The phrase "intrapreneurship" used in the report means a work practice based on innovation, openness and cooperation. The work environment in Scandinavia is believed to be exactly that. Cooperation hubs, accelerators and platforms hold different functions here. Some of them make it easier for startups within a specific category to network and cooperate, some focus on gathering innovators from various fields within one space, for others the most important thing is to create online platforms for quick resolution of problems by connecting experts with beginner entrepreneurs. One of the examples includes Start Here Ventures which offers assistance to starting teams, delivering experts' support, valuable contacts, as well as financial investment. It is a consultancy firm supporting startups at a very early development stage. Copenhagen FinTech Lab operates in Denmark. It is a cooperation space dedicated to startups from a single category. It is a place to co-create and create new partnerships, thus combining the worlds of businesses and startups, driving innovations, bringing startups closer to financing and to develop new, influential fintech firms. In turn, Startup Hub is a place gathering over 60 Swedish startups. Located in the very centre of Stockholm, it has become the hub of Nordic technology and innovation.

Besides the culture of openness and exchange in the business area, an ecosystem supporting innovations is also created by the science sector and government administration units. At the University of Helsinki in Finland Helsinki Think Company has been launched, a joint initiative of the city and the university. It is a local innovation centre the purpose of which is to gather students, academic personnel and beginner entrepreneurs in order to accelerate the process of converting good ideas into commercial solutions. However, under the Nordic Co-operation programme, representatives of the governments of Denmark, Finland, Iceland, Norway, Sweden, Faroe Islands, Greenland and Aland Islands want to strengthen the entire region and build its leadership in the digital industry area. Thus, the Nordic region is to become the most integrated region in the world.

[3] http://blogs.studyinsweden.se/2018/03/04/sweden-a-hotspot-for-technology-startups/
[4] http://www.projectfires.eu/wp-content/uploads/2017/02/D5.4-Working-Paper.pdf

Nestholma Venture Accelerator

Nestholma helps startups prepare for cooperation with financial institutions. On the other hand, it explains the specific nature of startups to the institutions, building a unique cooperation environment based on openness and transfer of knowledge among different partners. So far, Nestholma has organised over 25 cooperation programmes between innovators and financial institutions. One of these programmes was Nordea Startup Accelerator, an intensive, three-month course the purpose of which was the development of startups and their cooperation with Nordea. Under the programme, two accelerators were launched, in Helsinki and in Stockholm.

The Hub

The Hub is a free social platform adapted to the startups' needs. Via this platform, startups may obtain assistance in the recruitment of talents, initiation of contacts with investors, and obtaining access to the best tools. The Hub also includes an event calendar in which both startups and participants may obtain a review of approaching events from the entire ecosystem. The Hub gathers two target groups around its activities, the first one comprises startups, the other one - persons linking their future with working in a startup.

Work Wellbeing

Work Wellbeing is a trend encompassing all solutions implemented inside an organisation in order to ensure work environment based on cooperation and wellbeing of employees. It may be interpreted both at the level of employee wellbeing and work-life balance.

For many years now the Nordic countries have been at the forefront of states in which the happiest people in the world live. This is undoubtedly influenced also by the work environment and activities undertaken in this area. Based on the data gathered in the Global Workforce Happiness Index, Denmark, Finland, Norway, and Sweden are countries which show the highest level of employee satisfaction with their current place of employment. The Better Life Index, in turn, places Denmark in the lead of countries with the highest work-life balance index. Full-time employees devote on average 16 hours (62%) of their time during the day to meetings with friends, development of their passions, and satisfying basic physiological needs - sleep, hunger). It is above the average amount of 15 hours.[5] In the Nordic countries, it is undoubtedly the **lagom** philosophy that affects the work-life balance. It assumes balance, avoiding extremes, and giving up work if a person is overworked. Scandinavians are the only people in the world that have a separate word meaning happiness at work. In the Danish language this word is "**arbejdsglaede**", where "**arbejde**" means work, and "**glœde**" - happiness, so "**arbejdsglœde**" can be translated verbatim as "work happily" or "work with happiness". Another Nordic country, Sweden, was the first European country to experiment with a six-hour working day (an average Scandinavian working week is among the shortest in the world).

[5] http://www.oecdbetterlifeindex.org/topics/work-life-balance/

The Nordic companies follow a rule that wellbeing at work includes both physical and mental state. According to the Swedish government agency Swedish Work Environment Authority (SWEA), the average drop in productivity of an employee who is experiencing problems at work is 38%.[6] Wellbeing is therefore becoming a kind of employee duty. Employers look for solutions which will result in increased productivity and wellbeing of employees, but at the same time require their commitment.

Every Friday, employees of Bjorn Borg leave their desks and go for a training session to the nearby gym together. The idea came from the Director General of the brand, Henrik Bungee, himself, who assured that the idea for exercising together does not only provide an injection of endorphins, but also the possibility of strengthening relationships between colleagues on the basis of the principles of equality and cooperation.

At Kinnarps - a Swedish company focused on providing solutions for workspaces that ensure the development and well-being of employees - we believe that the office should provide the freedom of way, place and time of work in accordance with psychophysical conditions of the users and the features of the task. In cooperation with our clients, we analyze work patterns in the company, so the proposed functional division of space as well as furnishing and arrangement of the office helps companies and organizations in gaining a market advantage by improving the communication, cooperation and image of the employer.

We observe that the existing offices are changing from traditional, individual workstations into a space for interaction and cooperation. Also, increasing engagement, taking up challenges and an innovative approach are not possible without greater autonomy of employees and without creating a culture of trust and a solid foundation of company values matching also the personal mindset of employees. For all interested in directions of the development of the work environment, we publish Kinnarps Trend Reports at https://www.kinnarps.pl/wiedza/ or https://www.kinnarps.com/knowledge/five-global-workplace-trends-to-discover/

Beata Osiecka
CEO Kinnarps Polska, Head of CEE Region

HeadActive

HeadActive is a Finnish consultancy company whose objective is to ensure wellbeing and increase productivity of work. Kari Matilainen, CEO of the company, calls himself HeadActivator. He is a psychologist of Finnish, American, Swedish and French work culture, and the method of operation and provision of services is based on positive and modern psychology, allowing for the results of the latest research and mentoring.

Howdy

Howdy is a management tool which ensures the optimum level of wellbeing in the workplace. Based on the WHO-5 scientific questionnaire, Howdy tracks the level of satisfaction with work. The user answers an average of five questions generated in the application once every two weeks; if the result shows a low level of satisfaction with work, they can be contacted by a person from the so-called "response team" (formed by professional psychologists) who resolve the problem in its preliminary phase. The application is available for Android, iOS and Windows Phone.

[6] http://www.cushmanwakefield.fi/userData/dtz/Nordic-Office-A-Preview-of-the-Future_Cushman-Wakefield.pdf

MindCare

MindCare is a trend which assumes the achievement of the so-called mental wellbeing in the society. Thus, it encompasses all activities connected with the broadly understood mental health category.

As a society, we are battling the epidemics of depression (around 300 million worldwide are affected by it), loneliness (affecting around 9 million Brits and more than 50% of Americans), Internet addiction (this problem affects around 6% of the world population) and technology. All this affects the pace of human life and, which follows, also mental condition.

In the last "World Happiness Report"[7] which tests the level of happiness in individual countries, Finns came first, and other Nordic countries (Norway, Denmark, Iceland and Sweden) were second, third, fourth and ninth. Despite this, these countries persist in supporting their residents grappling with mental disorders. According to the report "In the Shadow of Happiness" of 2018, developed in cooperation with the Happiness Research Institute (a think tank based in Copenhagen, researching the reasons behind happiness in the society), these disorders affect 12.3% of the population of Nordic countries (in the group of young people aged 18-23, this value increases to 13.5%).[8] The reasons for such disorders occurring among young people include the pressures connected with entering the labour market, and changes taking place in the social life - e.g. cyberbullying or excessive focus on appearance. In Finland, depressive disorders affect 5.6% of the society, in Denmark - 5%, in Norway - 4,7%, and in Sweden - 4.9%.[9]

The authorities in the Nordic countries realise that battling these types of problems translates

[7] https://s3.amazonaws.com/happiness-report/2018/WHR_web.pdf
[8] https://norden.diva-portal.org/smash/get/diva2:1236906/FULLTEXT02.pdf
[9] http://apps.who.int/iris/bitstream/handle/10665/254610/WHO-MSD-MER-2017.2-eng.pdf

into how their residents function (loneliness has a negative impact on processes taking place in the brain, the ability to cope with cognitive activities, or the ability to regulate stress), as well as their productivity and results at work, which in turn, in a broad perspective, affects the functioning of the state itself. The awareness of the problem (even the very fact that the "In the Shadow of Happiness" report has been published) and the development of solutions aimed at improving the status quo, constitute evidence that the focus on mental wellbeing in the Nordic countries is currently one of the priorities in the social dimension.

The launch of the world's first mental health ambulance in Stockholm constitutes an excellent example of how solutions of this type are implemented at the local government level. The ambulance crew includes a paramedic and two mental health nurses. The ambulance responds to around 130 phone calls per month, and in the first year of its operation, it was sent to 1254 cases.

The process of development of new solutions in the area of mental wellbeing does not remain indifferent to the development of new technologies or digitisation. Mental Health Hub is a platform offering a comprehensive range of mental health services, the access to which may be obtained via a single portal. Improving patients' access to information and treatment, the hub allows the treatment of disorders at their early stage in order to obtain better treatment results. It was set up 10 years ago and at the time constituted a response to the fragmented system of medical care for people with mental disorders. It was funded by HUS (The Hospital District of Helsinki and Uusimaa in Finland) and government funds. The total number of people using the platform in 2016 was 545,000 (around 10% of the country population). The Centre for Telepsychiatry is a facility in Denmark which, in order to improve the mental state of its patients, uses telemedicine technology and solutions.

Self-help and digital wellness applications on smartphones and tablets has had their boom in the Nordic countries. Platforms using the behavioural-cognitive therapy (such as Braive described in the case studies below) constitute an alternative in the fight against mood disorders, and specific solutions help reduce the use of antidepressants (the Flow Neuroscience case study described below). A Finish start-up, Meru, set up an online clinic which helps treat the feeling of burnout and depression. In turn, the interdisciplinary project Shim (conducted by a team of psychologists, researchers, writers and engineers) has led to the creation of a chatbot which uses artificial intelligence to detect linguistic patterns and key words in messages written by a user. On this basis, replies are generated which force the user to reflect on positive emotions.

Case Studies

Shim

Shim is a chatbot developed in Sweden. The system uses artificial intelligence to detect linguistic patterns and key words in the user's message. Next, it generates personalised text messages which help change the user's negative attitude to the given event/problem. The application is based on positive psychology assumptions in order to improve the user's mood through conversation. Shim may ask the user about their mood during the performance of an activity that the user likes, thus encouraging them to reflect over positive emotions. The pilot study published in 2017 showed that participants who talked to Shim showed higher levels of good moods and lower levels of stress in comparison with the control group (after using the application for two weeks).

Flow Neuroscience

A Swedish start-up, Flow Neuroscience, developed a device which becomes an alternative to antidepressants. The device (resembling a headphone set in appearance), using transcranial direct current electric stimulation, stimulates the patient's left frontal lobe in order to reduce the activity of disorders in people with depression. The aspect of mobility was extremely important for the creators of the device - each user may use the device in their own home.

Braive

A Norwegian start-up, Braive, has been developing courses constituting a solution to general challenges connected with mental health on the basis of the cognitive-behavioural therapy (CBT). The platform offers access to personalised courses and programmes in order to help users overcome the challenges they are facing. Programmes continue to be developed thanks to the ongoing research cooperation with the academic circles and the health sector. Users may use the programmes on a stand-alone basis or in combination with other treatment methods.

Five global workplace areas worth a closer look

The Times They Are A Changin'. The tech revolution has already changed the way we live and work - and more is to come. Future workplace design will look very different from today. In Kinnarps' second Trend Report we've identified five important trends that will have great impact on the way we work - and play.

OUR WORLD TODAY IS MASHED UP AND MULTIFACETED, WITH BORDERS AND BARRIERS BECOMING BLURRED AT ALL LEVELS.

Geography is no longer a factor - the issue is identifying talent, and keeping it, wherever found - no matter what age, gender or culture. This increasing openness and connectedness has created one vital focus area where we must concentrate our creative thinking: diversity. Understanding our minds and bodies is now a prerequisite for understanding and building a modern work life environment. So, what are the workplace design opportunities of the diverse decade? For this report, we were allowed to pick the brains of a specially selected group of inspiring minds representing architecture, design, tech and innovation. We identified five strong trends that will in many ways fundamentally change our work lives, each and every day, and discovered that smart design will be a key to creating workplaces and life spaces tailored for the diverse decade.

DIVERSE DESIGN

How can we design workplaces to meet the needs of the many?

Looking into the future, design equality and inclusive environments will be a matter of

course in all workplaces. We can see three major shifts taking place.

1. For the first time in history, we will have four generations working side by side, meaning that their different ways of thinking and acting must be taken into consideration when designing working environments.

2. The struggle for equality between women and men in our professional lives is entering a new phase. Questioning the existing design status quo from a gender perspective will be a driver for creating a truly inclusive workplace environment.

3. Everyone has a different way of thinking to find solutions and solve problems. A main difference is the one between the introvert and the extrovert personality, and the future workplace should cater to both.

These three main shifts, coupled with the more global workforce, create a true cultural melting pot. Together, they drive the demand for design that caters for all types of physical differences while underlining the need for inclusive design: design that considers the full range of human diversity with respect to ability, language, culture, gender, age and other forms of human difference.

OFFICE BIOLOGY

How to create a sustainable and ergonomic professional environment?

Health is wealth, they say. Today, our cognitive cogs, and the diversity between them, are being increasingly seen as equally important to our physical needs in the workplace. In order to build a strong employer brand for the future, companies have to offer work environments adapted to both our bodies and our minds.

By creating ergonomic workplaces that actively make users move around, like sit/stand desks and ergonomic FreeMotion-office chairs the risks for work related injuries are effectively reduced. What about the mind? How do we offer a mindful workplace when technology is evolving at a ferocious pace, turning the working situation upside down for most people? Research shows that boring offices that do not work are a downright health hazard and result in more days off work sick. Our surroundings have the greatest impact on our brains. In a mindful workplace where people are in focus, there is an understanding that soft values play a vital role when it comes to well-being and that design and psychology are interlinked.

The obvious solution is to putthe requirements and needs of the individual employee in focus, letting people choose their own combinations of interactions and environments at work. To avoid tech fatigue we could take lessons from a company like Google that has decided to introduce technology-free meetings where both laptops and mobiles are not allowed.

TECHITURE

How can we use analogue and digital architecture to create the new workplace?

The interaction between technology and architecture is called techiture, and is a main driver in the next great design shift.Digital solutions for more seamless ways of work are

already here, making those who seize these opportunities winners in the coming decade of diversity. The art of designing for workplaces adapted to human relevance, not hardware dominance, is key to the future employee environment.

Future corporate workspaces will look and operate in fundamentally different ways from how they have in the past. Internet of things, connectivity and big data are cutting us loose from geography making it possible to move freely. The traditional office is slowly disappearing and successful companies have to be open to accept many different workplace solutions. Suddenly all the rigid requirements for standardised computer cables, floor panels, lighting and air conditioning are gone. The working environments of the future are going to be characterised by workplaces customised with people in mind and not hardware. The goal is to create environments that are as interactive as possible. The workplace should not only be a place where employees sit passively, receiving hoards of information, but should be a place where you can build living environments that encourage debate and creativity. A high-tech lifestyle in an apparently relaxed environment.

CO-CREATION

How can we collaborate without borders?

How will tomorrow's companies work? The days of companies trying to hide their methods of production behind closed doors are a thing of the past. Instead companies and customers collaborate to drive the design process. The main issue for companies is to become transparent, to build trust and create

a design dialogue together with employees and collaborators around the world.

Collaborating and creating together – from anywhere, at any time, in small companies as well as large corporations – is becoming simpler and smoother, and these new possibilities are impacting the design of everything from small objects to work stations and whole buildings. This will also of course change and place entirely new demands on our workplaces.

Building a modern workplace is an extensive process for the entire company. To build a collaborative organisation you need to nurture a collaborative culture. There's no simple formula, the challenge we face is taking all facets of a company and tailoring spaces accordingly. Organisation, technology and leadership must play a part in the process. This also means that organisations will need to adjust and design their physical workplaces with multi-use spaces, project designated zones and up to date technology.

MICRO-MULTINATIONAL

Where has the workforce gone?

Borderlessness distinguishes the modern workforce, with people constantly moving from one place to another and the task at hand being accessible through the virtual cloud across continents and countries. This drives a change where the growth of independent workers – freelancers, the self-employed, consultants and contractors – reflects an entrepreneurial surge of start-ups and sole proprietorships. In search of supportive places to work beyond home offices and Internet cafés, this brings the emergence of a new category of workspace, and design will follow suit. The liquid work space manifests itself in for example the form of home offices, pop up-workplaces and co-working communities.

To effectively redesign the workplace one must rethink the way we live and work on a much broader level since this era of multi-micronational co-workers is changing the way our society is built. Society is in turn built on community, and those set on designing for co-working do best in focusing on community to attract the diversity that interdisciplinary collaboration requires.

This means that our view of the traditional workplace is changing. Why should we be satisfied with boring furnishings and grey metal filing cabinets just because we are at work? Instead our workplaces must be more and more like home to attract skilled employees, and offer freelancers and temporary workers the opportunity to blend into with company staff. People want their workplaces to offer the same comforts that they would have at home, regardless of whether it is having a place to store their things, allowing personal space or creating a sense of community.

More about Kinnarps Trend Reports and future of the workplace at https://www.kinnarps.com/knowledge

About the Institute

infuture hatalska foresight institute

The infuture hatalska foresight institute is a forecasting institute focused on identifying and describing key trends and showing what implications they might have for the economy, market categories, and specific brands. The Institute was established by Natalia Hatalska, one of the most influential and acknowledged experts on trend analysis, trend forecasting, and trend research in relations between the market, brands, technologies, and consumers.
The Institute monitors and analyses all the factors, particularly technological and social ones, which might trigger fundamental changes in individual categories.

- We help you to understand tomorrow and implement innovation today.
- workshops on trend adaptation and using trends
- in the company
- processes of seeking out and implementing
- innovations
- forecasting reports and trend analysis
- trend-hunting trips
- consultancy and strategy
- research

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The Scandinavian-Polish Chamber of Commerce (SPCC) is one of the biggest bilateral chambers in Poland. Currently, it has 416 members. SPCC is an association established by and for business people having links to Scandinavia or interest in this region. The main office is located in Warsaw and the Chamber is active in Poznań, Tricity, Kraków, Szczecin and Wrocław. SPCC offers its members a wide range of activities, such as networking business mixers, seminars, thematic branch committees, conferences and breakfast meetings with renowned personalities from the world of politics and economy. Membership in SPCC offers not only networking opportunities with an elite group of high-performing managers of Nordic companies, but is also a way of finding inspiration for everyone who would like to expand their own business.

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