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TELENOR



# Telenor - våre suksesse historier

Telenor Norge er et telekommunikasjonsselskap som utvikler og leverer mobile, fastnett og internettjenester til kunder og bedrifter. Telenors heleide norske mobiloperasjon er landets ledende teleoperatør. Telenors tjenestepordefølge i Norge inkluderer fast- og mobiltelefoni, bredbånd og datakommunikasjonstjenester for privat- og næringskunder, samt et bredt spekter av grossisttjenester.



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**NETWORK**  
**SIGVE BREKKE**  
PRESIDENT AND CEO  
TELENOR GROUP

Podcaster gjort i samarbeid med:



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## «The Perfect Storm»

In this episode of LØRN Silvija talks to Telenor Group CEO Sigve Brekke about how Telenor is working to connect their customers to who and what matters most. The corporate culture of Telenor, the competitive advantage and its strong focus on job satisfaction have set the company at great heights in Scandinavian and around the world. He joined Telenor as an advisor, and later became Manager for Business Development, where he was part of setting the strategy for growth in Asia. Since this he has been CEO of Dtac and Uninor. He has also been key in M&A activities and most recently entered the market in Myanmar.

## Om bedriften

Telenor Asa is a Norwegian majority state-owned multinational telecommunications company and is one of the world's largest mobile telecommunications companies with operations worldwide, but focused in Scandinavia and Asia. It has extensive broadband and TV distribution operations in four Nordic countries, and a 10-year-old research and business line for Machine-to-Machine technology. Telenor owns networks in 9 countries and is listed on the Oslo Stock Exchange and had a market capitalization in November 2015 of kr 225 billion, making it the third largest company listed on the OSE.

## Refleksjon

The exponential growth of computational power, data and network capacity have catapulted the digital revolution that started years ago. Is it moving too fast and could that pose a danger?

Tema

Perspektiv



Tema: NETWORK  
Gjest: Sigve Brekke  
Språk: ENGLISH  
Perspektiv: ENTERPRISE  
Innspilt: OSLO  
Vert: Silvija Seres

Du vil LØRNE om:

- Culture
- 5G
- Diversity
- Developing cities
- Gender balance
- Leadership
- «The perfect storm»

Anbefalt lesing:

- Telenor



“Three tech components: AI, IoT and 5G network will create what we call «the perfect storm». When these elements come together and everything and everyone is connected, we get huge amounts of data that can be put through powerful cloud computers and analyzed through AI. We will see that there are endless opportunities, but also significant threats coming out from that.

- Sigve Brekke

# Intervju

## How and why Telenor stands out as a global Technology provider:

In all markets and industries, there will be losers and winners. The telecom industry is by no means any exception. Among all the big companies that the technological revolution has fostered, it is now Telenor, from small Norway that has risen to the top as one of the leading companies. How did they achieve this? And most important of all, how will they go about maintaining and reinforce this position in the future?

Sigve doesn't think this success is something that happened by chance in recent years, he believes that it has been a result of a culture and a mindset that Telenor has had for years. Sigve says that ever since the start of the technological revolution, Norway and Scandinavia have emerged as market leaders. A number of groundbreaking technologies and solutions came from the Scandinavian markets in the beginning. Already 20 years ago, Telenor showed a unique ability to commercialize the new technology and optimize it according to the customer's needs and usage

pattern. Compared to a number of other companies, Sigve believes that Telenor is exceptionally good at sticking to its core business and vision: "Connecting you to what matter most, empowering societies".

No matter how the market changes, people and organizations will always have a strong desire and need to communicate with each other. Sigve therefore believes that Telenor's ability to always have this vision in focus, more than what technology they use or how large margins they can create, is what has led Telenor to where they are today.

Silvija points out that Telenor is by far not the only company that have access to this technology and who are seeing these trends, so is this really all? Therefore in conclusion, Sigve explains Telenors strongest card: From his experience around the world, he has realized the simple fact that people are people. They like to be seen, respected and taken seriously. If you can bring this culture along, you can really get ahead in the market. He therefore credits much of Telenor's success abroad to the Scandinavian leadership culture that Telenor

has brought with it out into the world. How the company has a strong focus on job satisfaction, an informal and diversified management culture and the strong will of the employees to be heard, and deliver the service the customer wants. This despite the fact that it can destroy the company's current core markets.



# KURS SPØRSMÅL

Hvilke 3 teknologier er det Sigve Brekke mener skal danne den “perfekte stormen” med endeløse muligheter?

- a) AI, IoT og 5G
- b) IoT, VRAR og 5G
- c) Bigdata, AI og 5G

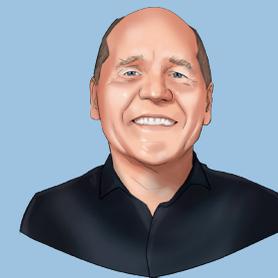
Hvor mange kunder hadde Telenor verden over per 2019?

- a) 128 millioner
- b) 178 millioner
- c) 188 millioner

Hvor stor er Telenor globalt?

- a) Telenor er et verdens tiende største leverandør av mobilt nettverk
- b) Telenor er det verdens femtiende leverandør av største mobilt nettverk
- c) Telenor er verdens største leverandør av mobilt nettverk

Podkast #0410



**NETWORK**  
**SIGVE BREKKE**  
PRESIDENT AND CEO  
TELENOR GROUP

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## RIKTIG SVAR

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AI, IoT og 5G

178 million

Telenor er et verdens tiende største leverandør av mobilt nettverk



**Scann og besøk bedriften**

<https://telenor.no/>



**NETWORK**  
**PATRICK WALDEMAR**  
VICE PRESIDENT  
TELENOR RESEARCH,  
TELENOR GROUP

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## 5G Digitizes Society

In this episode of #LØRN with Silvija, Technology Research Manager at Telenor Group, Patrick Waldemar, speaks about the new opportunities created by 5G networks such as providing solutions not only for smartphones, but also communication solutions for industrial purposes and the support it would provide for more sensors, more transmission capacity and better reliability when we need it. Patrick Waldemar joined Telenor in 2002 and is Vice President in Telenor Research. He has more than 15 years of management experience and education within Strategic Management, Strategic Marketing and Information Technology. He holds a Ph.D. in Telecommunication from NTNU and a Master of Management from Oslo Business School (BI). He has experience from research & development in telecommunications and the oil industry, software development and strategic management work. Over the last 8 years, Patrick has been head of Telenor's research on network technologies focusing on 5G.

## Om bedriften

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## Refleksjon

5G comes with this flexibility called network slicing; the ability to target a certain software solution. How will this function change your daily life on a personal level?

Tema

Perspektiv



Tema: NETWORK  
Gjest: Patrick Waldemar  
Språk: ENGLISH  
Perspektiv: ENTERPRISE  
Innspilt: OSLO  
Vert: Silvija Seres

Du vil LØRNE om:

- 5G
- IoT
- Sensor
- Digitalization

Anbefalt lesing:

- How 5G could change everything from music to medicine
- 5G-VINNI



**“** With 5G we are now able to handle more sensors, transfer more data, and have a higher reliability when we need it  
- Patrick Waldemar

# Intervju

## Who are you and how did you become interested in technology?

I am Research Manager at Telenor ASA and lead research in the next generation of technology with a focus on 5G and security. I became interested in the technology studies at NTH / NTNU and from the technology-oriented work I have had. Statoil R&D, FAST and Telenor.

## What is the most important thing you do at work?

The most important thing we do in the research part of Telenor is to stay up to date and try to understand the possibilities and limitations that come with new technology.

## What do you focus on in technology?

For the last 6-7 years, my focus has been on better understanding 5G both in terms of technology and how 5G will affect society. 5G will contribute to the digitalisation of society.

## Why is it exciting?

For me, 5G is exciting both because the technology itself is advanced and challenging to understand and because 5G offers society many new opportunities.

## What do you think are the most interesting controversies?

The extent to which mobile operators, alone or in combination with others, will be able to deliver 5G is for me an exciting topic and controversial in the sense that new players can become some future 5G solutions or deliver the 5G solutions without us mobile operators.

## Your own relevant projects last year?

The most relevant project is 5G-VINNI. The project will show that the performance requirements set for 5G can be met and demonstrate how 5G can deliver solutions to selected industries.

## Your other favorite examples of your type of technology internationally and nationally?

In 2018, we saw some 5G tests and small pilots. In 2019, we will see larger pilots in selected areas. For Telenor in Norway, we have a pilot in Kongsberg who

demonstrates broadband to the home and to companies, as well as communication that supports a self-driving bus.

## What do you think is relevant knowledge for the future?

In most future solutions, data handling will be an important component. Knowledge of storage, processing and analysis of data will therefore be relevant for the future.

## What do we do uniquely well in Norway from this?

In Norway, we work well both in 5G and in artificial intelligence. The unique thing in Norway is perhaps that we are good at collaborating and have a relatively high level of trust when we enter into a collaboration.

## A favorite future quote?

"If time travels is possible, where in the world are tourists from the future?" - S. Hawking

## Main points from our conversation?

5G contributes to the digitalisation of society and will reinforce the trend we already see with everything connected to the web and data being used for efficiency and smart solutions.



# KURS SPØRSMÅL

**What is the difference between 3G and 4G?**

a) 4G runs on four gigabytes, while 3G runs on three  
b) The difference is the speed at which they can download files from the internet. 3G is slow and has low capacity, 4G is faster.

c) There are almost no differences

**Patrick Waldemar has a masters and has taken a PhD in which field?**

a) Telecommunications  
b) Epidemiology  
c) Audiology

**Telenor has set up large scale facilities in Norway, UK, Spain, Greece and Germany, where they show that 5G is delivering as promised. What is Telenor's project called?**

a) 5G-Spin  
b) 5G-Win  
c) 5G-Vinni

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## RIKTIG SVAR

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The difference is the speed at which they can download files from the internet. 3G is slow and has low capacity, 4G is faster.

Telecommunications

5G-Vinni

Podkast #0411



**NETWORK**  
**PATRICK WALDEMAR**  
VICE PRESIDENT  
TELENOR RESEARCH,  
TELENOR GROUP



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**LØRNSOC**  
**OLA JO TANDRE**  
HEAD OF SOCIAL  
RESPONSIBILITY  
TELENOR GROUP

Podcaster gjort i samarbeid med:



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## Sustainability in Telenor

In this episode of #LØRN, Silvija talks to Head of Social Responsibility in Telenor Group, Ola Jo Tandre, about sustainability, diversity and tech. Technology can help the most vulnerable of us and give opportunities for a better life. Ola Jo Tandre from Telenor thinks our mobile phones is the best instrument to do exactly so. Ola has been the Head of Communications and Telenor Youth Forum guru since its inception in 2013. In this dialogue, he talks about exciting partners, such as Plan International and sights the birth registration project Telenor has with Unicef in Pakistan to help us understand further.

## Om bedriften

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## Refleksjon

The mobile phone and the mobile technology can positively influence every one of those 17 sustainability goals that the government has. But we know, for every new solution made, there will be new problems. Find one or two examples in the mobile industry where we both have technology that are solving one problem and at the same time are making a new one.

Tema

Perspektiv



Tema: LØRNSOC  
Gjest: Ola Jo Tandre  
Språk: ENGLISH  
Perspektiv: ENTERPRISE  
Innspilt: OSLO  
Vert: Silvija Seres

Du vil LØRNE om:

- Sustainability
- Technology
- Diversity
- Recruitment

Anbefalt lesing:

- <https://telenor.no/>



“Reports show that mobile technology can help achieve all 17 sustainability goals.”  
- Ola Jo Tandre



# Intervju

## How does sustainability work at Telenor?

For Telenor it's about being a responsible business throughout the supply chain. To make sure there's no child labour, that safety and health are looked after and preventing the countries they work in to not have an environmental impact. "You also have issues related to how technology is used and potentially abused by governments that are over-broad with surveillance or extracting data" Tandre tells. The company works hard on mitigating the negatives and to see the wonderful opportunities they have with mobile technology to improve the quality of people's lives.

"We got some exciting partners, such as Plan International and Unicef. They would know where the pressure points are in the countries we operate in and we can see how to apply the technology and perhaps help them address those issues" One of Telenor's project with Unicef is based in Pakistan. The country has for a long time struggled with birth registration. With a population of

190 million people, approximately 60 per cent of the population aren't registered. Pakistan has been doing work on addressing the situation, but it has been a troublesome path since they've been doing it in a traditional way. However, if you dig deep enough with technology you'll find solutions.

"We're trying to use technology through smart phones with an app that allows healthcare workers and marriage registration officers to do registrations out in the field. Even in a place without coverage, it'll be sent and the data will be processed" This is important because children who aren't registered are more vulnerable towards trafficking and child marriage, because they can't show a document with their age on. "They were able to register 30 per cent of the population before we started to use this technology, and now with our pilot project we have moved this number up to 90 per cent of the population. It's with good reason to think this is the right way of doing birth registrations in the future" Tandre tells.

"It's making the system more effective and safer. It's a way of getting money out quickly". Seres calls it kickstarting a banking system for a non-banking country. Tandre tells the banks only saw a vast of the majority population as interesting customers, but once you have the mobile phones as the means of delivery, suddenly everybody becomes an interesting customer. "The mobile phone can help you overcome barriers because it connects you with the services you desperately rely on as a human being. The most essential things in our lives, the mobile phone can build a bridge towards" Tandre says.



# KURS SPØRSMÅL

**Approximately 60 percent of population in Pakistan are unregistered by birth. Pakistan has for a long time tried to register the problem. Telenor are now helping using an app to get people registered faster. During the pilot face of the app they were able to register...?**

- a) 40% more people
- b) 30% more people
- c) 60% more people

**What is Easypaisa?**

- a) A safe banking system for sending money in non-banks part of the society
- b) A banking system that makes it easier for businesses to send money to non-banks part of the society.
- c) A Mobile pay solution for big companies

**The United nations have 17 sustainability goals. How many of them can Telenor solve with technology and mobile services?**

- a) 10
- b) 15
- c) 17

Podkast #0412



**LØRNSOC**  
**OLA JO TANDRE**  
HEAD OF SOCIAL  
RESPONSIBILITY  
TELENOR GROUP

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## RIKTIG SVAR

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60% more people

A safe banking system for sending money in non-banks part of the society 17



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<https://telenor.no/>



**BIGDATA**  
**LIV ELISE SAUNE TØFTUM**  
HEAD OF ANALYTICS AND  
CUSTOMER LIFECYCLE  
MANAGEMENT  
TELENOR NORWAY

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## Democratization of data

In this episode of #LØRN, Silvija speaks to Head of Analytics and Customer Lifecycle Management at Telenor Norway, Liv Elise Saune Tøftum, about the value created from insight, data democratisation and automation. Liv points out how our patterns of behaviour define us and how we learn about people from their patterns. For Telenor Norway, the customer is at the center of everything it does and Liv believes being relevant to clients and being able to adapt products according to customer expectations is more important than ever. She studied at the Norwegian University of Science and Technology.

## Om bedriften

Telenor Norway is a telecommunications company that develops and delivers mobile, fixed line, and internet services to customers and businesses. Telenor's wholly owned Norwegian mobile operation is the country's leading telecommunications operator. Telenor's service portfolio in Norway includes fixed and mobile telephony, broadband and data communication services for residential and business customers, as well as a broad range of wholesale services.

## Refleksjon

Det brukes atferds-analytiske algoritmer til å forutse våre bevegelser som kunder. Er det spennende at vi utstråler mønstre som kan definere oss og brukes til noe, eller er det overtråkk?

Tema

Perspektiv



Tema:	BIGDATA
Gjest:	Liv Elise Saune Tøftum
Språk:	ENGLISH
Perspektiv:	ENTERPRISE
Innspilt:	OSLO
Vert:	Silvija Seres

Du vil LØRNE om:

- Regulation
- Customer life cycle
- Algorithms
- Pattern recognition
- Data lake

Anbefalt lesing:

- Talk with professionals in your own organization



**“** *The gold is in the data. The most important thing is that the insight here improves our ability to serve customers and run an efficient business.*  
- Liv Elise Saune Tøftum

# Intervju

## Hvem er du, og hvordan ble du interessert i teknologi?

Jeg har så lenge jeg kan huske hatt et ønske om å forstå hvordan ting henger sammen og fungerer. Matte og fysikk var favorittfagene mine, og da ble NTNU et opplagt valg for studier. Etter studiene jobbet jeg cirka ti år i Boston Consulting Group, før jeg begynte i Telenor.

## Hva er det viktigste dere gjør på jobben?

Vi har to oppgaver: Vi hjelper organisasjonen (Telenor Mobile) med data og innsikt slik at vi kan ta bedre beslutninger i alt vi gjør, og ta lærdom av de beslutningene vi har tatt, og vi bruker personalisert kommunikasjon til å hjelpe kundene våre å ta i bruk gode, trygge og riktige produkter og tjenester.

## Hva er du mest opptatt av innen teknologi?

Jeg er mest opptatt av at teknologien må henge sammen for å kunne ta ut effektene av både verktøy og data. I tillegg er det viktig å utnytte mulighetene innen automatisering og effektivisering.

## Hvorfor er det spennende?

Fordi vi hele tiden lærer nye ting og finner nye måter å løse problemer på, både for kundene våre og oss selv. På den måten skaper vi verdier for samfunnet og for Telenor.

## Hva synes du er de mest interessante motsetningene?

80 prosent av jobben ligger å få samlet og tilrettelagt data, mens 20 prosent ligger i selve analysen/ algoritmen. Gullet ligger i dataene, og her er også den største kompleksiteten og de største tekniske utfordringene.

## Dine egne relevante prosjekter siste året?

- Demokratisering av data – få data og innsikt ut til organisasjonen/ forretningen ved hjelp av selvbetjeningsverktøy
- Lansering av vår big data-plattform, Mjøsa
- Fått ferdigstilt plattformen vår for å håndtere kunde-enerter i sanntid

**Dine andre favoritteksempler på din type teknologi internasjonalt og nasjonalt?** De beste er de store digitale aktørene som Spotify, Netflix, Amazon, Google og Facebook, men vi har også gode eksempler fra Norge, som Tibber, Kolonial og Vipps.

## Hva tror du er relevant kunnskap for fremtiden?

Alt som går på data/analyse/ programmering. Jeg tror også at UX og «behavioral economics» kommer til å være etterspurt.

## Har du et favoritt-fremtidssitat?

Det ligger mye hverdagslykke i å finne glede i de små ting – både i livet og også i nybråttarbeid.

## Viktigste poeng fra samtalen vår?

Gullet ligger like ofte i det enkle som i det kompliserte. Å få samlet og visualisert dataene på en lett forståelig måte, samt få distribuert datatilgang ut til større deler av organisasjonen (demokratisering av data), gir ofte betydelig innsikt og grunnlag for gode beslutninger.



# KURS SPØRSMÅL

## Det er snakk om Telenor og Telenor Norge. Er det ikke akkurat det samme?

- a) Jo, det bare sies forskjellig for å stadfeste at det er lokasjonen i Norge det er snakk om, siden Telenor har stasjoner i utlandet
- b) Ja og nei. Telenor Norge er en avdeling i Norge for Telenor
- c) Ja og nei. Telenor Norge er Telenor i Norge – der det hele startet.

## Hvorfor ønsker Telenor å bruke Big Data mot sine kunder?

- a) For å bli kjent med kundene gjennom å forstå dem, snakke med dem og spørre hvordan man skal gå videre med i utvikling av nye produkter basert på hva som er viktig for kundene
- b) Effektiviserende og skaper forutsigbarhet i bedriftens prediksjoner
- c) Det er en lønnsom måte å innhente personlig informasjon om kundene som lagres i kundearkivet

## Hvilken innfallsvinkel benytter Telenor seg av, i arbeidet med å skape en automatisert og effektiv kundeservice?

- a) Det å tenke enkelt. Det er ikke de mest avanserte algoritmene som gir den beste innsikten for å kunne tilby best kundeopplevelse
- b) Gjennom finpussede algoritmer som måler enhver atferd, kan alle områder av kundesituasjoner forutsees og med det forhindres det at misnøye oppstår
- c) Med storsatsning på Chatbots effektiviseres køen for kundene. Chatbotene er maskinlært til å håndtere problematiske områder, uten behov for rådgivere



**BIGDATA**  
**LIV ELISE SAUNE**  
**TØFTUM**  
 HEAD OF ANALYTICS  
 AND CUSTOMER  
 LIFECYCLE  
 MANAGEMENT  
 TELENOR NORWAY



## RIKTIG SVAR

Ja og nei. Telenor Norge er Telenor i Norge – der det hele startet.

For å bli kjent med kundene gjennom å forstå dem, snakke med dem og spørre hvordan man skal gå videre med i utvikling av nye produkter basert på hva som er viktig for kundene

Det å tenke enkelt. Det er ikke de mest avanserte algoritmene som gir den beste innsikten for å kunne tilby best kundeopplevelse



**Scann og besøk bedriften**

<https://telenor.no/>



**AI**  
**ASTRID UNDHEIM**  
VP OF ANALYTICS & AI  
TELENOR ASA

Podcaster gjort i samarbeid med:



Lytt til podcast



## AI in Telenor

Silvija talks to VP Analytics & AI in Telenor ASA, Astrid Undheim, about how Telenor works with artificial intelligence in this episode of LØRN. They touch on the benefits of working with artificial intelligence from Norway and why is it important to distinguish between artificial intelligence as a technology and its use. She has a doctorate in artificial intelligence and heads Telenor's Artificial Intelligence Lab (Telenor-NTNU AI-Lab) at NTNU in Trondheim. There she is responsible for a staff of 13 researchers. Undheim believes Artificial intelligence has matured over the years having gained enormous access to data and processing capacity that enables them to build artificial intelligence models that are so large and complex that they can be used to solve important tasks. She believes that artificial intelligence today is about machine learning - training computers to understand connections in data. The areas that have become most mature are image recognition and text comprehension.

## Om bedriften

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## Refleksjon

The issue of trust, security and safety with artificial intelligence systems is hard to overlook. How ready is the world to deregulate it? And do we have the time to wait for the regulations of the solutions?

Tema

Perspektiv



Tema:	AI
Gjest:	Astrid Undheim
Språk:	ENGLISH
Perspektiv:	ENTERPRISE
Innspilt:	TRONDHEIM
Vert:	Silvija Seres

Du vil LØRNE om:

- Machine Learning
- DL
- AI
- Open AI lab

Anbefalt lesing:

- Orwell, George (1949). Nineteen Eighty-Four. A novel.



“ *In order to succeed with AI in Norway, it is important to get strong initiatives where we connect industry, data and problems, with competence development and research. I am always excited by what we can achieve when data, infrastructure, and suitable issues are in place.*

*- Astrid Undheim*



# Intervju

## Hvem er du, og hvordan ble du interessert i teknologi?

Kommer fra en på bondegård på Jæren og har studert IKT/ Kommunikasjonsteknologi ved NTNU (MSC og PhD). Har jobbet i Telenors forskningsavdeling siden 2009 og har helt fra jeg var liten elsket matte. Interessen for matematikk var inngangen min til teknologi, snarere enn at jeg hadde noen spesiell interesse for dupperingser og datamaskiner.

## Hva er det viktigste dere gjør på jobben?

Vi er opptatt av å ta kunstig intelligens/maskinlæring videre som forskningsfelt. Vi driver anvendt forskning på AI, men jobber også tett sammen med NTNU, NR og andre rundt metodeutvikling. Det som er morsomt med AI, er at det ofte er kort vei fra forskning til anvendelse.

## Hva er du mest opptatt av innen teknologi?

Jeg er opptatt av dataanalyse generelt, og maskinlæring spesielt – med fokus på dyp læring i kombinasjon med andre metoder. Den viktigste jobben min er å

sørge for at forskerne får friheten de trenger for at de skal få brukt kompetansen sin og vokser.

## Hvorfor er det spennende?

Jeg synes generelt at automatisering er spennende, og jeg er fasinert over hvordan man kan bruke data og maskinlæring til å gjøre ting mer effektivt og samtidig tilby kundene bedre tjenester.

## Hva synes du er de mest interessante motsetningene?

Det pågår nå en stor debatt rundt etikk og kunstig intelligens. Det er etter min mening en stor tabbe å prøve å regulere kunstig intelligens som teknologi. Det er bruken som bør reguleres og begrenses.

## Dine egne relevante prosjekter siste året?

Jeg er mest fornøyd med at vi har kommet godt i gang med å analysere data fra mobilnettverkene våre ved bruk av nye metoder og verktøy. I tillegg har vi fått på plass en IoT/AI-plattform som vi kan jobbe med sammen med NTNU i Open AI lab.

## Dine andre favoritteksempler på din type teknologi internasjonalt og nasjonalt?

Favoritteksempelen er DeepMinds gjennombrudd innenfor Deep reinforcement learning, til bruk for spill (blant annet sjakk), men også for å styre datasentrene til Google for å spare strøm.

## Hva tror du er relevant kunnskap for fremtiden?

Jeg er teknologioptimist og tror at fremtiden er teknologidrevet.

## Er det noe vi gjør her i Norge som er unikt?

Jeg synes at det vi har startet på Open AI-lab, er viktig for å kombinere forskning og næringslivsproblemer.

## Har du et favoritt-fremtidssitat?

Nikolai Astrup om Norsk AI-strategi: «Vi må gripe mulighetene, og håndtere utfordringene».

## Viktigste poeng fra samtalen vår?

For å lykkes med AI i Norge er det viktig å få til store satsninger der vi kobler næring (data og problemer) med kompetanseutvikling og forskning. Blir alltid positivt overrasket over hva man kan få til når data, infrastruktur og de gode problemstillingene er på plass.



# KURS SPØRSMÅL

## Hvordan bruker Telenor AI?

- a) Til kundeservice, nettverksdata og statistisk progresjon
- b) Til kundedata, statistisk progresjon og kundeservice
- c) Til nettverksdata, kundeservice og kundedata

## Telenor sikter inn på et fjerde hovedområde for sin AI-implementering. Hva slags bruk av AI går det ut på?

- a) IoT-produkter
- b) Automatisk oppfølging av kunder som har sagt opp abonnement
- c) From 20 pe Forutseende statistikk av kundedata for å gi et fem års perspektiv på bedriftens økonomiske statusr cent to 50 per cent

## Hvordan har Telenors tidlige satsning på AI hjulpet til dagens effektive utvikling?

- a) Tidlig rekruttering av AI-kunnskapsrike folk
- b) Generell interesse på området
- c) Flere arbeidsplasser har ført til økt rekruttering av nyutdannede med teknologisk kunnskap



**AI**  
**ASTRID UNDHEIM**  
 VP OF ANALYTICS & AI  
 TELENOR ASA

## RIKTIG SVAR

Til nettverksdata, kundeservice og kundedata

IoT-produkter

Tidlig rekruttering av AI-kunnskapsrike folk



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<https://telenor.no/>



**NETWORK**  
**CAMILLA AMUNDSEN**  
CMO FOR FIXED & TV  
TELENOR NORWAY

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## Modernization of Norway

In this episode of #LØRN, Silvija talks with CMO for Fixed & TV at Telenor Norway, Camilla Amundsen, about how they are modernising Norway?by using network technology to make life easier at home and at work. She explained that modernization is a necessary boost to ensure quality infrastructure, high-quality telephony and broadband services throughout the entire Norway. Camilla Amundsen (born 1976) comes from the position as head of Talkmore. She has led Talkmore for three years and the company has achieved significant growth and development during the period. Prior to this, she has several years of management experience from Lyse. She has a master's degree in industrial economics from NTNU.

### Om bedriften

Telenor Asa is a Norwegian majority state-owned multinational telecommunications company and is one of the world's largest mobile telecommunications companies with operations worldwide, but focused in Scandinavia and Asia. It has extensive broadband and TV distribution operations in four Nordic countries, and a 10-year-old research and business line for Machine-to-Machine technology. Telenor owns networks in 9 countries and is listed on the Oslo Stock Exchange and had a market capitalization in November 2015 of kr 225 billion, making it the third largest company listed on the OSE.

### Refleksjon

Business and technology advancements without adequate social infrastructure development could yield terrible results in the P&L. How do we ensure that both develop at an equal, continuous pace?

Tema

Perspektiv



Tema: NETWORK  
Gjest: Camilla Amundsen  
Språk: ENGLISH  
Perspektiv: ENTERPRISE  
Innspilt: OSLO  
Vert: Silvija Seres

Du vil LØRNE om:

- Copper
- Network
- Infrastructure
- Modernization of Norway

Anbefalt lesing:

- Bredbånd og telefoni for fremtiden  
Telenor – teknologiskifter i 160 år



**“** *Telenor's mobile network now covers more than 87 per cent of the total areal of Norway and it covers 99.7 per cent of where people in Norway live. Our mobile network is a much better network technology than the existing copper lines. In addition, we are rolling out more fiber now than ever before.*  
- Camilla Amundsen



# Intervju

## What are you doing in Telenor today?

We are in the process of modernizing Norway. The goal is for everyone to have access to high-speed internet within four years. The core of this work consists of the development and upgrade of the mobile network as well as significant roll-out of fiber. In the modernization, we will use solutions such as signal amplifiers, mobile and fiber development. In addition, we will cooperate with the municipalities to ensure coverage in particularly challenging areas. This will make it easier to live and work in the rural areas.

## What makes Telenor unique?

We are investing more than ever in high-speed internet connection throughout Norway and helping our customers to adopt better technology, either via fiber or 4G coverage. Customers who do not have an alternative to the copper line yet will have the copper line corrected if an error occurs. This applies to both those who have telephony and those who have broadband over the copper network. The modernization will

take place over several years, and we will notify all affected parties at least three months in advance.

## Why do you want to modernize?

The copper lines are an old technology that is both challenging and expensive to maintain. The lines are often fragile, it becomes more difficult to get parts, and there are unfortunately many errors on the old lines. The speed, stability and experience for copper is also too poor in relation to today's needs. The average speed for broadband on the copper network is 10 mbit / s, while Telenor's average speed on 4G is over 70 mbit / s.

## Does anyone fall outside?

Telenor has a total of just over 500,000 customers with services on the copper network, and of these, 280,000 customers have landlines. The average age of fixed telephony customers is 72 years. There may be some who do not want a mobile phone, and for these we offer a mobile home phone that looks like a regular landline.

Telenor's mobile network covers 87 per cent of the country's area and 99.7 per cent of where people live. Our mobile network is a far

better network technology than the copper lines. In addition, we are building more fiber than ever before. No one should be worried about being left without internet or telephony.

## What is the replacement for the copper lines?

Customers affected by the modernization will be offered a mobile-based home broadband with a data quota of 1 Terrabyte (1000 GB) per month. The average consumption of a customer who has broadband via copper is currently 200 GB. Less than 1 percent of our customers use over 1000 GB.



# KURS SPØRSMÅL

**Hvorfor er det viktig å oppdatere kobber-nettverket som har gitt oss bredbånd i mer enn 100 år?**

- a) Det er en gammel metode som ikke støtter opp dagens moderne digitaliserte samfunn
- b) Kobbernettverket har sviktet. Flere skader har oppstått gjennom årene. Billigere å oppgradere til et nytt nettverk fremfor å reparere kobbernettverket
- c) Dagens kunder er ikke fornøyd med leveringene av nettverk over kobber fordi overføringene er for trege fremfor hva ledninger i plastikk kan gjøre med hastigheten

**Hvor mange prosent av befolkede områder i Norge dekker Telenor sitt nettverk?**

- a) 0,8
- b) 0,87
- c) 997

**Med Telenor's digitale strategi skal de levere 100 megabites per sekund. Hvor mange prosent av befolkningen vil motta denne tjenesten innen 2020?**

- a) 0,82
- b) 0,2
- c) 0,9

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## RIKTIG SVAR

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Det er en gammel metode som ikke støtter opp dagens moderne digitaliserte samfunn

997

0,9

Podkast #0415



**NETWORK**  
**CAMILLA AMUNDSEN**  
CMO FOR FIXED & TV  
TELENOR NORWAY



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**NETWORK**  
**RUNE HARALD RÆKKEN**  
SENIOR RADIO ACCESS  
NETWORK EXPERT  
TELENOR GROUP

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## New standardizations for 5G

In this #LØRN episode, Silvija speaks with Senior Radio Access Network Expert in Telenor Group, Rune Harald Rækken, about how creating a set of new global standardizations for 5G will make sure that the new smart devices will be able to speak and work smarter together to change the global perspective of Norway's network technology with a peculiar experience. Rune was leader of F2F in the period 1997-2005, as well as deputy leader from 2009 to 2014. After this, he again held the leadership position until April 2017. He is currently a senior adviser in F2F.

## Om bedriften

Telenor Asa is a Norwegian majority state-owned multinational telecommunications company and is one of the world's largest mobile telecommunications companies with operations worldwide, but focused in Scandinavia and Asia. It has extensive broadband and TV distribution operations in four Nordic countries, and a 10-year-old research and business line for Machine-to-Machine technology. Telenor owns networks in 9 countries and is listed on the Oslo Stock Exchange and had a market capitalization in November 2015 of kr 225 billion, making it the third largest company listed on the OSE.

## Refleksjon

5G is going to play a big part of society in the future. Should only the developers know about the efficient usage of possibilities 5G brings on the table, or should we as consumers get involved to reduce the borders of knowledge between who's working with technology vs who's the daily user of it?

Tema

Perspektiv



Tema: NETWORK  
Gjest: Rune Harald Rækken  
Språk: ENGLISH  
Perspektiv: ENTERPRISE  
Innspilt: OSLO  
Vert: Silvija Seres

Du vil LØRNE om:

- IoT
- 5G
- Standardization
- Smart home

Anbefalt lesing:

- Dette er 5G
- Hva vet vi om 5G



“ We need new standards in order to expand the use cases. With the new network you will get a broadband with much higher speed. This means you can get more IoT devices connected to the network; you could get up to 1 million pr. square km. This is important because everything will be connected in the future.  
- Rune Harald Rækken



# Intervju

## Education and hobbies?

Master of Science in Engineering from NTH, volunteering (Foreningen 2 Foreldre, Hadeland Ride- og Kjøreklubb), walks in the woods and fields.

## Who are you and how did you become interested in technology?

Dad was a machine contractor, two older cousins got me interested in sound, stereo and electronics.

## What is the most important thing you do at work?

Identifies new opportunities for Telenor, sets the direction for technology development.

## What do you focus on in technology?

Mobile technology in general, radio, 5G, IoT.

## Why is it exciting?

New opportunities, new challenges.

## What do you think are the most interesting controversies?

How to influence the suppliers to a technology development we want

## Your own relevant projects last year?

5G standardization, IoT, advice and help to Buene to develop common architecture and common solutions, points of view.

## Your other favorite examples of your type of technology internationally and nationally?

Has been part of the development from GSM, 3G, 4G, now towards 5G. Fantastic development, great impact on society and how we live.

## What do you think is relevant knowledge for the future?

Learn to learn. Understand the development. Identify new opportunities. Communicate and sell the opportunities to those who make the decisions.

## What do we do uniquely well in Norway from this?

We have the world's best mobile network and live in an advanced mobile market. This gives us a good position for learning that can be replicated in other markets. We understand the technology quite well, but there is more uncertainty about future uses. We need to partner with other industries to open up the potential that IoT and 5G offer.

## A favorite future quote?

The future belongs to the good storytellers. Quote from «Ona Fyr», Ingebrigt Steen Jensen.

## Main points from our conversation?

We work with exciting technologies with a great potential to improve society, we just have to understand how we can make use of this.



# KURS SPØRSMÅL

## What is the basic idea of global standardization for 5G?

- a) That every device should speak the same language
- b) A standard is telling how the mobile terminals should communicate so you can connect terminals from all around the world
- c) To know how 5G works

## How many IOT devices per square km is the 5G network capable of connecting to the internet at the same time?

- a) 1 million
- b) 2 million
- c) 3 million

## Rune says that «fixed mobile broadband» is the most important use-case internationally. What is «fixed mobile broadband»?

- a) It's a broadband service that will fix any damages by itself using AI technology
- b) Fixed mobile broadband is a mobile broadband that only works in a fixed location
- c) It is the operation of wireless communication devices or systems used to connect two fixed locations

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## RIKTIG SVAR

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A standard is telling how the mobile terminals should communicate so you can connect terminals from all around the world

1 million

It is the operation of wireless communication devices or systems used to connect two fixed locations

Podkast #0416

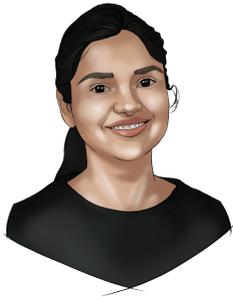


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**LØRNBIZ**  
**SWATI SHARMA**  
HEAD OF DIGITAL  
PRODUCT DEVELOPMENT  
TELENOR NORWAY

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## New Digital Products

In this episode of #LØRN, Silvija talks to Head of Digital Product Development in Telenor Norway's Services, Innovation and Projects unit, Swati Sharma, about how they explore new areas to develop digital products by looking at both the technology side and the user side. Swati heads a product group focusing on families in Telenor Norway and they work on developing new digital products for the Norwegian family. Swati hails from India and says her favourite thing about working at Telenor is 'being able to try new things without being afraid'.

## Om bedriften

Telenor Norway is a telecommunications company that develops and delivers mobile, fixed line, and internet services to customers and businesses. Telenor's wholly owned Norwegian mobile operation is the country's leading telecommunications operator. Telenor's service portfolio in Norway includes fixed and mobile telephony, broadband and data communication services for residential and business customers, as well as a broad range of wholesale services.

## Refleksjon

As the Head of Digital Product Development at Telenor Norway's Services, Innovation and Projects division, what problems would you like to see Swati focus on solving?

Tema

Perspektiv



Tema: LØRNBIZ  
Gjest: Swati Sharma  
Språk: ENGLISH  
Perspektiv: ENTERPRISE  
Innspilt: OSLO  
Vert: Silvija Seres

Du vil LØRNE om:

- «Min Familie»
- Voice assistants «Tia»
- Smart homes

Anbefalt lesing:

- Lean start up Innovator's dilemma



**“** *We are focusing on the consumer, which informs how we think about technology. We have a few different products which sets out to makes everyday life easier for families.*  
- Swati Sharma



# Intervju

## Who are you and how did you become interested in technology?

I am Swati and I head up a product group focusing on families in Telenor Norway. My interest in technology started early, when I was introduced to programming in school. And I later completed a bachelor's degree in Electronics and Communication.

## What is your role at work?

We work on developing new digital products for the Norwegian family.

## What are you focusing on in this area?

We focus on the consumer, which informs how we think about technology. We have a few different products, including Min Familie (meaning "My Family" in Norwegian) which makes everyday family life easier, and Min Fotball ("My Football") which is a collaboration with the Norwegian Football Federation (NFF) and has over 250,000 MAU (monthly active users). We are also developing a new product that provides voice assistance, called Tia, which is a bit special.

## Why is this exciting?

Tia is interesting because it's spearheading a completely new area, both from a technology and an end-user perspective. The next decade is expected to be the decade of voice assistants and this technology is evolving fast. Amazon, Apple and Google are all competing to be in your homes. However, it's still unclear what the use cases will look like. Tia is Telenor's answer to creating a voice ecosystem, which connects different Telenor and partner services to the voice assistants.

## What do you think are the most interesting controversies?

There are so many. The discussions in the US around breaking up giants like Amazon and Facebook are very interesting. So is the rising interest in user consent and data security. I believe data security will become a differentiator for products.

## Can you name any other good examples, nationally or internationally?

Nationally, Tibber. It gives the user the lowest-priced electricity at any given time. Internationally, we are now using AI and AR for things like talking to people who are no longer alive.

## What do you think is the most relevant knowledge for the future?

That's a bit broad. I think it's important to always remember that the user need comes first, and only then should we create the technology required to solve that need.

## Do you have a favorite quote?

*The Martian*: "You solve one problem... and you solve the next one... and then the next. And if you solve enough problems, you get to come home."



# KURS SPØRSMÅL

## What is Telenor biggest product?

- a) TIA
- b) Min familie
- c) Min Fotball

## What is "Min Familie"?

- a) It's a combination of many different apps like calendar, scheduling, shared shopping list etc.
- b) A family photo album
- c) An app

## What is «TIA»?

- a) A microphone
- b) A speaker
- c) A voice assistant

Podkast #0417



**LØRNBIZ**  
**SWATI SHARMA**  
HEAD OF DIGITAL  
PRODUCT  
DEVELOPMENT  
TELENOR NORWAY



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## RIKTIG SVAR

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Min familie

It's a combination of many different apps like calendar, scheduling, shared shopping list etc.

A voice assistant



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**NETWORK**  
**TERJE JENSEN**  
HEAD OF NETWORK  
ARCHITECTURE  
TELENOR GROUP

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# Architecture driving future business

In this episode of LØRN Silvija talks to Terje Jensen, Head of Network Architecture in Telenor Group, about global leadership and how architecture is driving future business. Telenor converts its technical trends and opportunities into tangible business plans hereby advancing Norway as a leading network tech nation. Dr. Terje holds a Senior Vice President position in Telenor. He is heading global network architecture and acting director for the 5G readiness strategic program. After more than 30 years in the telecom industry, he has been involved in several activities such as strategy, research, planning, operation and partnership management. He holds a PhD from The Norwegian University of Science and Technology and is involved in more than 200 publications.

## Om bedriften

Telenor Asa is a Norwegian majority state-owned multinational telecommunications company and is one of the world's largest mobile telecommunications companies with operations worldwide, but focused in Scandinavia and Asia. It has extensive broadband and TV distribution operations in four Nordic countries, and a 10-year-old research and business line for Machine-to-Machine technology. Telenor owns networks in 9 countries and is listed on the Oslo Stock Exchange and had a market capitalization in November 2015 of kr 225 billion, making it the third largest company listed on the OSE.

## Refleksjon

It is still questionable whether it is the responsibility of the public, individual, supplier og the operator when socially critical IoT does not work optimally. What do you mean?

Tema

Perspektiv



Tema: NETWORK  
Gjest: Terje Jensen  
Språk: ENGLISH  
Perspektiv: ENTERPRISE  
Innspilt: OSLO  
Vert: Silvija Seres

Du vil LØRNE om:

- Networks
- 5G
- Innovation
- History of
- Telenor
- Leadership

Anbefalt lesing:

- GSMA
- ETSI
- GSA
- ITU
- IETF



“*Though Norway isn't a big country, it's among the most digitalized societies in the world. Partly due to our demand for the latest technologies, combined with our ability and willingness to pay for it.*

- Terje Jensen



# Intervju

## Who are you and how did you become interested in technology?

I have been working for more than 3 decades in Telenor in various roles including testing, operation, strategy and research. Technology comes from the interest to create solutions that can be proven to work, which solves someone's problems.

## What is the most important thing you do at work?

As architects we bridge our business strategy into specific solutions and time lines for how we can achieve these ambitions, such as how to achieve the business growth, the efficiency improvements, the flexibility, etc.

## What do you focus on in technology?

We are looking after the main network areas such as base stations, fibre, IP routers, cloud, mobile core etc. These days, it is quite a lot of work related to introducing 5G and cloud platform.

## What do you think are the most interesting controversies?

Tradeoffs have to be made regarding balancing "future-proof", flexibility and simplicity versus the historic compatibility. Placing heavy weight on the latter commonly comes with added complexity.

## Your own relevant projects last year?

During the last year we have scaled up a global team with participants from all Telenor countries. This is then the global network architect team. They represent a change in our way of working, to re-use the best competency and drive for Telenor standards.

## Your other favourite examples of your type of technology internationally and nationally?

There are great initiatives from around the world, such as the recent launch of 5G in South Korea, now having more than 1 million users after 2 months.

## What do you think is relevant knowledge for the future?

As a company we have defined the ambition to deliver personalised service experiences as well as providing solutions that improves citizens' welfare. There is a

demand for several technical improvements such as analytics, real-time delivery, and so forth. Then, we have the more traditional disciplines such as traffic and capacity dimensioning and security that will steadily also be in demand.

## What do we do uniquely well in Norway from this?

Norway is among the leading technology societies. This has partly to do with our demand for the newest technologies, such as smartphones, but also the cost of living that asks for automation of several of the basic tasks in our society. Norway has a tradition for allowing individual thinkers and explorers who look into specific issues, to come up with technical solutions.

## A favourite future quote?

Louis Pasteur: "Chance favors the prepared mind"

## Main points from our conversation?

Translate the technical trends and business opportunities into action plans – start, learn and adapt.



# KURS SPØRSMÅL

**Which country was the first to launch 5G?**

- a) Norway
- b) China
- c) South Korea

**Are cables, radio, mobile networks, 2G, 3G, 4G all different kinds of networks?**

- a) Yes
- b) No
- c) They are the same

**What is the purpose of Telenor developing its own cloud service?**

- a) Clouds are a growing business with financial potential. Telnor has to adjust their services after the market or else they will loose their leading spot in the market
- b) Growing network traffic requires that 90% of data traffic having to go through clouds to manage the use of network amongst companies and private persons for futures stakes
- c) Telenor is going to collect personal data gathered from private persons motions to analyze and make better future services. Storing this information in their own cloud is the safest option according to GDPR.

Podkast #0418



**NETWORK**  
**TERJE JENSEN**  
HEAD OF NETWORK  
ARCHITECTURE  
TELENOR GROUP

## RIKTIG SVAR

South Korea

Yes

Growing network traffic requires that 90% of data traffic having to go through clouds to manage the use of network amongst companies and private persons for futures stakes



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**NETWORK**  
**RUZA SABANOVIC**  
GROUP CTO  
TELENOR GROUP

# Modernizing Telenor and society—technology as engine

Technology is globalizing now and in this episode of #LØRN Silvija talks to Group CTO at Telenor Group, Ruza Sabanovic, about how technology is changing the way we work and why culture begins with the customers. From a civil engineer's perspective, she believes that they are both the drivers and enablers of Telenor's modernization journey. On 12 October 2015, Ruza was appointed Chief Technology Officer for Telenor Group. She described this job at the time as a great honor, but at the same time, she recognized the great weight of responsibility which rested on her shoulders. Subsequently, on 2 March 2016, Ruza was appointed Telenor Group's EVP and Chief Technology Officer of Telenor Group.

## Om bedriften

Telenor Asa is a Norwegian majority state-owned multinational telecommunications company and is one of the world's largest mobile telecommunications companies with operations worldwide, but focused in Scandinavia and Asia. It has extensive broadband and TV distribution operations in four Nordic countries, and a 10-year-old research and business line for Machine-to-Machine technology. Telenor owns networks in 9 countries and is listed on the Oslo Stock Exchange and had a market capitalization in November 2015 of kr 225 billion, making it the third largest company listed on the OSE.

## Refleksjon

Why is it important for large, global companies like Telenor to elicit global agreements across borders when each country is unique in its requirements and use of telecommunications networks?

Tema



Perspektiv



Tema: NETWORK  
Gjest: Ruza Sabanovic  
Språk: ENGLISH  
Perspektiv: ENTERPRISE  
Innspilt: OSLO  
Vert: Silvija Seres

Du vil LØRNE om:

- Globalization
- Digitalization
- Private and public sector collaboration
- The power of understanding

Anbefalt lesing:

- "Who moved my cheese" by Spencer Johnson

Podcaster gjort i samarbeid med:



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**“** Everything starts and ends with technology. And the good thing is it never stops. It continues, and when you take action, you immediately get feedback from that action, good or bad. This direct feedback leaves you always striving for more.  
- Ruza Sabanovic



# Intervju

## Who are you and how did you become interested in technology?

I am Montenegrin and have lived, worked and studied in countries all over the world. I'm a civil engineer and teacher and have been living in Norway for seven years now. I have always aspired to build bridges – connect people physically and now through wireless communication to wherever they are. Most importantly, I am the proud aunt of my sister's two kids, Vanja and Anika.

## What is your role at work?

Collaboration, setting the direction, engaging with people, and being hands on in the key initiatives. I need to be encouraging and motivating, get the right capabilities in place and remove obstacles.

## What are the most important concepts in your technology/sub-branch?

We believe that we are both the driver and enabler of Telenor's modernization journey. We work with partners to drive innovation and efficiency through joint projects, procurement and

incorporating security in everything we do (security by design).

Developing and implementing new operating models that foster global collaboration and accountability is key.

## What do you think are the most interesting controversies?

Controversies are commonly related to 'how fast', 'how relevant', 'how much' and 'how we do it'. How much effort should we plan for and how fast should we change?

## What is your own favourite example of this technology?

We are currently modernizing our systems and deploying security by design and procurement. We own two strategic programmes – 5G readiness and technology enablers for digital technology – and we are contributing to others.

## Can you name any other good examples, nationally or internationally?

We are also preparing for 5G, introducing cloud, staying true to our API first policy and providing partner interfaces and collaboration. Guided by our customers, we are changing the way people work and the culture they work in.

## What do you think is the most relevant knowledge for the future?

For any engineer, it's important to put the solution into a business context and to explain how it solves customers' problems. We have to understand and drive value for our customers.

## Is there anything unique about what we do in this field here in Norway?

Exploring is in the Norwegian DNA – a unique Viking trait. Norway has a long history of exploring, constantly challenging the status quo, asking "Why is it like this?", and then testing the options and finding the solution.

## What do you think is the most important takeaway from our conversation?

Follow the principles of life, keep exploring and learning, believe in dreams and yourself, and never give up. Dare to challenge and take risks. In difficult times, stay the course. Own the dream and work hard!



# KURS SPØRSMÅL

**What technology does Ruza believe will be a real game-changer?**

- a) AI
- b) Big Data
- c) 5G

**When did Telenor shift the whole network infrastructure chain into the cloud?**

- a) 2010
- b) 2016
- c) 2005

**What major change is Telenor experiencing as the main provider for telecommunication?**

- a) That the world is becoming more global demanding 3G to expand and follow the customer of mobile subscriptions across borders, rather than 3G to follow the national borders
- b) That more people switch away from telecommunication. This demands Telenor to adapt its future service to be more analog in the future
- c) Industries and companies are merging due to digitalisation. Therefor Telenor must also evolve and expand its services to widen up the horizon of methods for telecommunication

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## RIKTIG SVAR

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5G

2016

Industries and companies are merging due to digitalisation. Therefor Telenor must also evolve and expand its services to widen up the horizon of methods for telecommunication

Podkast #0419



**NETWORK**  
**RUZA SABANOVIC**  
GROUP CTO  
TELENOR GROUP



**Scann og besøk bedriften**

<https://telenor.no/>



**NETWORK**  
**INGEBORG ØFSTHUS**  
CTO  
TELENOR NORWAY

Podcaster gjort i samarbeid med:



Lytt til podcast



## Going to the next “G”

In this episode of #LØRN, Silvija talks to Ingeborg Øfsthus, CTO at Telenor Norway, about how our lives and workplaces will be transformed in the digital age and the modernization of our network infrastructure within the next five years at least.

Ingeborg has held technology management positions in Telenor Operations in Germany, Thailand and Norway. In addition, she has worked in various Telenor Group positions including establishing and leading the Telenor Group CTO forum. She has been with Telenor since 1998. Ingeborg has experience from starting two greenfield mobile operations, and have built up extensive experience across both network and IT domain in her various roles. Ingeborg holds a Master of Science in Electronic Communications from Norwegian University of Science and Technology (NTNU).

## Om bedriften

Telenor Norway is a telecommunications company that develops and delivers mobile, fixed line, and internet services to customers and businesses. Telenor's wholly owned Norwegian mobile operation is the country's leading telecommunications operator. Telenor's service portfolio in Norway includes fixed and mobile telephony, broadband and data communication services for residential and business customers, as well as a broad range of wholesale services.

## Refleksjon

With the transition from 4G to 5G, Telenor's internal systems must also be modernised, and this must be completely flawless. What would happen if Norway were to experience a few seconds, minutes or even days without a mobile network?

Tema

Perspektiv



Tema: NETWORK  
Gjest: Ingeborg Øfsthus  
Språk: ENGLISH  
Perspektiv: ENTERPRISE  
Innspilt: OSLO  
Vert: Silvija Seres

Du vil LØRNE om:

- Network
- 5G
- Modernizing components

Anbefalt lesing:

- Telenor



“4G is a great network technology that is able to great things. However, the volume of data that we now need to communicate is getting so big that we need to go to the next generation, the next “G”. That is 5G, and this will happen soon.  
- Ingeborg Øfsthus

# Intervju

## Who are you and how did you become interested in innovation or your technology?

I am Ingeborg Øfsthus, technology director at Telenor Norway. I ended up a bit by chance in the telecom technology, given that I graduated from NTNU (NTH at the time!) at the same time as the telecom monopoly in Norway fell, and digital mobile technology (GSM) was being planned. Since then, I have remained in this industry since it is in rapid development and provides the opportunity for international cooperation.

## What is the main problem you are trying to solve at your job?

We work to offer the world's best telecom infrastructure to customers who expect the best - and this in a country with demanding geography and climate! As the need changes from day to day, this is a constant challenge.

## What is your main project now?

Now our main project is to modernize Telenor's infrastructure - expand the mobile network of the future (4G / 5G) and fiber, as well as build down copper-based

technology. We are modernizing not only Telenor, but Norway.

## Why is it exciting?

It is exciting because we not only have to think about new technology, but how this solves the customers' needs as well as how we build down old technology.

## What do you think are interesting dilemmas in your field?

In general, it is probably a dilemma in my industry that there are expectations and the use of the services is increasing sharply, without this necessarily being reflected in increased willingness to pay.

## Your other important projects in the last year?

We are modernizing both transport networks and mobile core networks, as well as a number of our service platforms.

## Who inspires you, internationally and nationally?

I am inspired every day by talented colleagues - both in Norway, but also in our sister companies abroad - most recently with a new "sister", DNA in Finland, which has already launched 5G.

## What do we do uniquely well in Norway, related to your field?

We build world-class mobile networks! We have built a common transport network for fixed and mobile that has shown the ability to handle a huge increase in traffic.

## What do you think is relevant knowledge for the future?

In addition to basic knowledge of communication technology, the ability to build networks that optimize and operate themselves using AI / machine learning.

## A favorite quote we can hook on you?

"It must work!"

## Main points from our conversation?

Norway is a world leader in how we modernize our infrastructure!



# KURS SPØRSMÅL

**What is the next «G»?**

- a) 4G
- b) 5G
- c) 6G

**How much is Telenor investing per year to make the network technology in Norway better?**

- a) 4,5 billion kr
- b) 2 billion kr
- c) 3 billion kr

**How does Salma use 5G?**

- a) They're using sensors and cameras to make sure that the fish is fed in the right way. They need the 5G network to transfer the video
- b) To watch the fish on live TV
- c) They don't use 5G

Podkast #0420



**NETWORK**  
**INGEBORG ØFSTHUS**  
CTO  
TELENOR NORWAY

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## RIKTIG SVAR

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5G

4,5 billion kr

They're using sensors and cameras to make sure the fish is fed in the right way. They need the 5G network to transfer the video



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<https://telenor.no/>



**AI**  
**JARLE MOSS HILDRUM**  
VP RESEARCH  
TELENOR

Podcaster gjort i samarbeid med:



Lytt til podcast



# AI and transformation of the workplace

In this episode of #LØRN Silvija speaks with VP Research in Telenor, Jarle Moss Hildrum. Jarle is originally a social scientist but became interested in technology when he was studying history and saw the transformational impact technology has had on the society. He has a Ph.D. in innovation studies and now works with the development of long-term knowledge that can help Telenor with making good decisions in the future. They do this with the help of machine learning, statistics and text mining applied to data about employees and customers. To name one example, they have developed a machine learning model which predicts voluntary resignations in Telenor. In the episode you can hear more about this example and what its controversies are, in addition to other examples of how Telenor utilize AI to transform their workplace.

## Om bedriften

Telenor Asa is a Norwegian majority state-owned multinational telecommunications company and is one of the world's largest mobile telecommunications companies with operations worldwide, but focused in Scandinavia and Asia. It has extensive broadband and TV distribution operations in four Nordic countries, and a 10-year-old research and business line for Machine-to-Machine technology. Telenor owns networks in 9 countries and is listed on the Oslo Stock Exchange and had a market capitalization in November 2015 of kr 225 billion, making it the third largest company listed on the OSE.

## Refleksjon

Do the advantages of artificial intelligence outweigh its challenges?

Tema

Perspektiv



Tema: AI  
Gjest: Jarle Moss Hildrum  
Språk: ENGLISH  
Perspektiv: ENTERPRISE  
Innspilt: OSLO  
Vert: Silvija Seres

Du vil LØRNE om:

- Innovation
- Diversity
- AI
- Machine learning models

Anbefalt lesing:

- Competing on Talent Analytics
- Richard Rosenow's blog on LinkedIn



“ AI og maskinlæring har et stort potensiale for å transformere arbeidsplasser på en positiv måte, men for at vi skal oppnå disse gode effektene må innføring av denne teknologien gjøres i dialog mellom utviklere, ansatte og ledere.  
- Jarle Moss Hildrum

# Intervju

## Hva er det viktigste dere gjør på jobben?

Vi jobber for langsiktig utvikling av kunnskap som kan hjelpe Telenor til å gjøre gode veivalg for fremtiden.

## Hva fokuserer du på innen teknologi?

Maskinlæring, statistikk og text mining anvendt på data om ansatte og kunder.

## Hvorfor er det spennende?

Fordi det gir store muligheter til å utvikle kunnskap som ledere kan benytte direkte i å forbedre arbeidsbetingelser for ansatte i selskapet, samt styrke prestasjoner.

## Hva synes du er de mest interessante kontroverser?

Etiske implikasjoner av økt bruk av AI i samfunnet. Vi kan se dette tydelig i prosjekter hvor vi bruker maskinlæring på ansattdata.

**Dine egne relevante prosjekter siste året?** Utviklet en maskinlæringsmodell som predikerer frivillige oppsigelser i Telenor og en maskinlæringsmodell som predikerer «dropouts»

i e-læringsprogrammer. I tillegg har jeg jobbet med en tekstanalysemodell som automatisk kategoriserer fritekst-tilbakemeldinger fra kunder på tema og sentiment.

## Dine andre favoritteksempler på din type teknologi internasjonalt og nasjonalt?

Recruitment robot hos Amazon, recruitment analytics hos Reitangruppen og retention analytics hos Experian.

## Hva tror du er relevant kunnskap for fremtiden?

Måter vi kan benytte maskinlæring til å forbedre arbeidsbetingelser og prestasjoner i organisasjoner uten å gå på akkord med ansattes personvern.

## Hva gjør vi unikt godt i Norge av dette?

Reitangruppen og Elkjøp har interessante eksempler på bruk av analytics og maskinlæring i rekruttering.

## Et favoritt fremtidssitat?

Livet kan bare forstås baklengs, men det må leves forlengs.

## Viktigste poeng fra vår samtale?

AI og maskinlæring har et stort potensiale for å transformere arbeidsplasser på en positiv måte, men for at vi skal oppnå disse gode effektene må innføring av denne teknologien gjøres i dialog mellom utviklere, ansatte og ledere.



# KURS SPØRSMÅL

## How did Jarle describe social scientist?

- a) Social scientists would know how individuals interact in groups in order to achieve certain objectives
- b) Social scientist would know how to teach groups of people how to live together
- c) Social scientist would know how to describe people in a group

## Where was Jarle working before moving to leaving to where he is working recently, at Telenor research? He was working at

- a) NTNU
- b) University of Oslo Stanford University
- c) University of Montenegro

## Why did Amazon actually scrap the recruitment robot? It was scrapped because

- a) It destroyed lab objects
- b) It was not fast
- c) It discriminated against women

Podkast #0421



**AI**  
**JARLE MOSS HILDRUM**  
VP RESEARCH  
TELENOR

## RIKTIG SVAR

Social scientists would know how individuals interact in groups in order to achieve certain objectives

University of Oslo Stanford University

It discriminated against women



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**BIGDATA**  
**JOHANNES BJELLAND**  
MOBILITY ANALYTICS  
TELENOR

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Lytt til podcast



## Big Data and 'Social Physics'

In this episode of #LØRN Silvija speaks with Senior Data Scientist in Telenor Research, Johannes Bjelland, about how Telenor use the data they collect as a network company, while staying within the frames of ethics and GDPR. Johannes explains how big data gives us tools to study human behavior on a large scale, and the several positive uses beyond more effective spamming on the internet. They also discuss what would come out from the intersection between social science and technology. Johannes has focused on developing and testing new methods to extract insight and value from vast amounts of Telecom customer data. This includes data mining, machine learning, social network analysis and setting up data driven marketing pilots. He strongly believes in data analysis as a tool for optimizing business decisions and understands human behavior.

### Om bedriften

Telenor Research is Telenor Group's corporate unit for scientific research. It plays a key role in providing insight and competence that enable Telenor to become a software and data-driven company. This unit conducts research within key areas, including customer insight, data analytics, machine learning, innovation, digital services, new technologies and market dynamics.

### Refleksjon

Ved å bruke informasjon fra SIM-kortene til turister kan man få innsikt i bruker-mønstrene til turistene, og dermed raskere vite nøyaktig hvor vi skal investere. Men hva kan være negativt med dette, og hvordan kan det gjøres på en måte som er lovlig?

Tema

Perspektiv



Tema:	BIGDATA
Gjest:	Johannes Bjelland
Språk:	ENGLISH
Perspektiv:	ENTERPRISE
Innspilt:	OSLO
Vert:	Silvija Seres

Du vil LØRNE om:

- Data science
- Collaboration
- Telenor
- Mobility analytics
- Lazer Lab
- Human mobility

Anbefalt lesing:

- Mapping poverty using mobile phone and satellite data  
Improving official statistics in emerging markets using machine learning and mobile phone data



“Big data gir oss  
verktøy til å studere  
menneskelig oppførsel i  
stor skala, og det finnes  
flere positive bruksområder  
utover mer effektiv  
spamming på internett.  
- Johannes Bjelland



# Intervju

## Hva er det viktigste dere gjør på jobben?

Vi finner nye muligheter å bruke våre data på. Jeg jobber med cutting edge teknologi, ofte i skjæringspunkt mellom social science og teknologi, matematikk og statistikk.

## Hva fokuserer du på innen teknologi?

Jeg fokuserer på å utvikle og teste nye bruksområder innen big data.

## Hva synes du er de mest interessante kontroverser?

Bruk av AI og big data i forskning vs. personvern.

## Dine egne relevante prosjekter siste året?

Big data metoder for å forstå sammenheng mellom kundens høyst subjektive rating av Telenors tjenestekvalitet og tekniske parametre, og telekom data for å måle bevegelsesmønstre i store folkemengder.

## Dine andre favoritteksempler på din type teknologi internasjonalt og nasjonalt?

Lazer Lab.

## Hva tror du er relevant kunnskap for fremtiden?

Jeg tror relevant kunnskap er python programmering og elementærkunnskaper i statistikk og maskinlæring.

## Et favoritt fremtidssitat?

If you do not change direction, you may end up where you are heading.

## Viktigste poeng fra vår samtale?

Big data gir oss verktøy til å studere menneskelig oppførsel i stor skala, og det finnes flere positive bruksområder utover mer effektiv spamming på internett.



# KURS SPØRSMÅL

**Telenor did an exciting project in Denmark, mentioned in the podcast.**

**What type of project was this?**

- a) Running out 5G on 100 Huawei phones for testing
- b) A pilot project using Big Data
- c) Phones charging on solar energy

**What can we learn by using big data?**

- a) We can reveal patterns and associations relating to human behaviour and interactions
- b) We can find creative solutions to a business problem
- c) Predict a definitive future

**We can now pull information from SIM cards to find out more about tourism in Norway. For what reason would this be valuable?**

- a) To find out where to invest
- b) To customise advertising
- c) Tracking for safety reasons

Podkast #0422



**BIGDATA**  
**JOHANNES BJELLAND**  
MOBILITY ANALYTICS  
TELENOR

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## RIKTIG SVAR

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A pilot project using Big Data

We can reveal patterns and associations relating to human behaviour and interactions

To find out where to invest



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# Lørn manifesto

Ingen bør kaste bort tid og penger på ferdigheter som snart er ubrukelige. Vi må lære relevante ting for den fremtiden vi skal inn i. En reklame spør: do you think it is about mindset or skillset? Svaret er: BOTH! Mindset uten skillset er ubrukelig; skillset uten mindset er rettningsløs.

Skillsa for fremtiden vil være en kombinasjon av teknologisk kunnskap og mot til å tenke selv. Vi må tørre å mene noe om hvordan denne fremtiden skal være, for å kunne ta aktive valg. Det er for enkelt å si at «vi bare lærer kidsa å kode». Det er alle som må lære og vi må lære mer enn koding. Vi trenger å lære kidsa og alle andre, DIGITAL SKAPERKRAFT. Vi må bli noe mer enn gode forbrukere av ny teknologi – vi må kunne skape den om. Og vi voksne må ikke tåle så inderlig lett den læringen som ikke gjelder oss selv.

Men hva er de nødvendige ferdigheter for fremtiden?

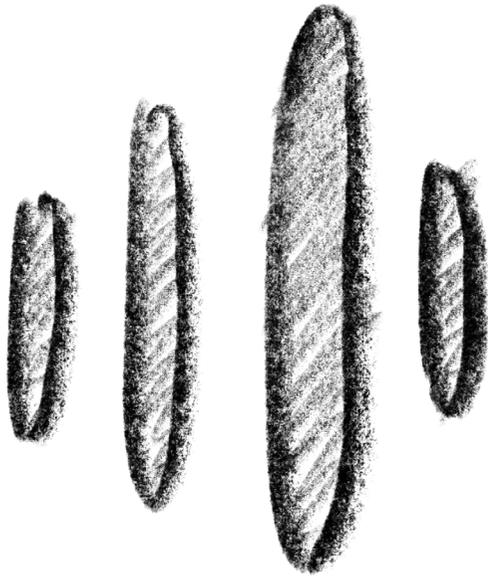
Direkte konkurranse mot roboter er en tapt kamp for mennesker. Robotar, automasjon og AI dreier seg om det maskinene er veldig gode på. Det er å kunne lese og finne mønstre i store data mengder, men det å tolke disse mønstrene på riktig måte, en måte som også er kulturelt og politisk forankret, som speiler den uhyre komplekse menneskelige psyken, det er bare mennesker som kan og bør gjøre. Bedre og billigere roboter vil kunne utføre de fleste av våre rutinemessige oppgaver som krever liten eller ingen kreativitet. Derimot oppgaver som krever fleksibel handling i uforutsigbare omgivelser, og som krever empati, vil mennesker alltid være flinkere til. AI passer godt for administrative og rutinemessige oppgaver. Mennesker er uovervinnelige på oppgavene som krever omsorg og omtanke. Uansett vil det være spennende og kreve mye ny kunnskap.

Claude Shannon, faren til Informasjonsteori, sa: «We know the past but cannot control it. We control the future but cannot know it».

Bli med og utforsk fremtiden, så vi kan sammen drive den i en god retning.

Gründer  
Silvija Seres





**Redaktør:** Silvija Seres

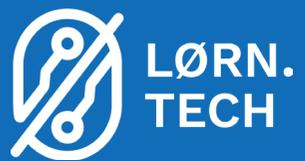
**Produksjon podkaster og webinarer:** Linda Hesselberg

**Produksjon bok:** Benjamin Solli

**Produksjon kurs:** Elisa Stenberg

**Administrasjon:** Andrijana Vukicevic

**Partner:** Telenor



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