

Automatiseringens effekter: Djøf



Endelig analyse | 26-10-2017

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1. Resumé, afgrænsning og metode

2. Analyse af automatiseringspotentiale og aktiviteter på tværs af jobs
3. Analyse af automatiseringspotentiale på tværs af baggrundsvariable



Resumé og afgrænsning

Resumé

- ~20% af arbejdstimer i Djøf relaterede jobs kan automatiseres ved hjælp af eksisterende teknologier – lavere end det danske gennemsnit på 43%
- Ansatte i Djøf relaterede jobs bruger ~70% af deres nuværende tid på opgaver, der er sværere at automatisere, hvilket driver automatiseringspotentialt
- Variationen i automatiserings potentialt er drevet af A) sammensætning af aktiviteter og B) automatiseringspotentialt for aktiviteterne
- Automatisering påvirker bredt på tværs af aldersgrupper, uddannelsesniveauer, region og virksomhedsstørrelse – men er ikke signifikante forskelle
 - De ældste ansatte bruger 6 procentpoint mere af deres tid på automatiserbare opgaver end de yngste
 - Ansatte i de mindste virksomheder bruger 4 procentpoint mere af deres tid på automatiserbare opgaver end ansatte i de største
 - Automatisering vil påvirke ansatte på tværs af uddannelsesniveau og region

Afgrænsning

Følgende dokument har til hensigt at analysere automatiseringspotentialt for en række jobs, der typisk bestrides af medlemmer af Djøf

- Djøf har identificeret 30 jobkategorier af særlig interesse, som udgør ~5% af den danske beskæftigelse
- Heraf er 4 jobkategorier (~5% af de identificerede jobs) blevet ekskluderet grundet datavaliditet

Analysen er således ikke begrænset til medlemmer af Djøf, men formodes at være repræsentativ for medlemmer af Djøf

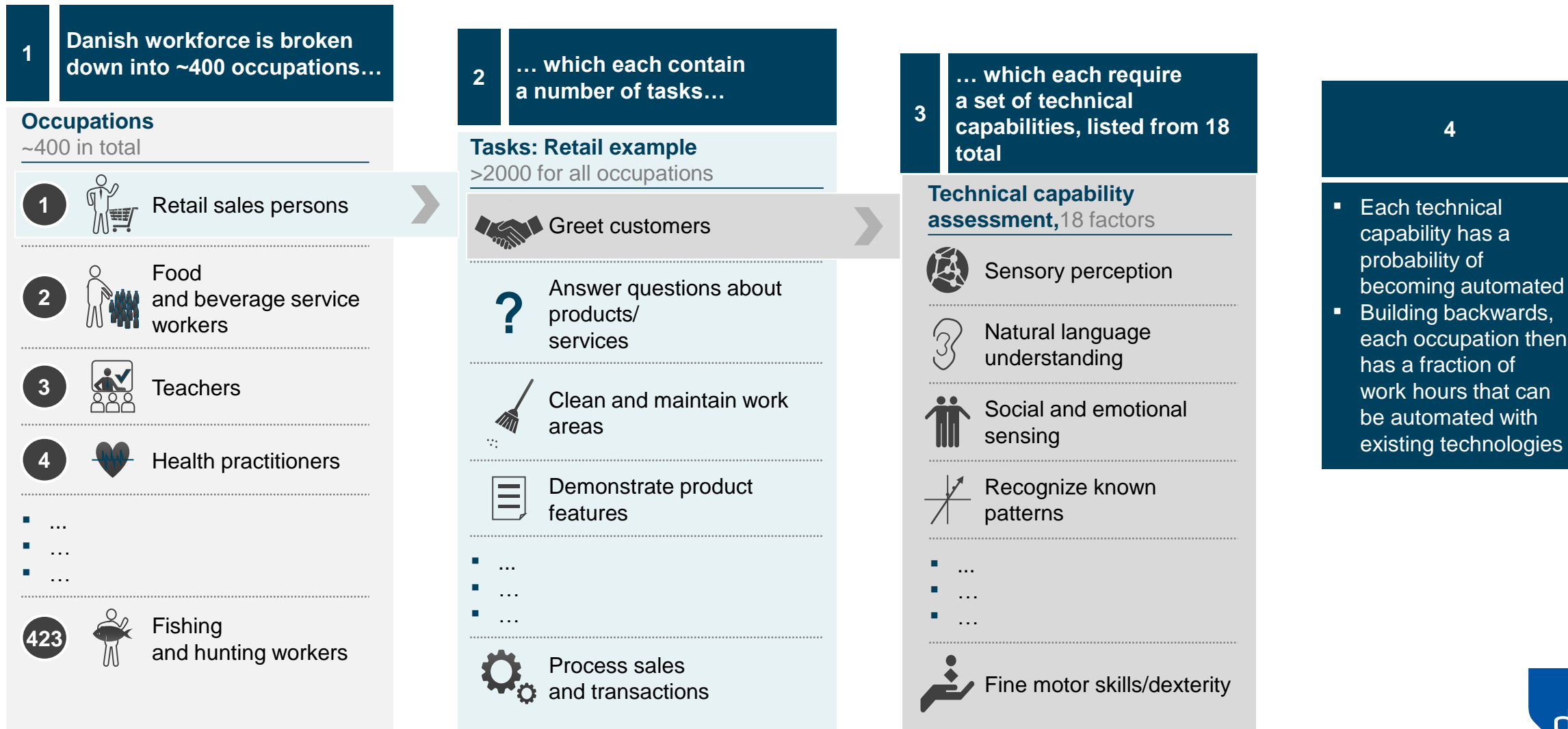
Analysen bygger på en grundig afdækning af sammenhængen mellem job, aktiviteter og kapabilitier samt eksisterende teknologis' evne til at udføre samme kapabiliteter¹

¹ 'A Future That Works: Automation, Employment And Productivity', McKinsey Global Institute (2017), 'A Future That Works: The Impact Of Automation In Denmark', McKinsey (2017)

Metodebeskrivelse

- Følgende analyse bygger på McKinseys vurdering af automatiseringspotentialer for ~400 forskellige jobs. Metoden er udviklet af McKinsey Global Institute (MGI) og beskrevet i rapporten "A Future That Works - Automation, Employment, and Productivity", januar 2017. Metoden består kort fortalt af tre dele:
- For det første har MGI analyseret på hvilket niveau, kendt teknologi kan udføre 18 fundamentale menneskelige færdigheder, fx kognitive evner (herunder mønstergenkendelse, kreativitet mv) eller fysiske evner (herunder fin- og grovmotorik). Analysen er baseret på akademiske forskningsresultater og interviews med førende eksperter indenfor de 18 felter.
- Herefter har MGI analyseret på hvilket niveau, hver af de 18 færdigheder indgår i ~2.000 forskellige arbejdsaktiviteter. Ved at koble denne analyse med kendt teknologis evne til at udføre samme færdigheder, kan man således vurdere, hvilke aktiviteter, der samlet kan udføres af kendt teknologi.
- Slutteligt har MGI brugt databaser fra Verdensbanken og US Bureau of Labor Statistics, til at analysere hvor meget tid der bruges på hver af ~2.000 arbejdsaktiviteter i hvert job. Baseret herpå, kan man således vurdere automatiseringspotentialer - andelen af arbejdstimerne i et givet job, der består af aktiviteter, som kan udføres af kendt teknologi.
- I denne analyse beskrives automatiseringspotentialer for ansatte i jobs, der typisk bestrides af medlemmer af Djøf. Analysen bygger på det 4-cifrede DISCO-hierarki, som Danmarks Statistik bruger til at kategorisere danske jobs. Baseret herpå, har Djøf vurderet hvilke stillingsbetegnelser, der typisk bestrides af personer med en videregående samfundsvidenskabelig uddannelse, og som derfor kan give et repræsentativt billede af automatiseringspotentialer for medlemmer af Djøf. Analysens præmis er således, at aktivitetsfordelingen for danske ansatte i disse jobs er sammenlignelig med amerikanske ansatte i samme jobs.
- Det er vigtigt at understrege, at automatiseringspotentialer ikke direkte kan omsættes til en endelig reduktion i antallet af ansatte. Udover at stort set alle jobs består af aktiviteter, der ikke kan automatiseres med kendt teknologi, er der en lang række forhold ud over automatisering, der påvirker efterspørgslen efter arbejdskraft. Særligt kan kendt teknologi også øge efterspørgslen efter teknologi-baseret arbejdskraft, såsom analytikere og softwareudviklere, ligesom teknologi-baserede produktivetsgevinster kan øge den samlede indkomst i samfundet og dermed den generelle efterspørgsel efter arbejdskraft. Begge forhold er bl.a. beskrevet i "Digitally-enabled automation and artificial intelligence: Shaping the future of work in Europe's digital front-runners", McKinsey, oktober 2017.

McKinsey's proprietary analytical framework assesses the potential for automation at the task and technical capability level



Current technologies within AI and robotics have achieved different levels of performance across 18 human capabilities

Rating ■ Low ■ Medium ■ High

	Human capability	Description (ability to ...)	Current tech. level ¹
Sensory	Sensory perception	Autonomously infer and integrate complex external perception using sensors	Medium
Cognitive capabilities	Recognizing known patterns/categories	Recognize simple/complex known patterns and categories other than sensory perception	High
	Generating novel patterns/categories	Create and recognize new patterns/categories (e.g., hypothesized categories)	Low
	Logical reasoning/problem solving	Solve problems in an organized way using contextual information and increasingly complex input variables other than optimization and planning	Low
	Optimization and planning	Optimize and plan for objective outcomes across various constraints	High
	Creativity	Create diverse and novel ideas, or novel combinations of ideas	Low
	Information retrieval	Search and retrieve information from a large scale of sources (breadth, depth, and degree of integration)	High
	Coordination with multiple agents	Interact with others, including humans, to coordinate group activity	Low
	Output articulation/presentation	Deliver outputs/visualizations across a variety of mediums other than natural language	Medium
	Natural language processing	Natural language generation	Deliver messages in natural language, including nuanced human interaction and some quasi language (e.g., gestures)
Natural language understanding		Comprehend language, including nuanced human interaction	Low
Social and emotional capabilities	Social and emotional sensing	Identify social and emotional state	Low
	Social and emotional reasoning	Accurately draw conclusions about social and emotional state, and determine appropriate response/action	Low
	Social and emotional output	Produce emotionally appropriate output (e.g., speech, body language)	Low
Physical capabilities	Fine motor skills/dexterity	Manipulate objects with dexterity and sensitivity	Medium
	Gross motor skills	Move objects with multidimensional motor skills	High
	Navigation	Autonomously navigate in various environments	High
	Mobility	Move within and across various environments and terrain	Low

¹ Assumes technical capabilities demonstrated in commercial products, R&D, and academic settings; compared against human performance.

SOURCE: Analysis based on "The Future of Work: The Impact of Automation in Denmark" by McKinsey & Company (2017)

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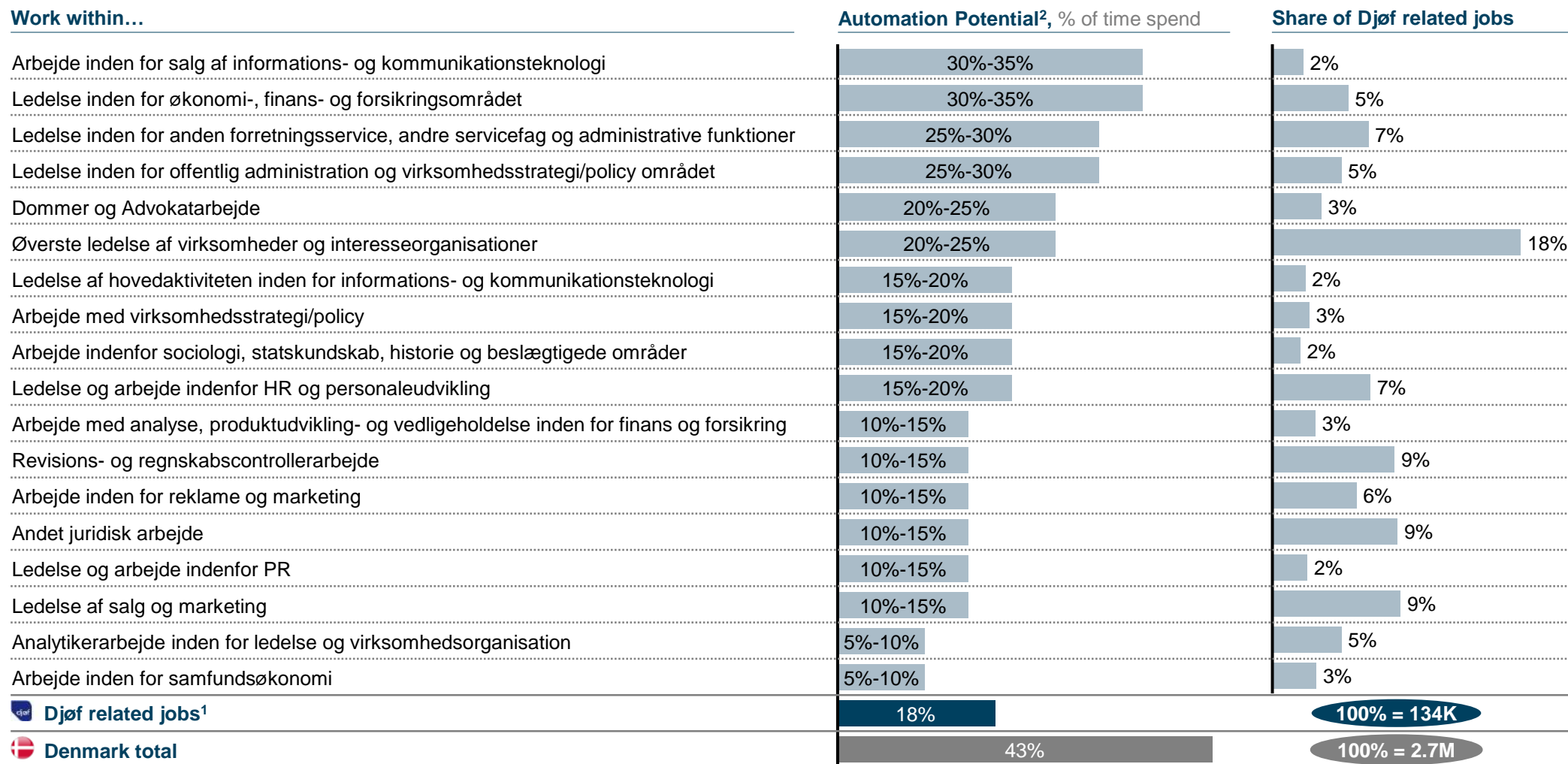
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Jobs related to Djøf have an automation potential of 18% overall, but variation exists between jobs



1 We have grouped the 26 occupations into 18 groups in order to ensure data validity

2 We define automation potential by the work activities that can be automated by adapting currently demonstrated technology

SOURCE: Statistics Denmark; Analysis based on "The Future of Work: The Impact of Automation in Denmark" by McKinsey & Company (2017)








Djøf related jobs spend almost twice as much time on the hard-to-automate activities, driving the relative low automation potential

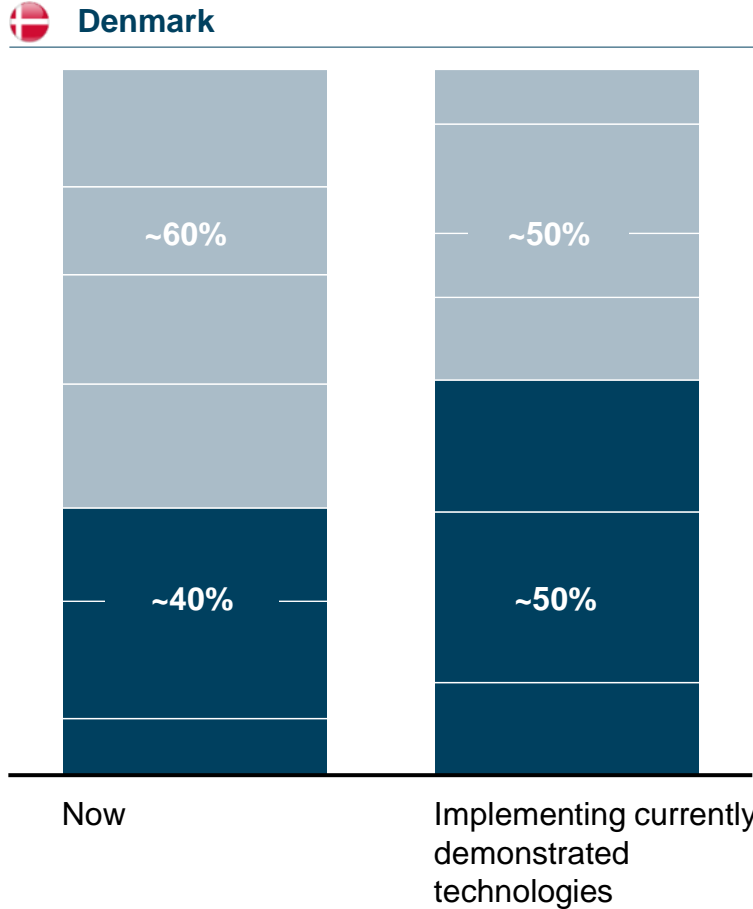
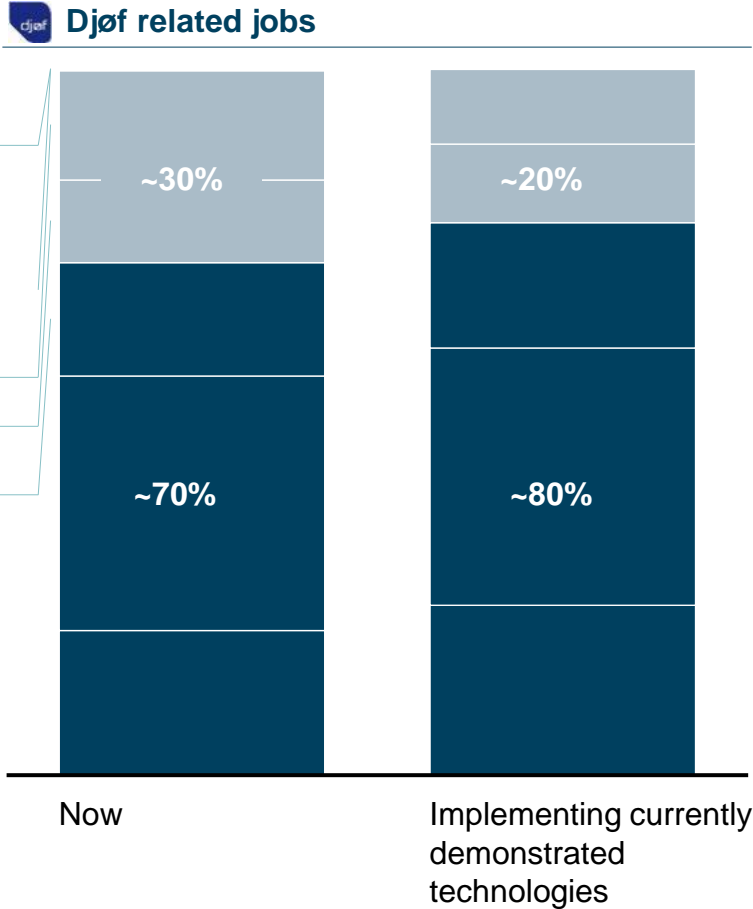
Change in activity composition from achieving automation potential¹

Fraction of working hours, percent

■ Activities with high automation potential
 ■ Activities with low automation potential

Activity types

-  Performing physical activities & operating machinery in predictable environments
-  Performing physical activities & operating machinery in unpredictable environments
-  Collecting data
-  Processing data
-  Interfacing with stakeholders
-  Applying expertise
-  Managing and developing people

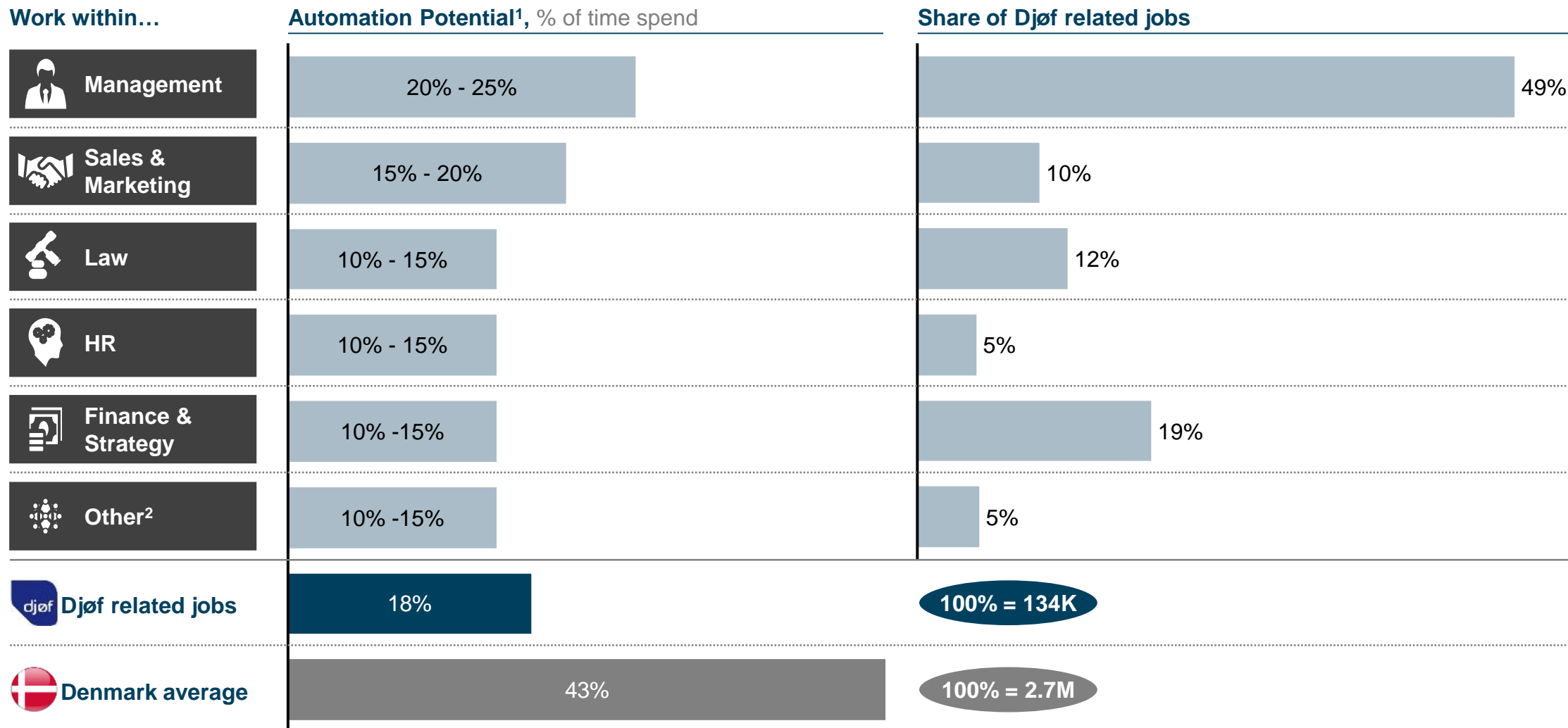


¹ Assuming the time freed up from automation will be evenly distributed among the remaining activities

SOURCE: Statistics Denmark; Analysis based on "The Future of Work: The Impact of Automation in Denmark" by McKinsey & Company (2017)



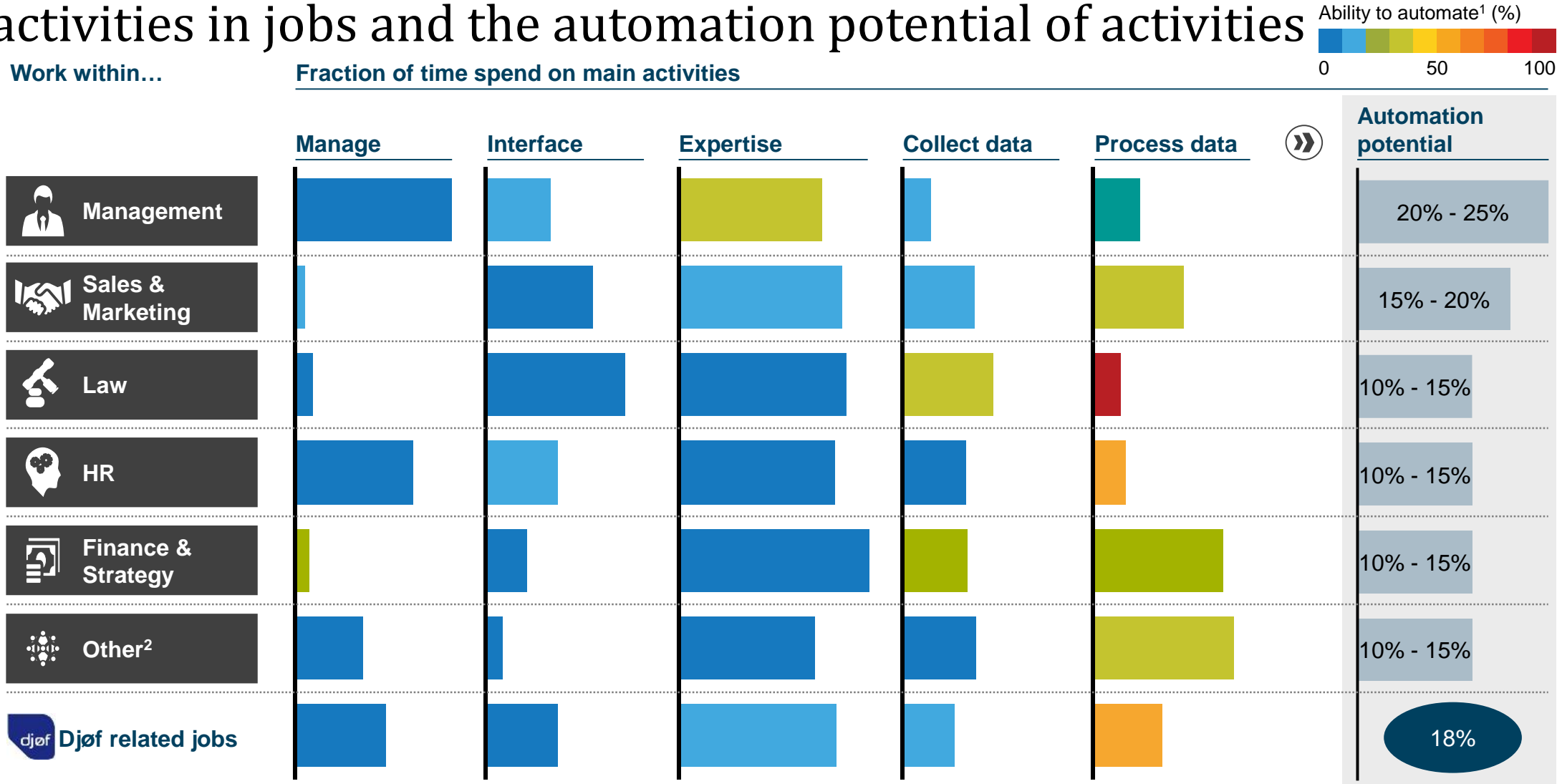
In jobs related to Djøf, managers have the highest share of working hours that can be automated



¹ We define automation potential by the work activities that can be automated by adapting currently demonstrated technology

² Includes jobs related to macroeconomics, sociology, anthropology, philosophy, history and political science

Variation in automation potential is driven by the composition of activities in jobs and the automation potential of activities



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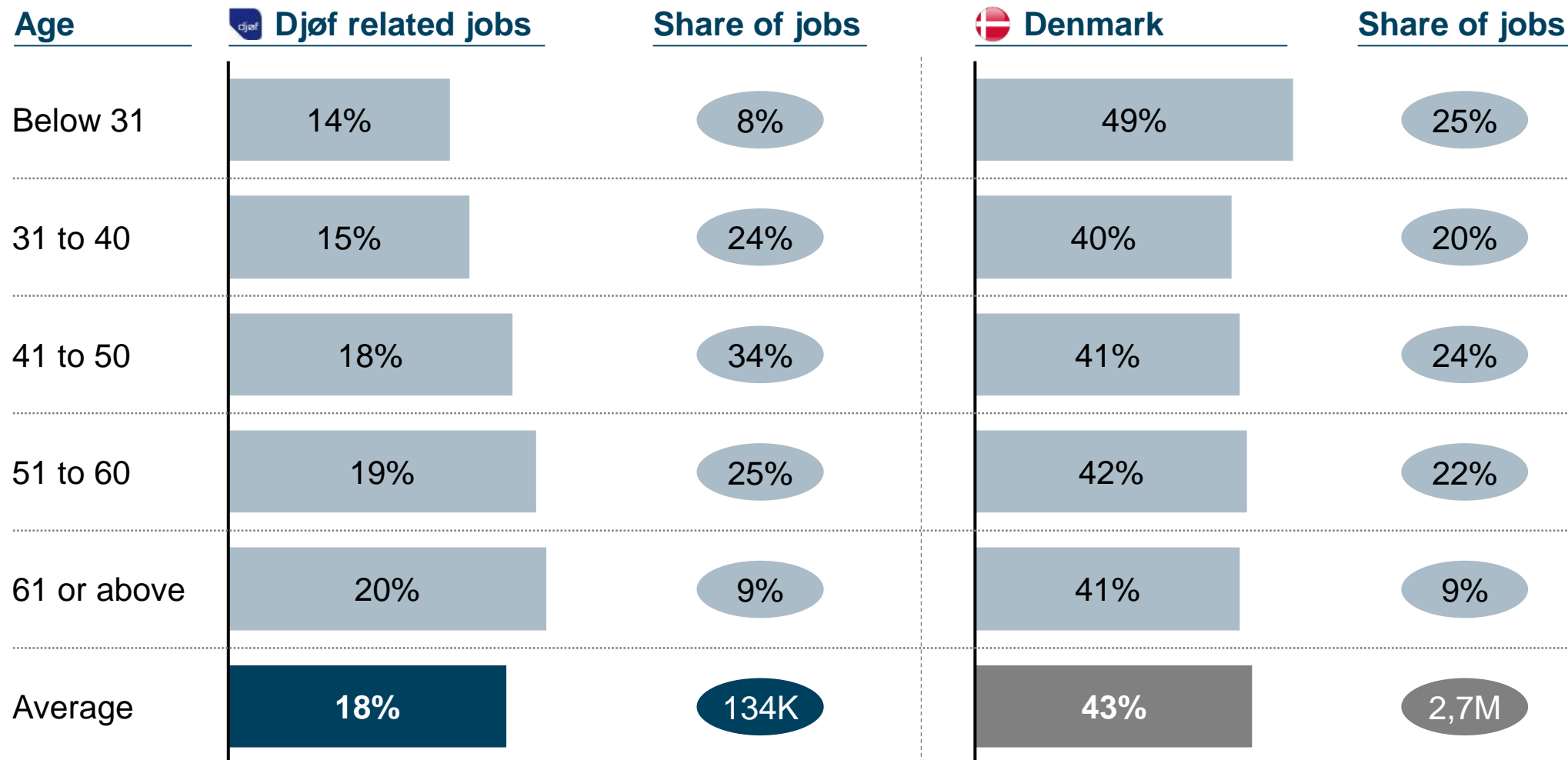


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Elderly in Djøf related jobs show a higher automation potential than young, opposite of the national average

Technical automation potential of work activities by age group²

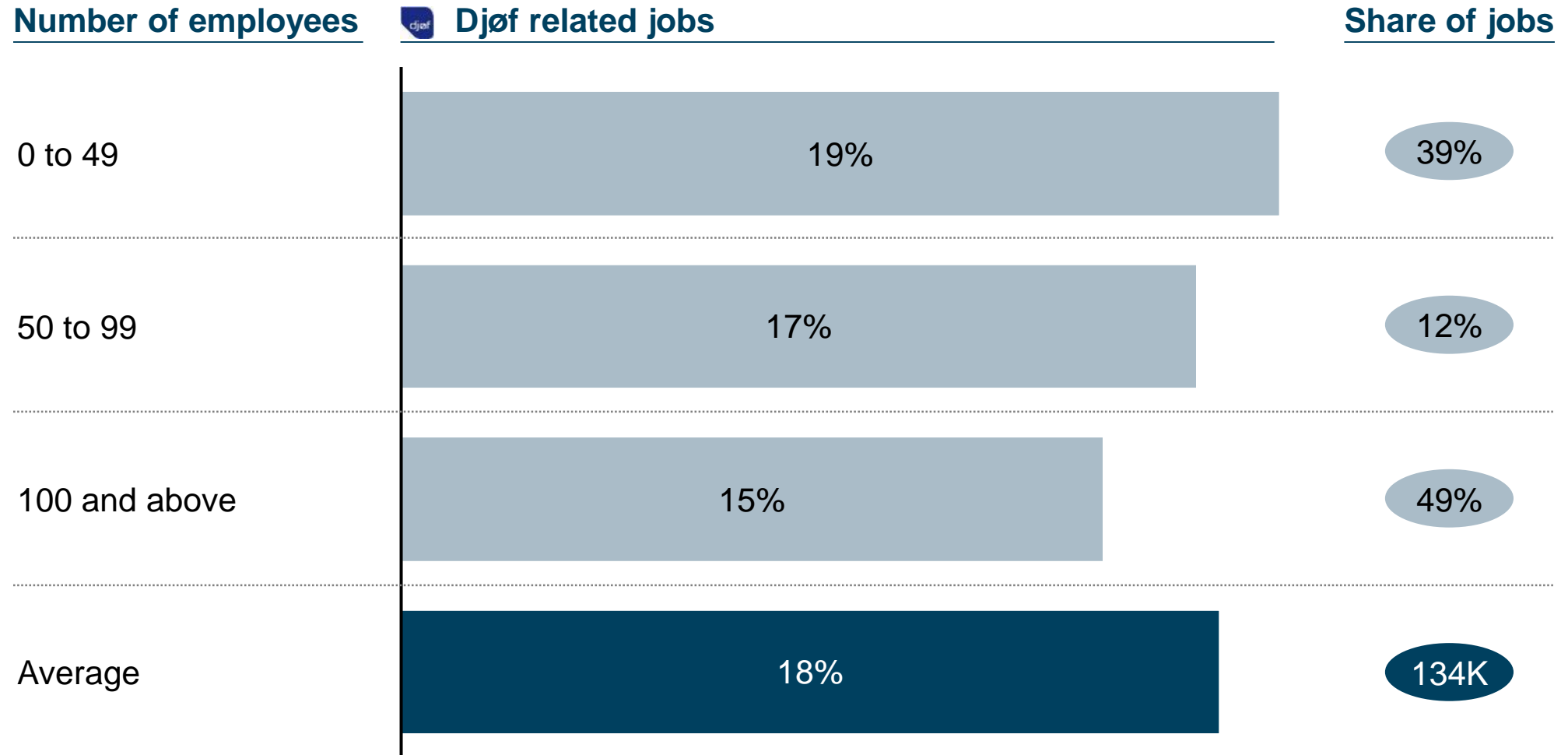


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Low variation in automation potential across company size

Technical automation potential of work activities by company size¹

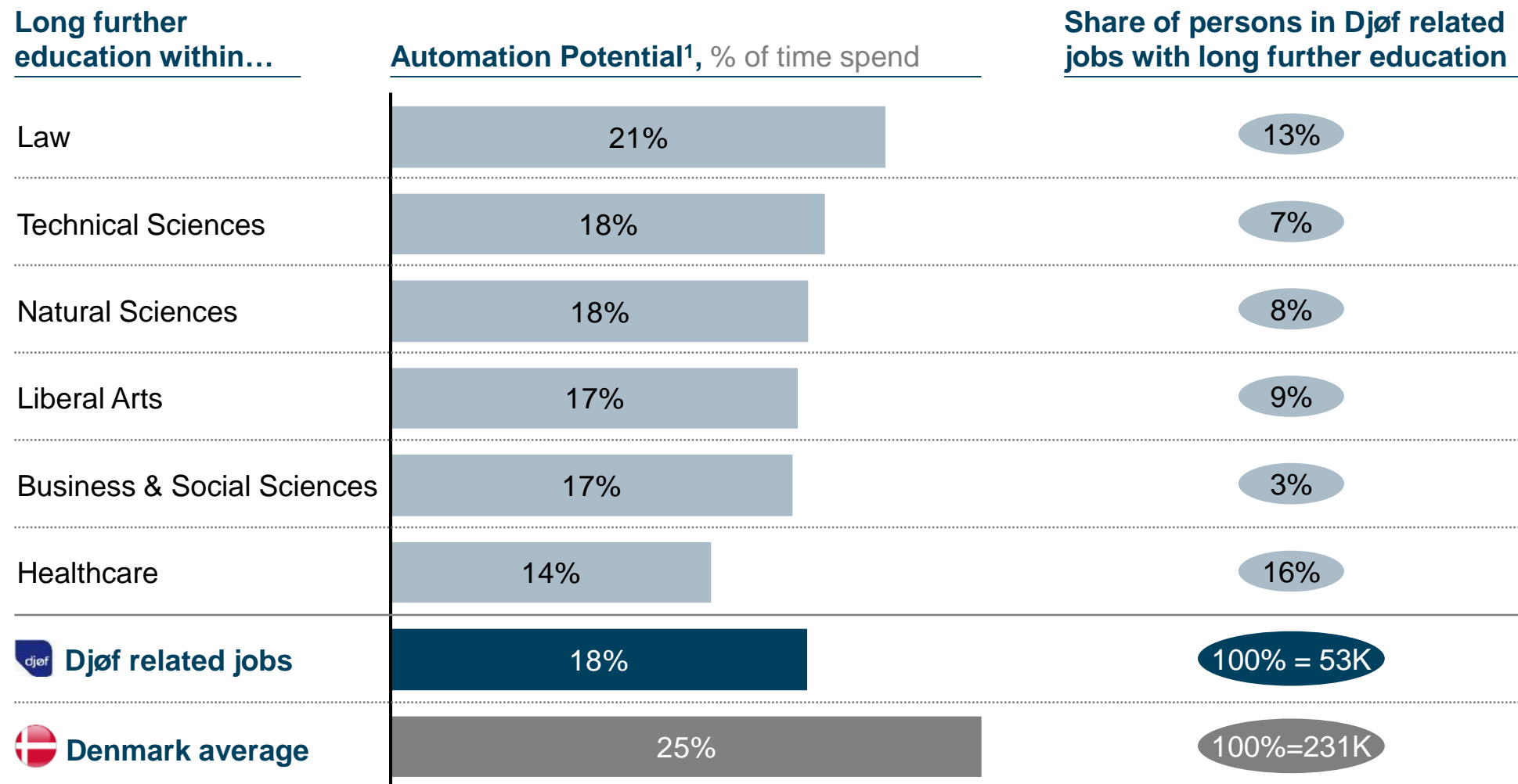


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SOURCE: Statistics Denmark; Analysis based on "The Future of Work: The Impact of Automation in Denmark" by McKinsey & Company (2017)

Limited variation in automation potential across educations, with Law backgrounds having higher automation potential

Technical automation potential of work activities by type of long further education¹

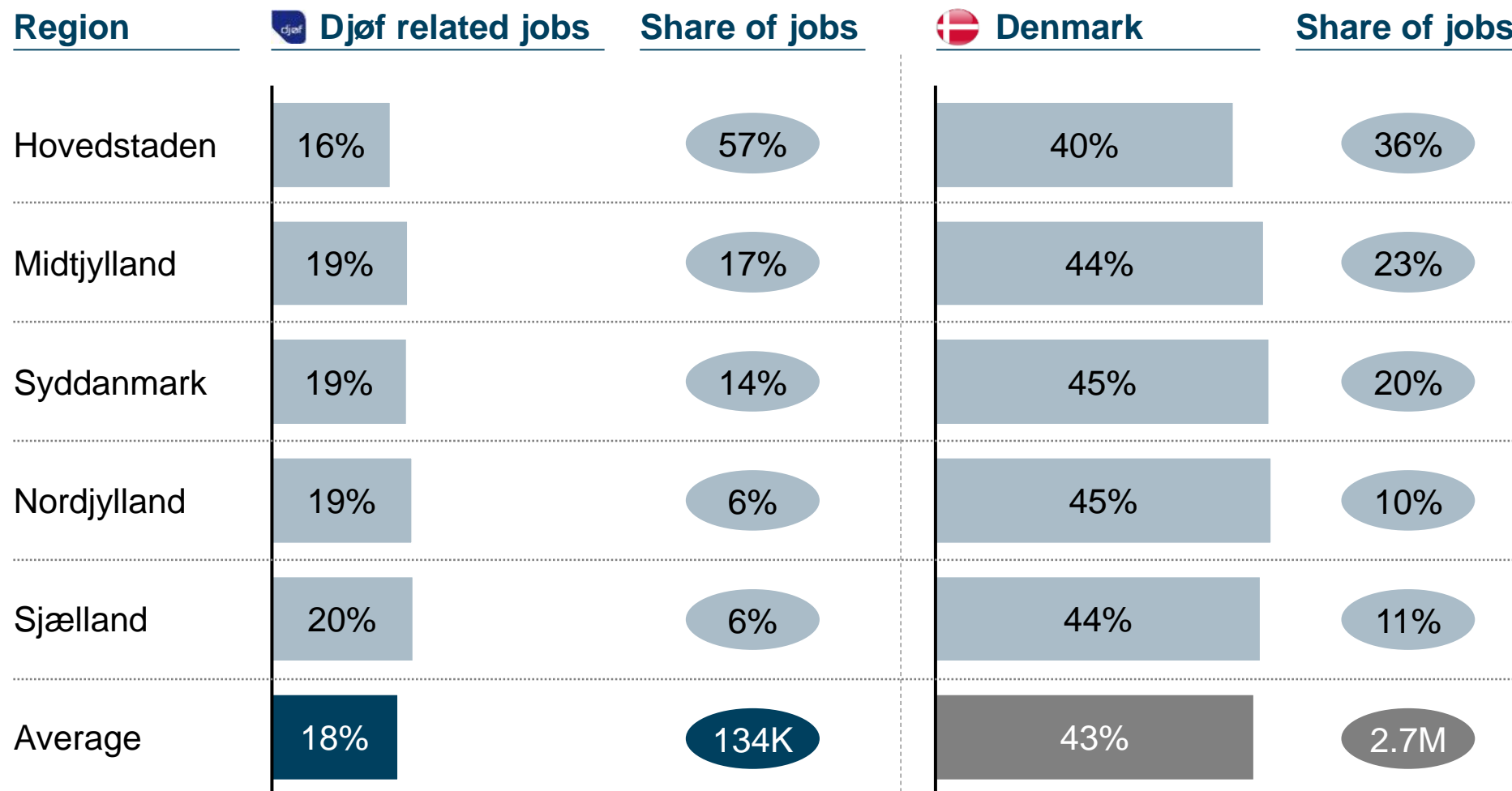


¹ We define automation potential by the work activities that can be automated by adapting currently demonstrated technology

SOURCE: Statistics Denmark; Analysis based on "The Future of Work: The Impact of Automation in Denmark" by McKinsey & Company (2017)

Djøf members in Copenhagen have the lowest automation potential, but limited variation across the country

Technical automation potential of work activities by region¹



¹ We define automation potential by the work activities that can be automated by adapting currently demonstrated technology

SOURCE: Statistics Denmark; Analysis based on "The Future of Work: The Impact of Automation in Denmark" by McKinsey & Company (2017)