



# Facility Management from the European Perspective

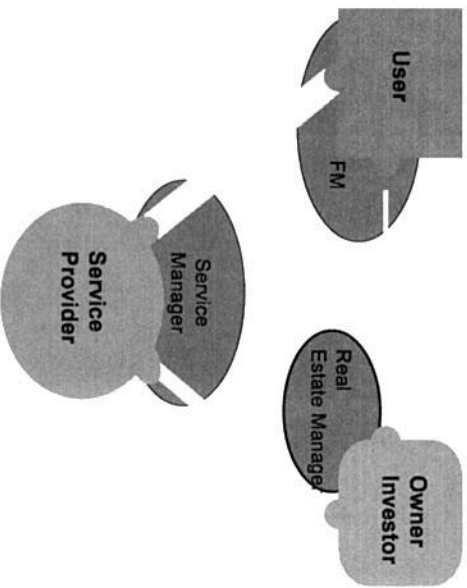
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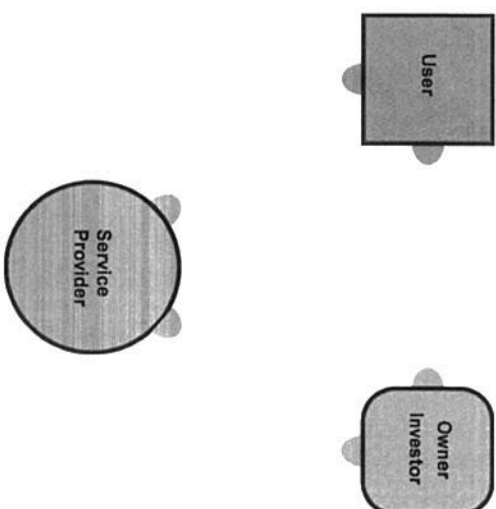


## Rolls and their representatives



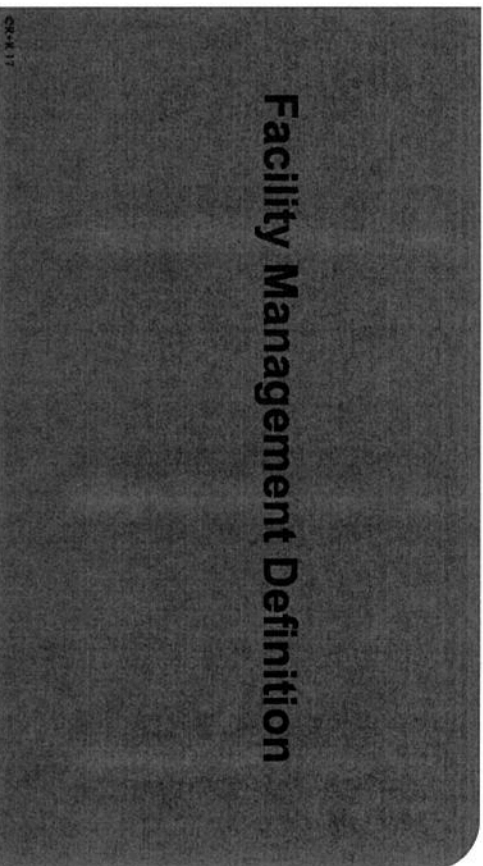
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## Rolls in Real Estate Industry



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## Facility Management Definition



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## Definition of FM – ISO 41011



“Organizational function which integrates people, place and process within the built environment with the purpose of improving the quality of life of people and the productivity of the core business”

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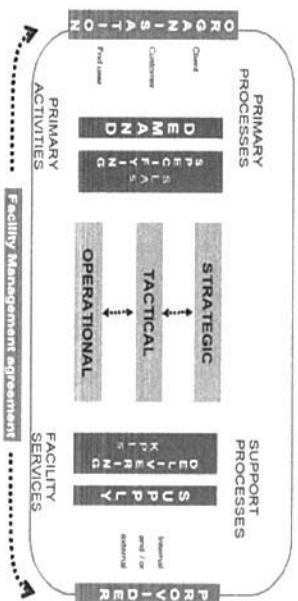
## The Importance of Facility Management

- IFMA: between 10-18% of expenditure is related to real estate
- Schulte: 25-50% of the assets of companies are real estate
- Geza-Richard Horn: Even in companies focused on production Facility Services are the second largest cost factor

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## Model

CEN/TC 348 Facility Management



Source: EN 15221-1: Facility Management - Part 1: Terms and definitions by CEN/TC 348

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## Macroeconomic Supply Side Study IFM FS compared to other sectors 2016 (value added)

	EU28	DE	UK	FR	IT	AT	GR	PL
Manufacturing	27%	34%	16%	23%	32%	29%	28%	38%
Wholesale and retail trade; repair of motor vehicles and motorcycles	19%	18%	17%	19%	19%	19%	23%	17%
Professional, scientific and technical activities	10%	10%	16%	10%	8%	8%	6%	7%
Information and communication	8%	7%	11%	9%	7%	5%	9%	7%
Transportation and storage	8%	6%	7%	9%	8%	8%	8%	9%
Administrative and support service activities	8%	7%	11%	8%	5%	6%	5%	5%
Construction	8%	6%	9%	9%	7%	9%	7%	5%
FS in total	7%	8%	7%	8%	7%	7%	6%	6%
Real estate activities	4%	5%	3%	4%	3%	5%	2%	3%
Accommodation and food service activities	4%	3%	4%	4%	4%	5%	2%	2%
Electricity, gas, steam and air conditioning supply	3%	2%	2%	3%	3%	3%	5%	4%
Water supply; sewerage, waste management and remediation activities	2%	1%	2%	1%	2%	1%	2%	2%
Mining and quarrying	1%	0%	1%	0%	0%	0%	3%	0%
Repair of computers and personal and household goods	0%	0%	0%	0%	0%	0%	0%	0%

Value added at factor cost in percentage of total value added at factor cost for non-financial business economy NACE B.

N, S95, excl. KI for 2016.

Only countries included that didn't show more than two missing values

Own calculation on the base of annual detailed enterprise statistics (European Commission/Eurostat, last modified 2019)

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## Macroeconomic Supply Side Study IFM

### FS compared to other sectors 2016 (value added in million €)

	BE	DE	DK	FR	IT	AT	GR	PT
Manufacturing	1,912,371	569,864	202,362	213,732	224,995	54,390	16,944	21,785
Wholesale and retail trade; repair of motor vehicles and motorcycles	1,352,939	304,319	227,924	178,553	133,308	35,647	14,178	9,482
Information and communication	743,659	160,939	203,704	95,726	56,708	15,684	3,368	4,072
Transportation and storage	597,647	117,174	145,904	82,624	47,651	9,909	5,194	4,162
Administrative and support service activities	550,000	103,634	95,939	84,791	60,161	14,145	4,888	5,145
Construction	543,039	110,553	144,875	77,215	37,858	11,848	2,766	3,078
Real estate activities	540,000	101,464	111,851	83,354	48,009	16,779	4,212	2,549
Electricity, gas, steam and air conditioning supply	509,730	126,433	96,206	73,731	52,427	13,048	3,491	3,547
Water supply; sewerage, waste management and remediation activities	287,868	76,742	44,970	42,247	18,745	9,409	1,386	1,963
Mining and quarrying	264,371	44,505	56,784	38,475	31,165	9,415	1,356	1,104
Repair of computers and personal and household goods	223,000	39,815	30,881	30,241	24,461	5,582	3,052	2,156
Business Economy in total	108,000	24,370	21,593	10,655	14,224	2,011	1,105	851
	47,990	4,471	14,123	1,464	3,408	838	1,833	137
	11,000	1,481	2,885	2,013	945	144	99	103
	7,181,884	1,659,330	1,303,775	941,089	701,639	185,800	60,379	56,586

**Value added at factor cost in million € for non-financial business economy (NACE B-N, S95, excl. K) for 2016.**  
 Only countries included that didn't show more than two missing values  
 Own calculation on the base of annual detailed enterprise statistics (European Commission/Eurostat, last modified 2019)

## FS compared to other sectors 2016 (employees)

	BE	DE	DK	FR	IT	AT	GR	PT
Wholesale and retail trade; repair of motor vehicles and motorcycles	23%	22%	22%	23%	24%	23%	21%	21%
Manufacturing	21%	25%	19%	25%	23%	30%	28%	28%
Administrative and support service activities	11%	12%	13%	8%	8%	8%	9%	9%
Information and communication	10%	13%	9%	10%	9%	10%	10%	10%
Transportation and storage	9%	9%	9%	9%	9%	5%	9%	9%
Construction	8%	8%	11%	9%	11%	9%	8%	8%
Real estate activities	8%	8%	7%	9%	11%	4%	5%	5%
Electricity, gas, steam and air conditioning supply	5%	4%	8%	9%	8%	7%	9%	9%
Water supply; sewerage, waste management and remediation activities	2%	2%	2%	2%	2%	2%	1%	3%
Mining and quarrying	1%	1%	1%	1%	1%	1%	2%	2%
Repair of computers and personal and household goods	1%	1%	1%	1%	1%	1%	2%	1%
Business Economy in total	0%	0%	0%	0%	0%	0%	0%	0%

**Number of employees as a percentage of all employees in non-financial business economy (NACE B-N, S95, excl. K) for 2016.**  
 Only countries included that didn't show more than two missing values  
 Own calculation on the base of annual detailed enterprise statistics (European Commission/Eurostat, last modified 2019)

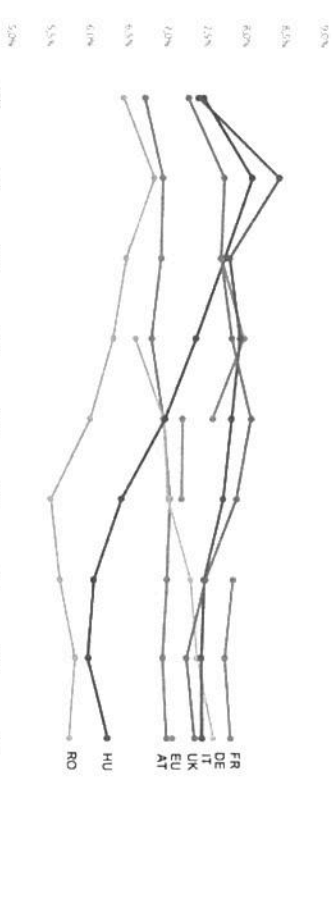
## Macroeconomic Supply Side Study IFM

### FS compared to other sectors 2016 (employees)

	BE	DE	DK	FR	IT	AT	GR	PT
Manufacturing	33,289,520	6,295,791	3,477,493	3,371,633	657,152	907,015	573,901	30,472,486
Wholesale and retail trade; repair of motor vehicles and motorcycles	30,472,486	7,360,959	2,905,577	3,662,318	629,053	1,209,753	739,145	15,606,671
Information and communication	15,606,671	3,487,818	2,079,913	1,217,437	232,505	300,124	232,096	14,513,700
Transportation and storage	14,513,700	3,654,708	1,523,101	1,508,444	256,841	390,695	275,390	13,544,746
Administrative and support service activities	13,544,746	2,733,362	1,409,837	1,254,856	245,215	212,174	248,318	12,690,460
Construction	12,690,460	2,272,627	1,651,096	1,324,178	292,359	373,779	206,521	11,900,000
Real estate activities	11,900,000	2,300,813	1,057,696	1,379,644	302,905	176,177	138,371	6,780,000
Electricity, gas, steam and air conditioning supply	6,780,000	1,240,715	869,310	1,117,011	199,140	365,814	247,103	2,911,538
Water supply; sewerage, waste management and remediation activities	2,911,538	486,368	345,887	304,673	49,134	47,229	70,975	1,550,000
Mining and quarrying	1,550,000	237,123	166,973	195,138	21,025	84,696	47,821	1,230,000
Repair of computers and personal and household goods	1,230,000	227,943	189,412	88,287	29,340	70,559	24,712	515,000
Business Economy in total	515,000	55,440	19,010	29,637	6,195	40,756	3,960	434,465
	45,643	65,003	44,927	3,858	11,638	11,811	142,253	136
	29,086	416	15,619	438	14,547	328	2,778	445
	3,978	093	2,672	445	3,978	093	2,672	445

**Number of employees of the industries and non-financial business economy (NACE B-N, S95, excl. K) for 2016.**  
 Only countries included that didn't show more than two missing values  
 Own calculation on the base of annual detailed enterprise statistics (European Commission/Eurostat, last modified 2019)  
 \* Because of one missing value each, the values in the table are underestimated by appr. 250 000 in FR and 500 000 in the EU

### Value added at factor cost - FS as a percentage

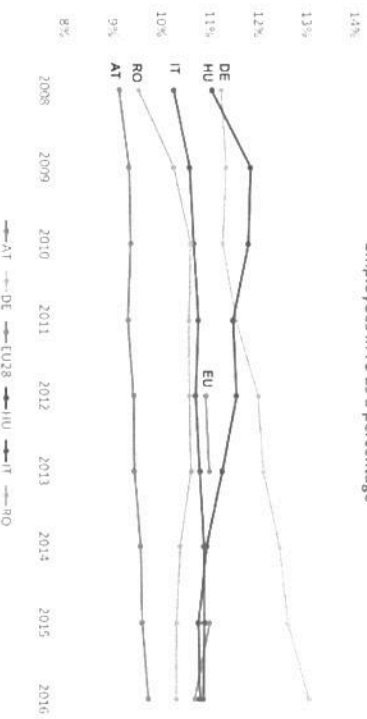


### Value added at factor cost as a percentage of non-financial business economy (NACE B-N, S95, excl. K)

Own calculation on the base of annual detailed enterprise statistics (European Commission/Eurostat, last modified 2019)



Employees in FS as a percentage



**Number of employees as a percentage of non-financial business economy (NACE B-N, S95, excl. K)**  
 Own calculation on the base of annual detailed enterprise statistics (European Commission/Eurostat, last modified 2019)

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## Change is knocking on your door!

Number of employees	EU	US
Total number of employees in Total business economy	135.601.377	90.337.386
Total number of employees in Facility Services	14.438.876	9.008.432
Proportion of employees in Facility Services	10.65 %	9.97 %

- New technologies change operation and service provision
- Disruptive changes in the next 10 to 15 years
- Estimation: 40 to 68% of the current jobs are automated or done by robots
- Main question:
  1. Which smart building technologies are essential to optimize the Facility Service provisions?
  2. Which ones are already in use and which ones will become feasible on a short-term basis?
  3. What FS are affected and by which technologies?

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## Workplace of the Future (IFM Research Area)

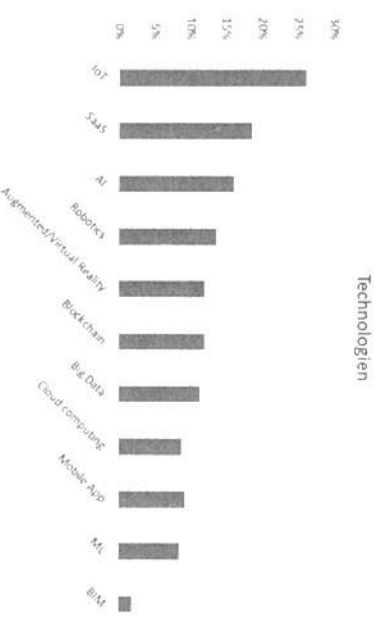
- Activity based working
- Come to office to communicate
- Concentrated work (at home?)
- Co-operative Workspaces
- Service during the day
  - Meeting rooms
  - The lounge – the hub
  - Office (multiple use)
- Demand for more services
- Additional Costs?



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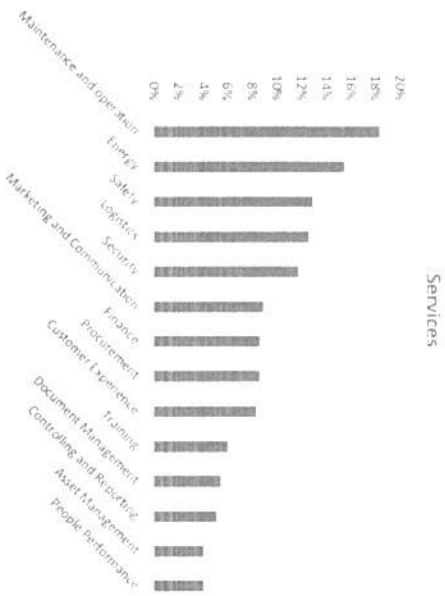
## Quantitative Literature Research 2018 Relevant Technologies



Source: Radien, 'Impact of emerging technologies on Facility Services', IFCON 2018, IEEE

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## Quantitative Literature Research 2018 Affected Services



Source: Radtke, 'Impact of emerging technologies on Facility Services', IECOM 2018, IEEE

## Digitalization of Facility Services: IoT

- Sensors/IoT – everything is connected
- Self sufficient
  - Provides current info about
    1. Room Climate
    2. Usage of rooms
      1. Labs
      2. Washrooms
      3. Meeting rooms
    3. Ordering e.g. by 'Alexa'
  - Triggers tasks/activities
  - From preventive/scheduled to demand orientation



## Digitalization: Mobile Apps / Cloud

IoT as a basis and provider of data

- ➔ New Processes triggered by IoT in Mobile Apps
- Forwarding of assignments
  - Sending of error messages
  - Route Planning
  - Room (climate) control (BIG/ISS)
- ➔ IT out of the cloud
- SAAS
  - Maintenance out of the cloud (KONEMIE)
  - CAFM?

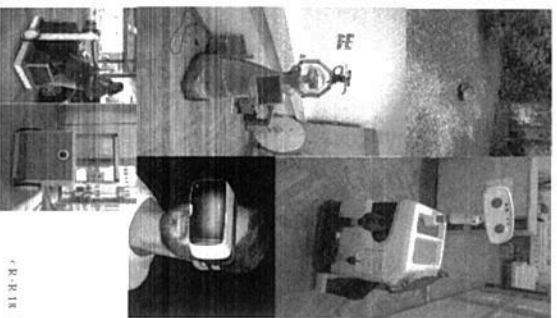


## Digitalization: BIG Data / ML

1. BIG Data
  - used to store and analyze IoT data
2. Artificial Intelligence (AI) and Machine Learning to recognize patterns
  - Do I need the room?
    - Meeting room capacity
    - Forecast of workplaces
  - Predictive Maintenance
  - Video analysis (Security, Access Control, ...)
  - Taylor 2.0
3. Blockchain
  - Data Storage
  - Smart contracts

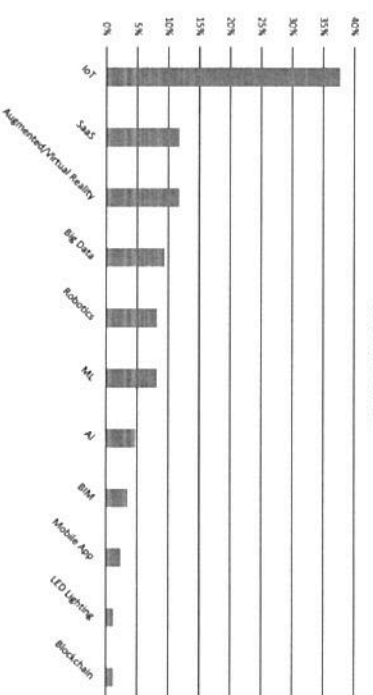
## Digitalization: The Future

- 3-5 Years
  1. Platform Solutions (UBER for FS)
  2. Augmented reality
  3. Virtual reality
  4. Robotic and Human Robot Interaction
    - Concierge Service
    - Cleaning
    - Landscaping
    - Security
    - Transportation
    - Exoskeletons
  5. Drones
  6. Wearables



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## Quantitative Literature Research 2018 Technologies affecting Maintenance



Source: Redlien, Impact of emerging technologies on Facility Services, IECON 2018, IEEE

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## Outlook

- Technology is developing rapidly / everything is on the move
  - IoT is becoming cheap, only delivers data
  - Big Data/ML to analyze, make data usable
  - No set technology
- But Digitalization is not about IT/technology, it's about
  - New demands
  - User orientation including user in supply chain
  - Personalized products
  - New, disruptive ways of operation enabled by new technologies:
- **Combing**
  - Technology/Content Research at TU Vienna and
  - Design Research at Stanford Engineering
- **Research Working/Living/Learning of the Future and the new demand for infrastructure and services**

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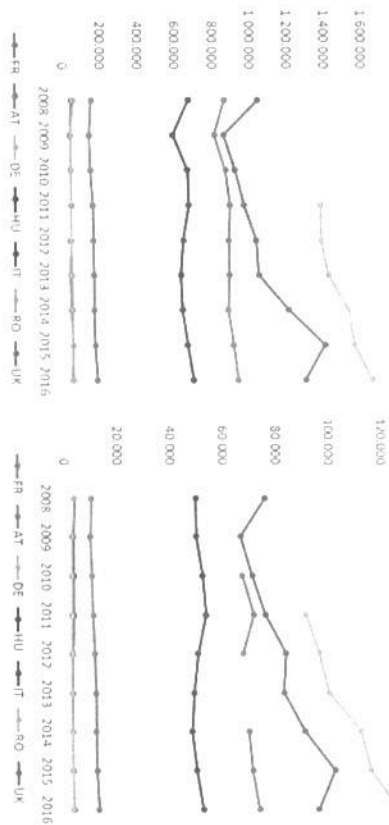
## Sum up

- The outsourced FS industry is
  - 3. largest in the EU in terms of employees
  - Grows faster than the rest of economy
- General research of IFEM
  - Macroeconomic Supply Side Study
  - Demand Side Study
- Research projects - Impact of digitalization:
  - Changes of Workplace infrastructure and service demand
  - Impact on facility service provision
  - **How do we work, live and learn and how can we support this with optimal infrastructure and services**

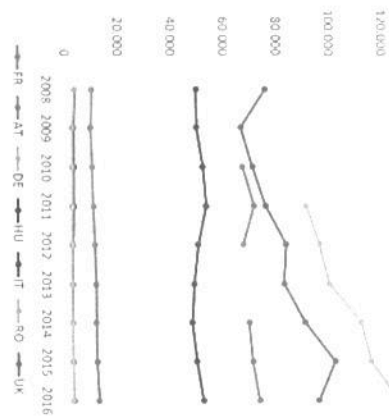
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Value added at factor cost - total business economy



Value added at factor cost - FS



left: Value added at factor cost in total non-financial business economy (B-N, S95 exkl;K) expressed in millions of €  
right: Value added at factor cost - FS in total

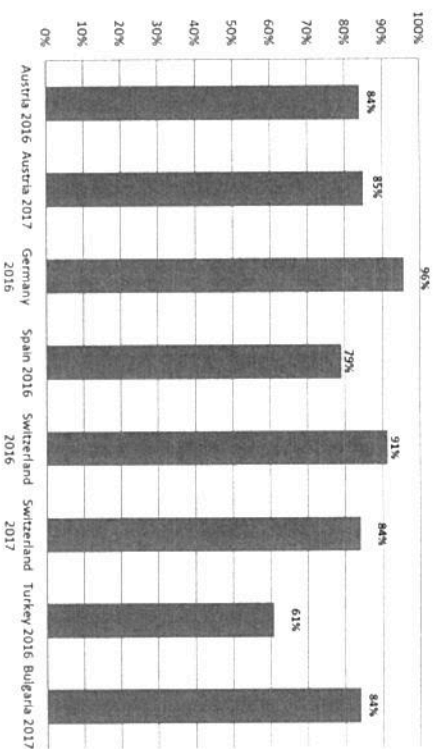
Own calculation on the base of annual detailed enterprise statistics (European Commission/Eurostat, last modified 2019)

## Methodology

1. Qualitative pre-study
2. Quantitative literature analysis of more than 350 international cases
  1. Scientific studies published in peer-reviewed journals
  2. Strategy documents (scientific & strategy consultancies)
  3. White papers and business project descriptions
3. Validation of results

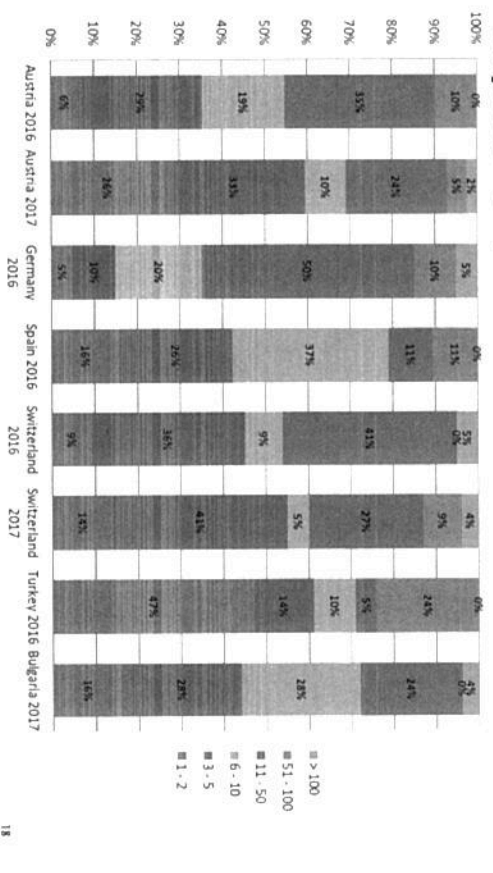
## Status Quo Demand Side

## Own FM Department

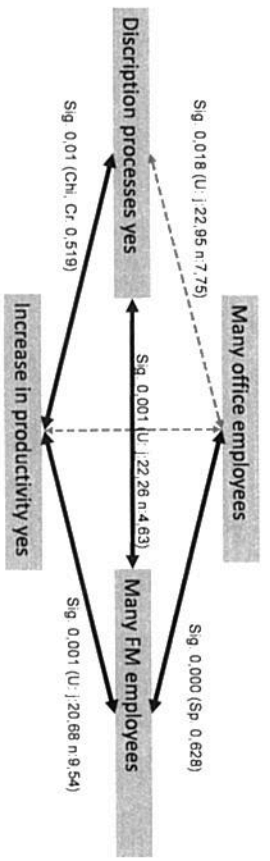




## Number of employees within FM department

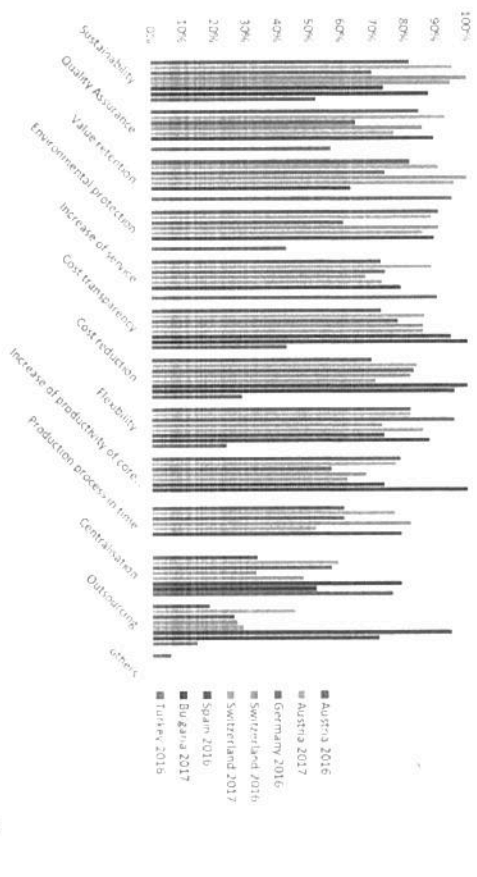


## Statistical tests (Austria 2017)

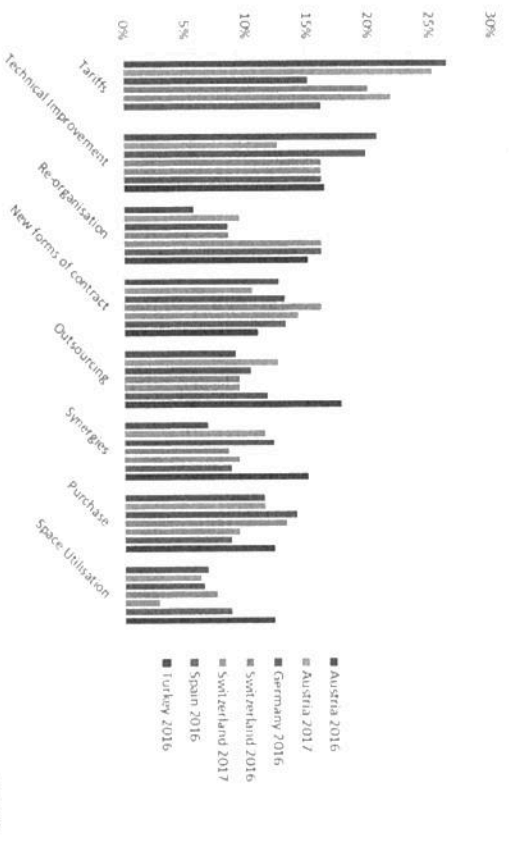


Larger companies have larger FM departments. In this case description of processes can be found and increases in productivity are more likely.

## Strategy of FM department

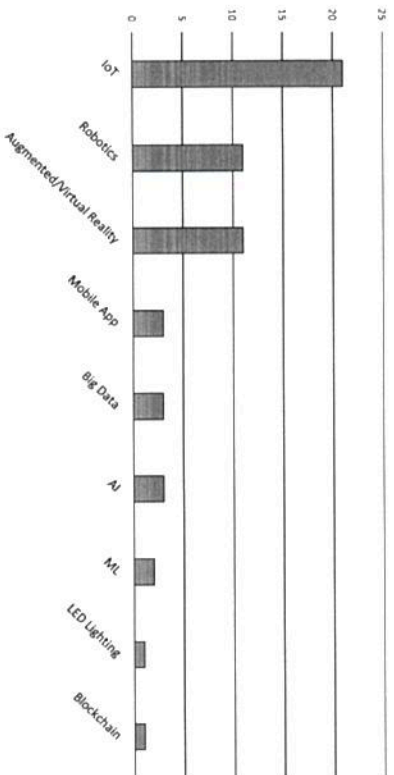


## Savings - Reasons



## Quantitative Literature Research 2018 Technologies affecting

Safety

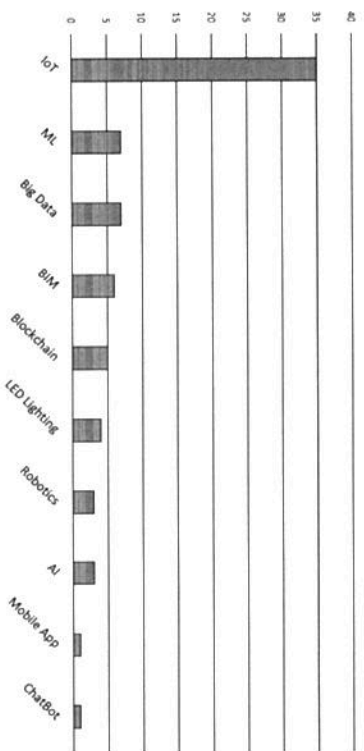


Source: Redlén, 'Impact of emerging technologies on Facility Services', IECON 2018, IEEE

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## Quantitative Literature Research 2018 Technologies affecting

Energy



Source: Redlén, 'Impact of emerging technologies on Facility Services', IECON 2018, IEEE

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