

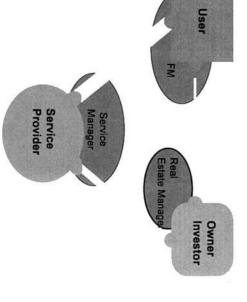
Facility Management from the **European Perspective**

Prof. Alexander Redlein

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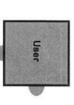
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Rolls and their representatives





Rolls in Real Estate Industry









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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"





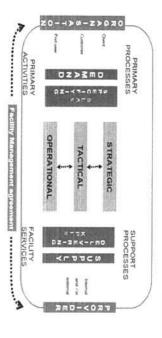
The Importance of Facility Management

- FMA: 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

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	п	AT	RO	ни
Manufacturing	27%	34%	16%	23%	32%	29%	28%	38%
Wholesale and retail trade; repair of motor vehides and								
motorcycles	19%	18%	17%	19%	19%	19%	23%	17%
Professional, scientific and technical activities	10%	10%	16%	10%	88 %	88	8	7%
Information and communication	88	7%	11%	9%	7%	5%	9%	7%
Transportation and storage	8%	6%	7	9%	9%	88	%	9
Administrative and support service activities	8%	7%	11%	8%	5%	6%	5%	5%
Construction	8%	6%	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%	7%	1%	2%	2%
Mining and quarrying	1%	%0	1%	9	%	95	3%	9
Repair of computers and personal and household goods	0%	0%	9	98	9	2	200	2

Value added at factor cost in percentage of total value added at factor cost 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.

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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 (value added in million €)

	EU28	DE	UK	FR	IT	AT	RO	
Manufacturing Wholesale and retail trade; repair of motor vehicles and	1.912.371	569.864	202.362	213.732	224.995	54.390	16.944	21.785
motorcycles	1.352.939	304.319	227.924	178.553	133,308	35.647	14.178	9,482
Professional, scientific and technical activities	743.659	160.939	203.704	95.726	56.708	15.684	3.368	4.072
Information and communication	597.647	117.174	145.904	82.624	47.651	9.909	5.194	4.162
Transportation and storage	550.000	103.634	95.939	84.791	60.161	14.145	4.888	5.145
Administrative and support service activities	543.039	110.553	144.875	77.215	37.858	11.848	2.766	3.078
Construction	540.000	101.464	111.851	83.354	48.009	16.779	4.212	2.549
FS in total	509.730	126.433	96.206	73.731	52.427	13.048	3,491	3.547
Real estate activities	287.868	76.742	44.970	42.247	18.745	9,409	1.386	1.963
Accommodation and food service activities	264.371	44.505	56.784	38.475	31.165	9,415	1.356	1.104
Electricity, gas, steam and air conditioning supply Water supply; sewerage, waste management and	223.000	39.815	30.881	30.241	24.461	5.582	3.052	2.156
remediation activities	108.000	24.370	21.593	10.655	14.224	2.011	1.105	851
Mining and quarrying	47.990	4.471	14.123	1.464	3.408	838	1.833	13
Repair of computers and personal and household goods	11.000	1,481	2.865	2.013	945	144	99	103
Business Economy in total	7.181.884	7.181.884 1.659.330 1.303.775	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

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13 FS compared to other sectors 2016 (employees) EU28 DE FR AT

(employees)	EU2	DE	FR	п	AT	RO	нυ
Wholesale and retail trade; repair of motor vehicles and							
motorcycles	23%	22%	22%	23%	24%	23%	21%
Manufacturing	21%	25%	19%	25%	23%	30%	28%
Administrative and support service activities	11%	12%	13%	% %	88	8%	9%
FS in total	10%	13%	9%	10%	9%	10%	10%
Professional, scientific and technical activities	10%	9%	9%	9%	9%	5%	9%
Construction	9%	8%	11%	9%	11%	9%	8%
Accommodation and food service activities	8%	%	7%	9%	11%	4%	5%
Transportation and storage	8%	8%	9%	8%	7%	9%	9%
Information and communication	5%	4%	6%	4%	4%	4%	5%
Real estate activities	2%	2%	2%	2%	2%	1%	3%
Water supply, sewerage, waste management and							
remediation activities	1%	1%	1%	1%	1%	7	2%
Electricity, gas, steam and air conditioning supply	1%	1%	1%	1%	1%	2%	1%
Mining and quarrying	98	R	98	9%	9,	1%	20%
Repair of computers and personal and household goods	0%	0%	9%	0%	98	98	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)

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FS compared to other sectors 2016 (employees) Macroeconomic Supply Side Study IFM

RO

HU

motorcycles Manufacturing Administrative and support service activities FS in total Professional, scientific and technical activities Construction Accommodation and food service activities Transportation and storage	33.289.520 30.472.486 15.606.671 14.513.700 13.544.746 12.690.460 11.900.000 11.328.250		1 1 1 1 2 2 3		- UI W 10	P	573.901 739.145 232.096 275.390 248.318 206.521 138.371 247.103
Accommodation and food service activities Transportation and storage	11.328.250	2.300.813	1.382.231	1.379.644	302.905	176.177	138
Information and communication	6.780.000	1.240.715	869.310	557.589	110.564	178.879	127.761
Real estate activities Water supply; sewerage, waste management and	2.911.538	486.368	345.887	304.673	49.134	47.229	70.925
remediation activities	1.550.000	237.123	166.973	195.138	21.025	84.696	47.821
Electricity, gas, steam and air conditioning supply	1.230.000	227.843	189.412	88.287	29.340	70.559	24.712
Mining and quarrying	515,000	55.440	19.010	29.637	6.195	40.256	3.960
Repair of computers and personal and household goods	434.465	45.643	65.003	44.927	3.858	11.638	11.811
Business Economy in total	142.253.136 29.086.416	29.086.416	15.619.438	15.619.438 14.547.328 2.778.445 3.978.093 2.672 445	2.778.445	3.978.093	2.672.4

Number of employees of the industries and non-financial business economy (NACE B-N, S95, axcl. 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 underestmated by appr. 250 000 in FR and 500 000 in the EU

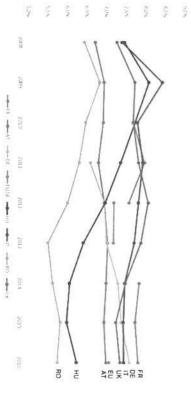
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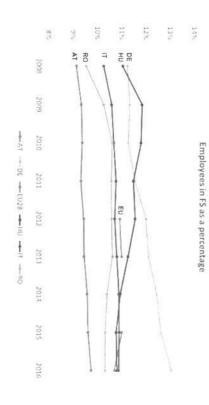
Value added at factor cost - FS as a percentage



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

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





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:
- 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?





Workplace of the Future (IFM Research Area)

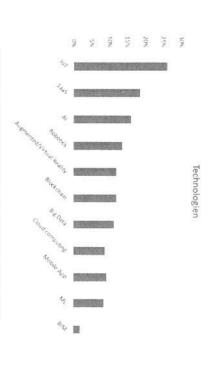
- Activity based working
- Come to office to communicate
- Concentrated work (at home?)
- Co-operative Workspaces
- Service during the day
- Meeting rooms
- The lounge the hub
- Office (multiple use)
- Demand for more services
- ➤ Additional Costs?



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Quantitative Literature Research 2018 Relevant Technologies

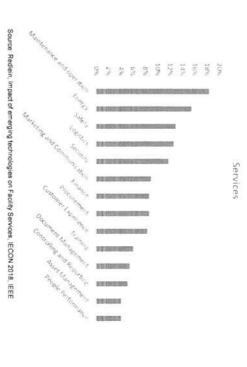


Source: Redlein, Impact of emerging technologies on Facility Services, IECON 2018, IEEE



Affected Services

Digitalization of Facility Services: IoT







Digitalization: Mobile Apps / Cloud

IoT as a basis and provider of data

- → New Processes triggered by IoT in Mobile
- Forwarding of assignments
- Sending of error messages
- Route Planning
- Room (climate) control (BIG/ISS)
- → IT out of the cloud
- Maintenance out of the cloud (KONE/VIE)
- · CAFM?





BIG Data

Digitalization: BIG Data / ML

- used to store and analyze IoT data
- 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
- ω Blockchain
- Data Storage
- Smart contracts



Digitalization: The Future

Technologies affecting

Maintenance

Quantitative Literature Research 2018

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





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 is about
- 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



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

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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 IFM
- 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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Opportunities for Research A lot of Changes and

Thank you for your attention!

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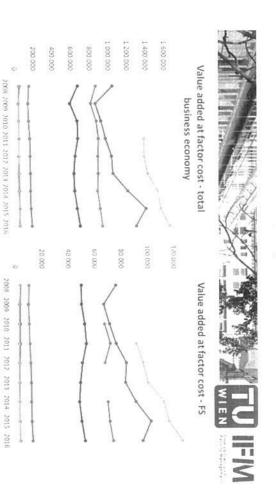


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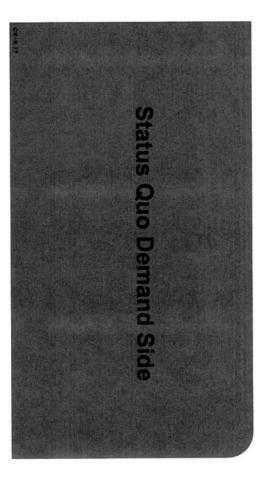
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Methodology

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

expressed in millions of €

right: Value added at factor cost - FS in total

+AT -- 05 + HU + IT -- BO -- UK

FR -AT -DE +HU +IT -RO +UX

left: Value added at factor cost in total non-financial business economy (B-N, S95 exkl.K)

Commission/Eurostat, last modified 2019)

Own calculation on the base of annual detailed enterprise statistics (European

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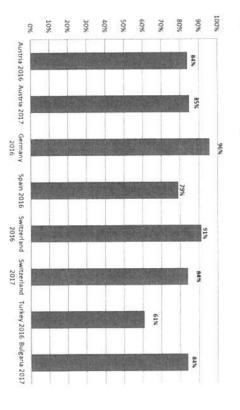




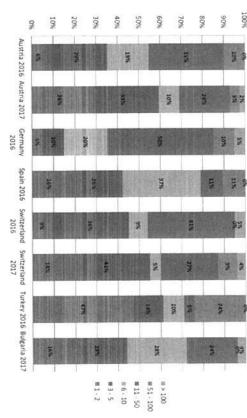




Own FM Department

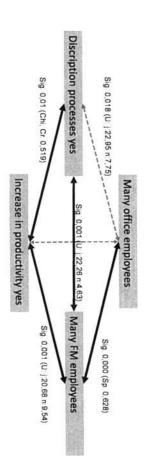


Number of employees within FM department





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.

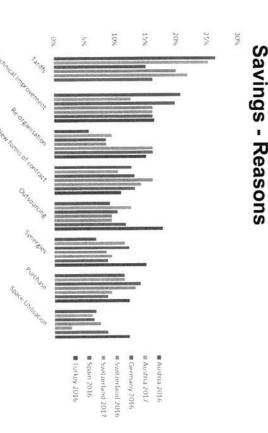


Strategy of FM department



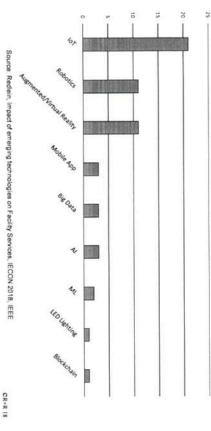


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Quantitative Literature Research 2018 Technologies affecting

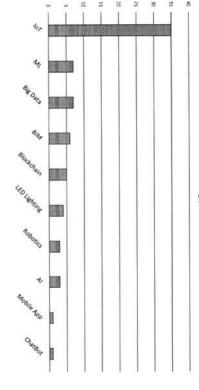




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Quantitative Literature Research 2018 Technologies affecting

Energy



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

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