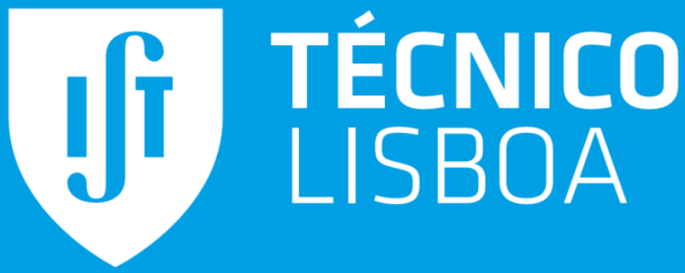

Cloud-based Facility Management Benchmarking

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Outline

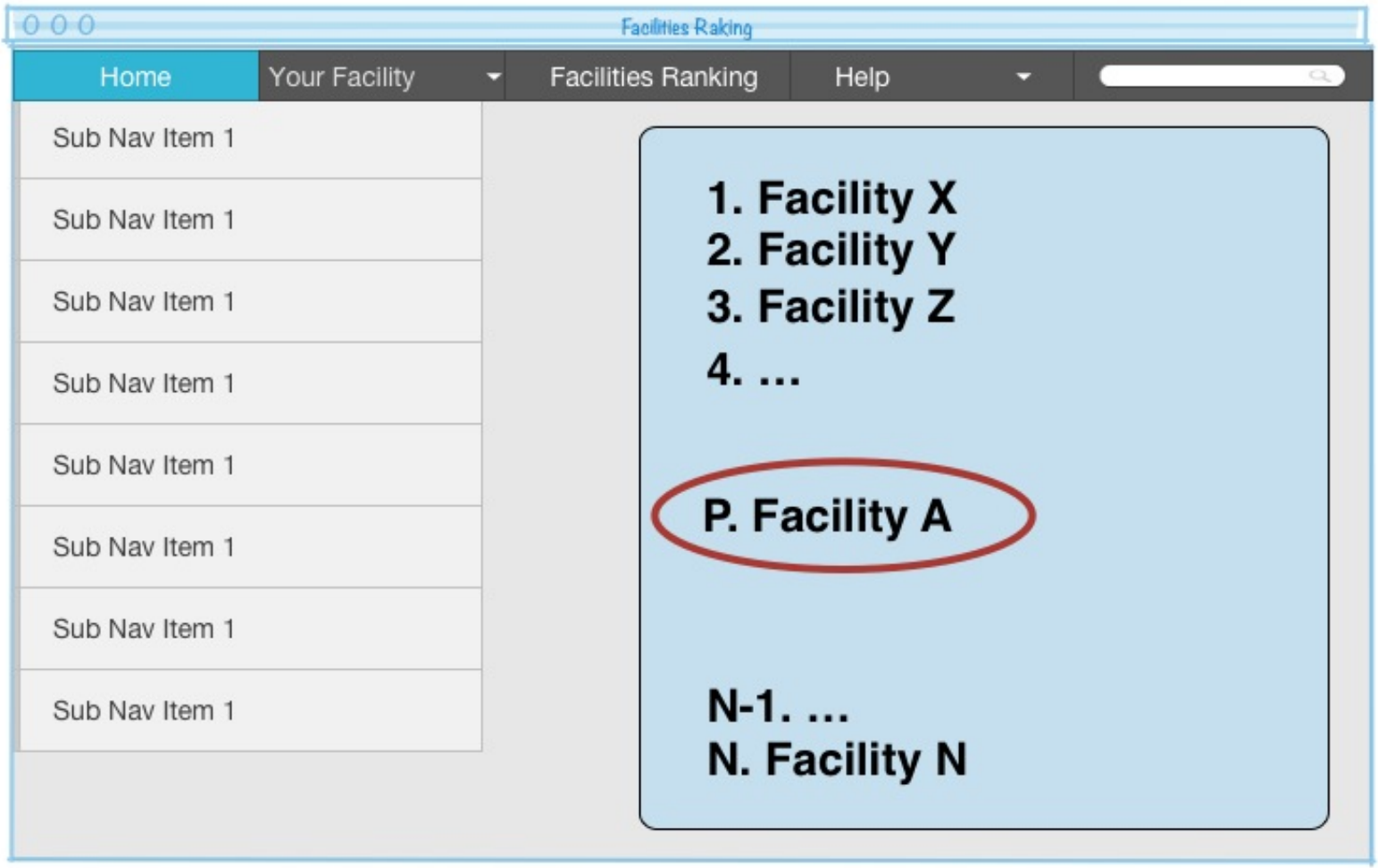
Outline

Facilities Management

- Rationalizes expenditures related to facilities
- Makes organizations more efficient
- It is important to measure the effect of the FM, and its own performance
- Specialized software such as CAFM, IWMS, CMMS, CAD, BAS, EMS, ERP

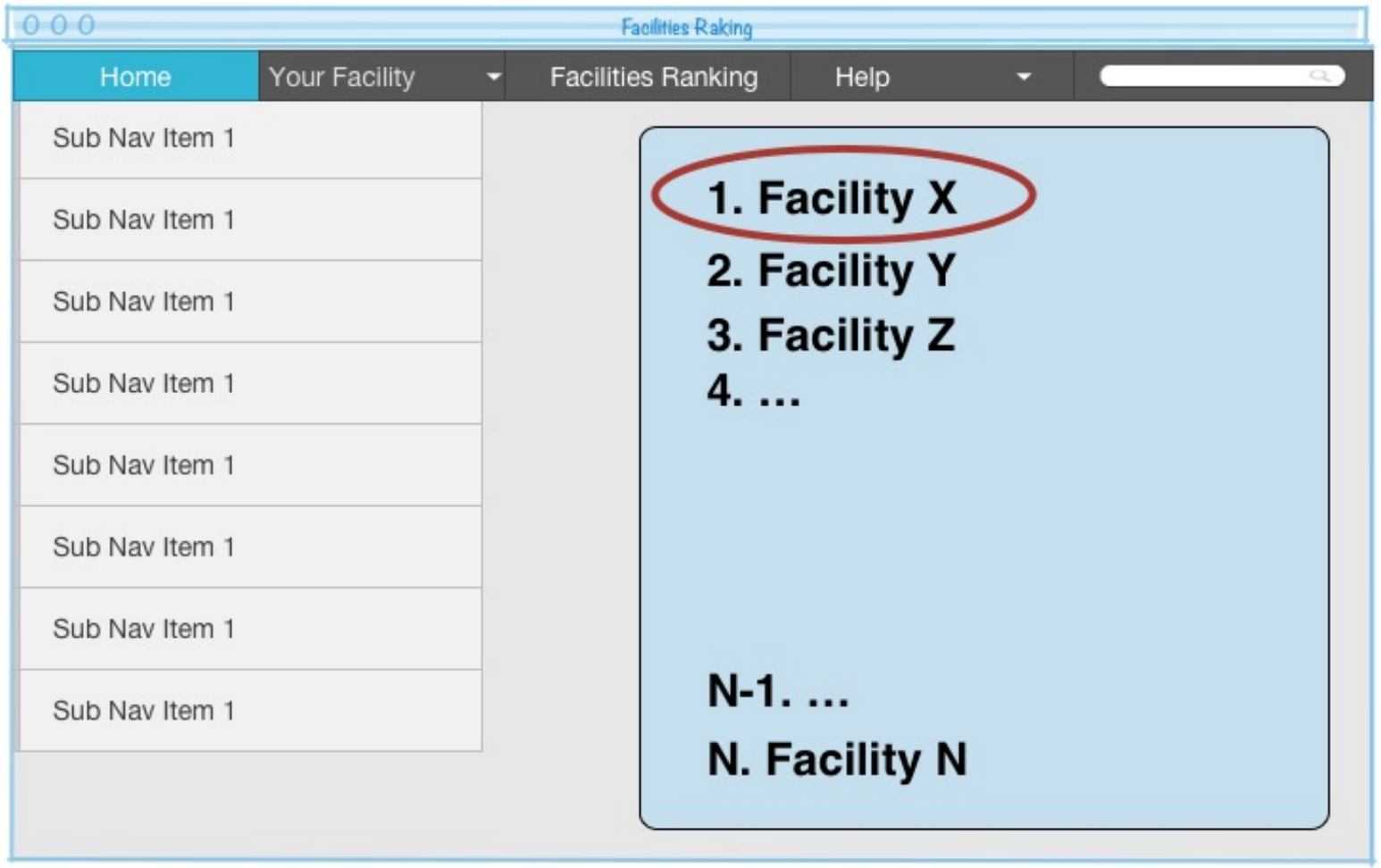
Motivation Scenario A

Improvement Path Awareness



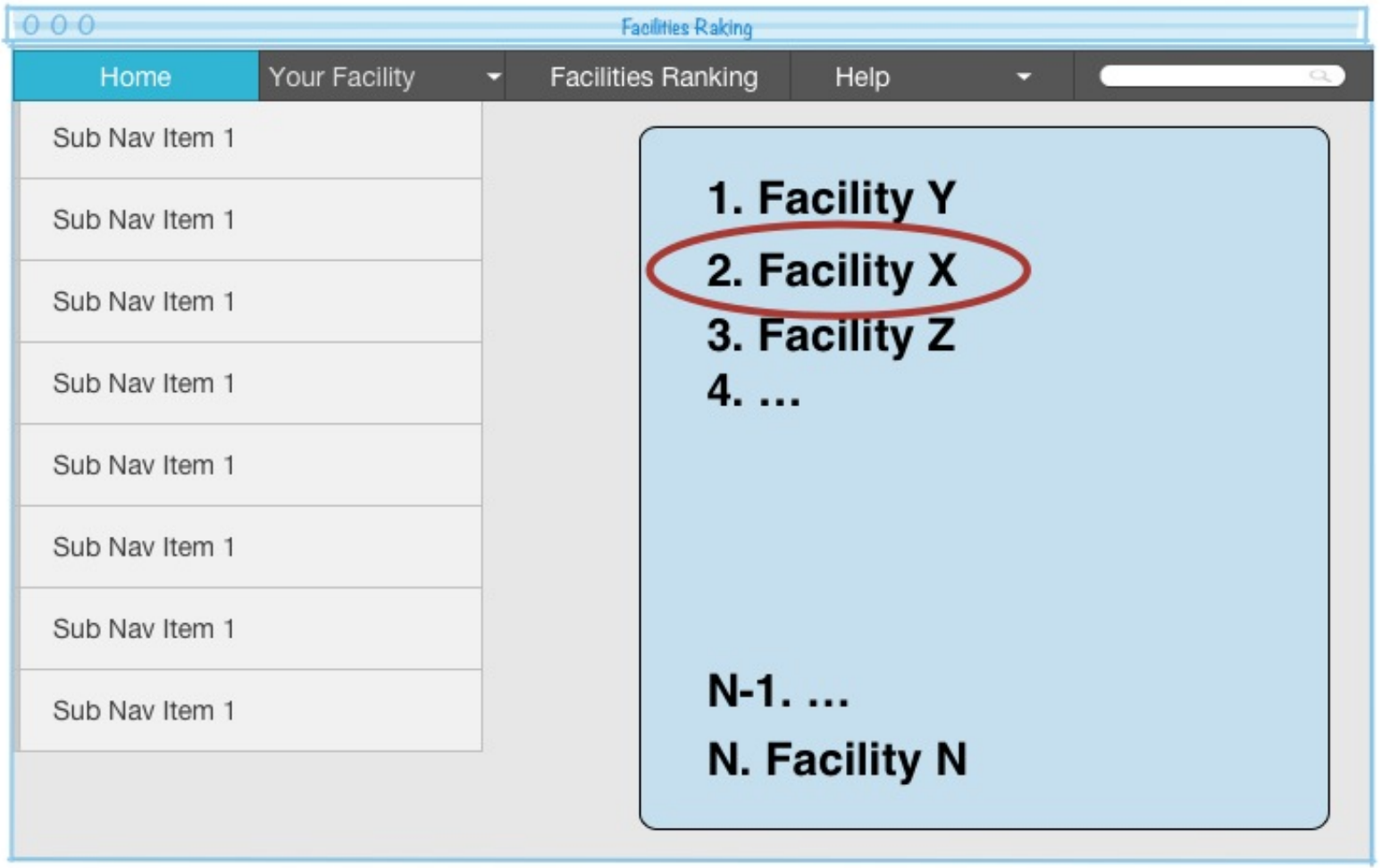
Motivation Scenario B

Continuous Improvement Awareness



Motivation-Scenario 2

Continuous Improvement Awareness



Key Performance Indicators

Through the FM software is possible to extract measures which are used to calculate Key Performance Indicators (KPIs)

KPIs give important insight into functioning of the FM functions

KPIs Examples

- **Cleaning Cost per m^2:** Total Cleaning Costs/Net Floor Area
- **Repairs VS Preventive Maintenance:** (Number of Corrective Maintenance per month/Number of Preventive Maintenance per month)x100
- **Quality of Cleaning:** Obtained Through Audits or Questionnaires

Key Performance Indicators

KPIs must be SMART

- **S**pecific: well defined and clearly understood
- **M**easurable: theres a well defined process that enables the KPI tracking
- **A**greed: all stakeholders have to agree with it
- **R**ealistic: that can be measured at a reasonable cost
- **T**ime driven: if corresponds of a time interval

Key Performance Indicators

KPIs for FM are not always SMART

- They are not specific
- They are not a standard measure method

And more...

- There are not even an agreed set of KPIs for FM

Benchmarking

Benchmarking in Management

- Organizations have to perform better than their competitors
- Organizations have to operate at the lower costs
- Benchmarking enables to compare performance aspects

Benchmarking in Facilities Management

- Benchmarking can compare distinct organizations or a facility with itself at different time lines
- We have to measure the same things

Benchmarking

Fundamental steps for benchmarking

- **Knowing operation** to evaluate internal operation strengths and weaknesses
- **Knowing the industry leaders or competitors** to know the strengths and weaknesses of the competition
- **Incorporating the best** to emulate the strengths of the leaders in competition
- **Gaining superiority** to go beyond the best practices installed and be the best of the best

Outline

Problem Statement

There is not an agreed set of KPIs or a benchmarking process.

Methodology

Analysis of Related Work

- Analysis of existent standards for FM
- Analysis of scientific literature about selection of KPIs
- Analysis of existing tools for FM and benchmarking

Methodology

Matrix Elaboration

- Elaboration of a normalized and prioritized KPI matrix

Matrix Validation

- Cross-over of KPI matrix with experts opinion
- Evaluation of conclusions through a cloud application

Outline

Standards

ISO - International Organization for Standardization

- ISO 31000:2009: Principles and guidelines
- IEC 31010:2009: Risk assessment techniques

ICS - International Classification for Standards

- ICS 03. 100: Risk Management
- ICS 01. 110: Facilities Management

RICS - Royal Institution of Chartered Surveyors

- Gross External Areas (GEA)
- Net Internal Area (NIA)

BICS - Building Cost Information Service

- Occupancy costs
- Construction duration

Scientific Literature

- Massheder and Finch, 1998
- Ho et al, 2000
- Costa et al, 2004
- Hinks and McNay, 1999

Scientific Literature

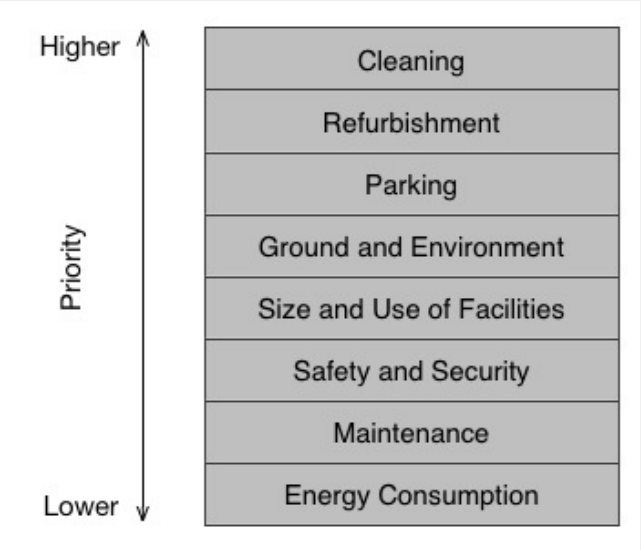
Massheder and Finch, 1998

- Measure of the use of the different metrics on UK benchmarking organizations
- The most used metrics are within the categories: Business, Portfolio Metrics and Building Performance

Scientific Literature

Ho et al, 2000

- Rates the importance of 97 metrics on a five point scale in Asia Pacific Region



- Most important metrics to the organizations: the ones with a financial implication

Scientific Literature

Costa et al, 2004

- Discussion about three benchmarking initiatives in United Kingdom, United States of America and Chile
- Costa et al concluded that:
  - KPI selections were focused on categories such as Financial, Safety, Satisfaction and Performance
  - The measures should be simple and well designed and give a comprehensive company wide-view

Scientific Literature

Hinks and McNay, 1999

- Need to established a set of universally accepted KPI
- **First phase** literature review
- **Second phase** questionnaires, scenario workshops and group discussions set
- **Third phase** it was allocated a grade for each KPI, according to its importance
- Of 172 KPIs were selected the 23 most important

Scientific Literature

Performance Dimension	Metric
Business	No loss of business due to failure of premises services
General	Customer Satisfaction
Change Management	Completion of project to customer satisfaction
Environment	Provision of safe environment
Space	Effective utilization of space
Change Management	Effectiveness of communication
Maintenance	Reliability
General	Professional approach of premises staff
General	Responsiveness to problems
General	Competence of staff
Maintenance	Management of maintenance
Change Management	Responsiveness of PD to changes/requirements
Business	Value for money
Environment	Satisfactory physical working conditions
Equipment	Equipment provided meets business needs
Business	Suitability of premises and functional environment
Change Management	Quality of end product
Maintenance	Effectiveness of helpdesk service
Change Management	Achievement of completion deadlines
Equipment	Correction of faults
Maintenance	Standards of cleaning
General	Management information
Environment	Energy performance

Existing Software Solutions

Software Solutions	Centralization of Organizations Info	Business Analysis	Increased Visibility and Control	Costs Reduction	CAD/BIM Integration	Cloud Application	Benchmarking
Maxpanda	•	•	•	•			
IBM Tririga	•	•	•	•			
FM:Systems	•	•	•	•	•		
Indus System	•	•	•	•		•	
PNMSoft	•	•	•	•		•	•
ARCHIBUS	•	•	•	•	•	•	•

The Problem Remains

- ARCHIBUS and PNMSoft show an organization KPIs when accessing their web site
- Only applicable for facilities that have one of those software installed

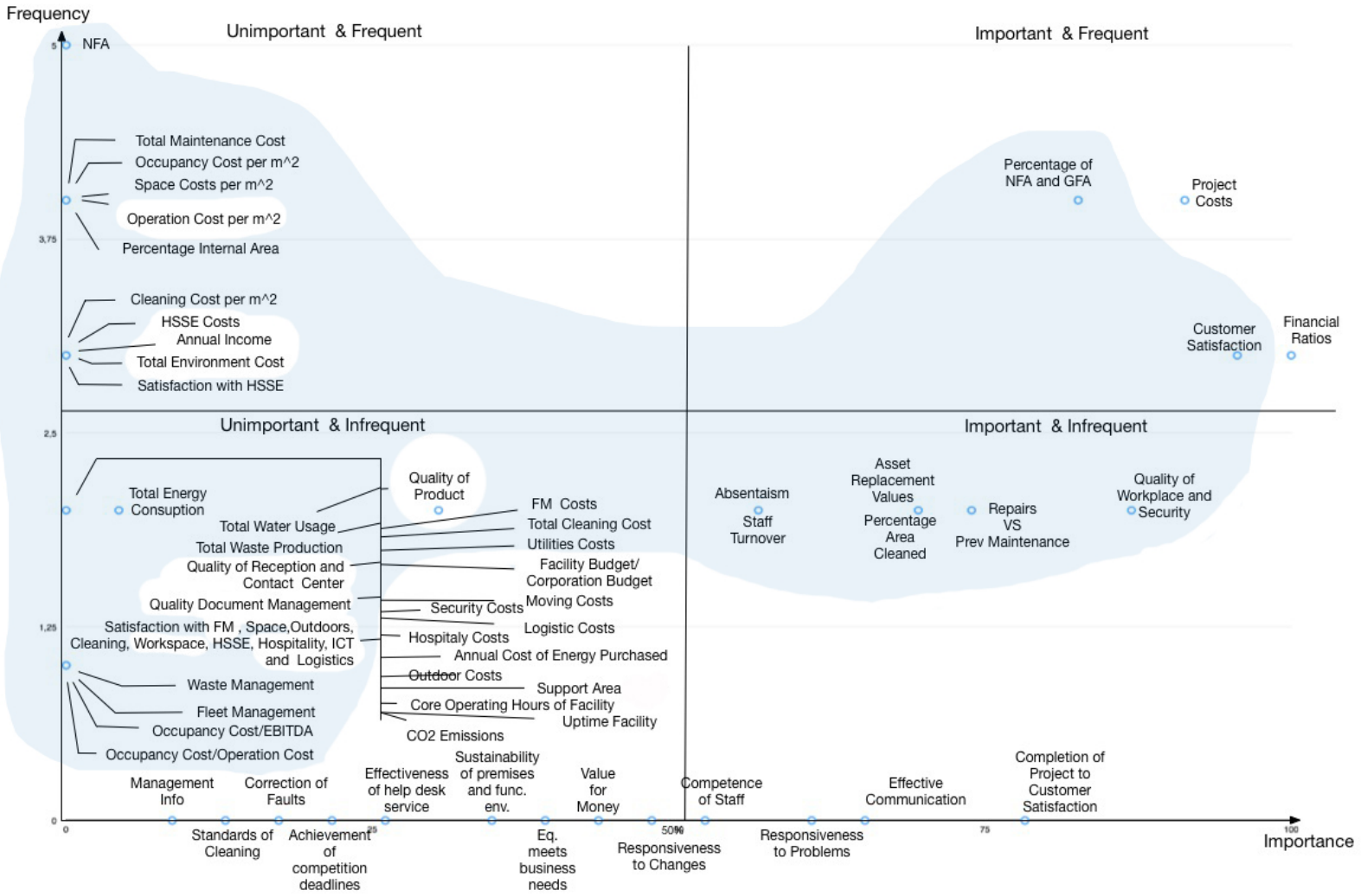
Frequency of KPIs on Scientific Literature and Existing Solutions

Indicators	Costa et al	USA, UK and Chile Projects	IFMA	ARCHIBUS	Ho et al	Massheder et al	Hinks et al	Total
Financial Indicators								
Total Cleaning Cost			•					1
Cleaning Cost per m^2			•	•				2
Total Maintenance Cost			•	•	•			3
Spacial Indicators								
Net Floor Area			•	•	•	•	•	5
Percentage Net Floor Area			•	•	•		•	4
Percentage Internal Area			•	•	•		•	4
Maintenance/Cleaning Indicators								
Repairs VS Preventive Maintenance					•		•	2
Asset Replacement Values			•				•	2
Percentage of Area Cleaned			•				•	2
...			...					

Calculation of KPIs

Indicators	Units	Description
Financial Indicators		
Total Cleaning Cost	€/mo	Sum of all cleaning costs
Cleaning Cost per m^2	€/m^2	Total Cleaning Cost/Net Room Area OR Total Cleaning Costs/Net Floor Area
Spacial Indicators		
Net Floor Area per FTE	m^2/FTE	Net Floor Area/Number of FTE personnel
Percentage Net Floor Area	%	(Net Floor Area/Total Level Area)x100
Percentage Internal Area	%	(Internal Area/Total Level Area)x100
Maintenance/Cleaning Indicators		
Repairs VS Preventive Maintenance (by specialty)	%	(Number of Corrective Maintenance per month/Number of Preventive Maintenance per month)x100
Asset Replacement Values (by specialty)	%	(Annual Maintenance Cost/Maintained Assets Replacement Value)x100
Percentage of Area Cleaned	%	Area Cleaned/Net Floor Area
...	...	

Discussion



KPIs Proposed

Indicator	Units	Description
Financial Indicators		
Total Cleaning Cost	€/mo	Sum of all cleaning costs
Occupancy Cost per EBITDA	%	(Occupancy Cost/Earning Before Interest, Taxes, Depreciation and Amortization)*100
Spacial Indicators		
Net Floor Area per FTE	m^2/FTE	Net Floor Area/Number of FTE personnel
Percentage Gross Floor Area	%	(Gross Floor Area/Total Level Area)x100
Maintenance/Cleaning Indicators		
Repairs VS Preventive Maintenance (by specialty)	%	(Number of Corrective Maintenance per month/Number of Preventive Maintenance per month)x100
Percentage of Area Cleaned	%	Area Cleaned/Net Floor Area
Productivity Indicators		
Staff Turnover	%	(Number of Employee Departures (FTE)/Average Number of Staff Members (FTE) Employed)x100
Absenteeism	%	(Total Days Lost/Total Possible Days Worked)x100
Environmental Indicators		
Total Energy Consumption	kWh/mo	
Total Water Usage	m^3/mo	
Service Quality Indicators		
Quality of Cleaning		Values Obtained Through Audits or Questionnaires
Quality of Security		Values Obtained Through Audits or Questionnaires
...	...	

Outline

Goals

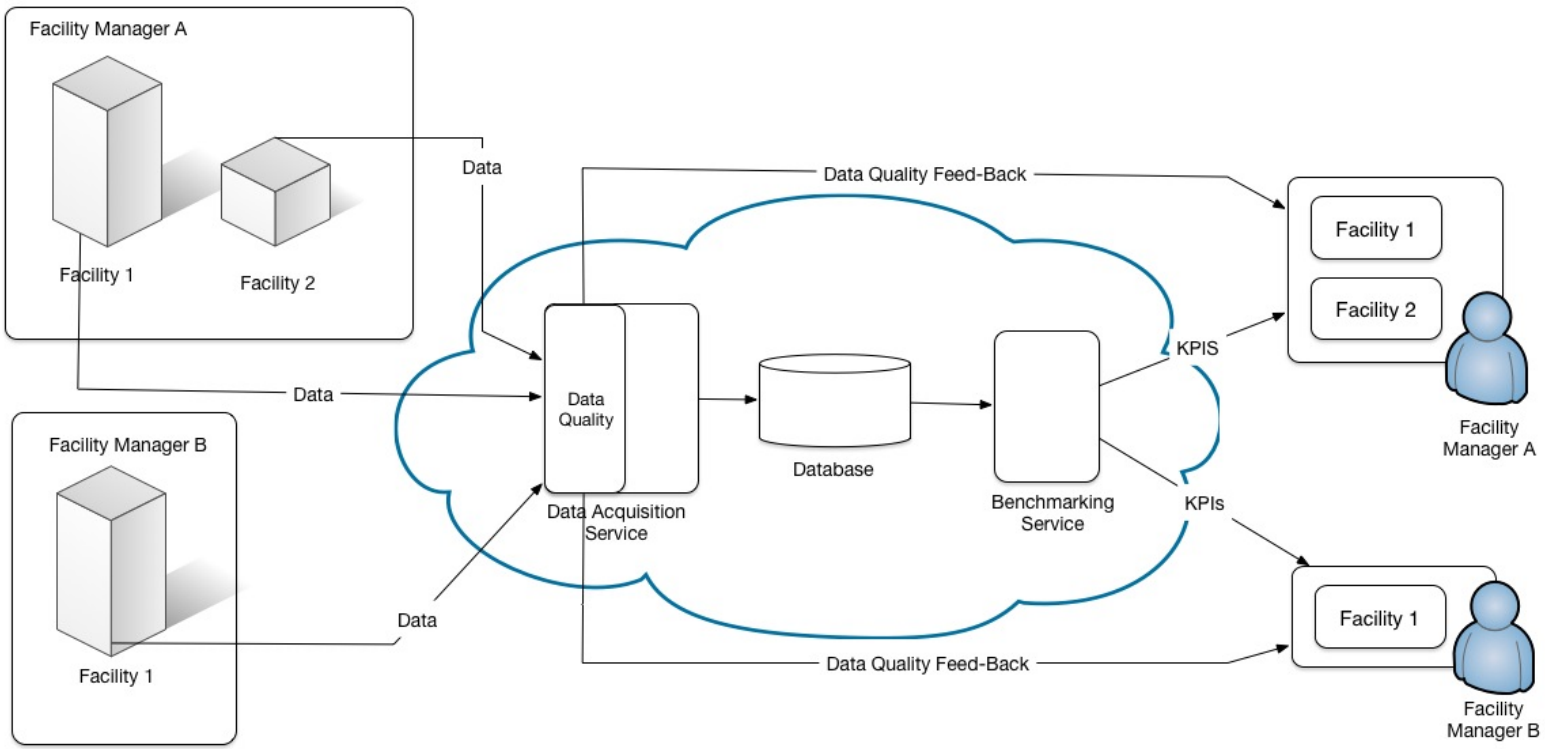
- Display KPIs through graphics
- Have a ranking between organizations
- Use authentication service to authenticate the users of a organization
- Have a cache on the database for better performance

Cloud Computing

Bringing FM and Benchmarking to the cloud brings benefits:

- Enables a easier way for entering, process and accessing the data
- Enables saving of IT and maintenance costs
- Cloud applications can be accessed anywhere and anytime

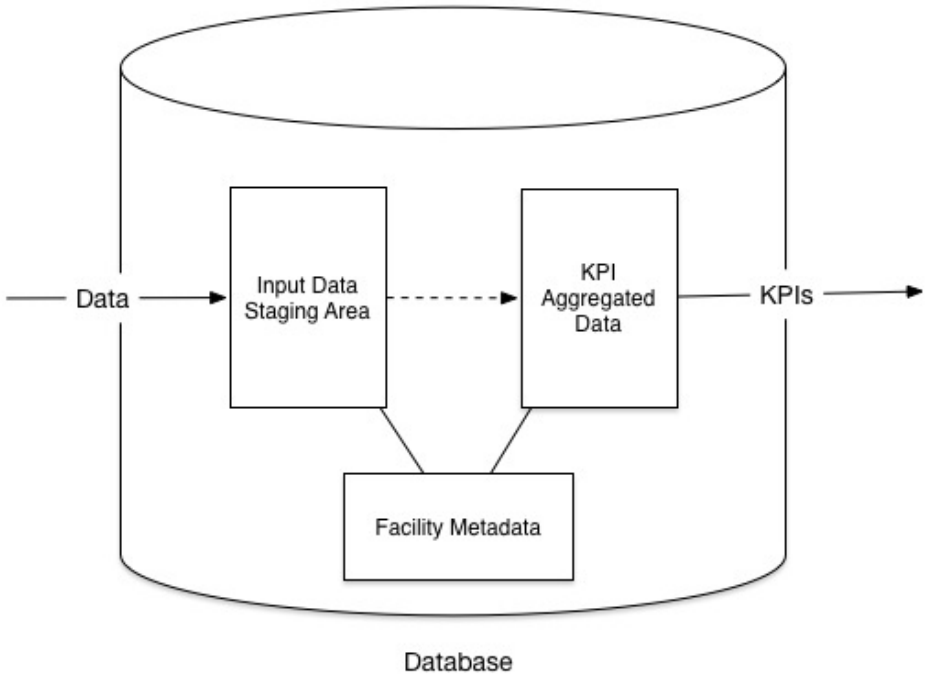
Architecture



Architecture

Database

- Relational Database
- Theoretically divided in three



Deployment

Outline

Evaluation

Usability Tests

- To understand if the application interface is well designed and perceptible.

Qualitative Tests

- To gather users opinions.

Indicators Rating

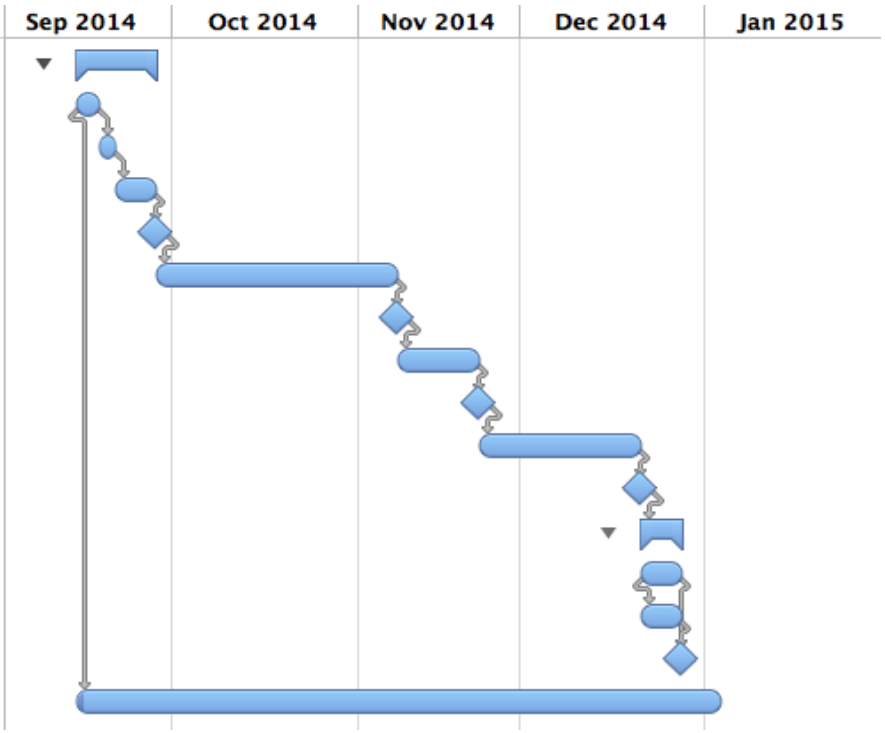
- To realize which indicators are the most convenient to any specific users.

Performance Tests

- To verify the transactions costs.

Planning

Task	Effort
1) **Start-up**	2w
1.1) Work environment setup	3d
1.2) Study PlayFramework	2d
1.3) Study key services to implement	1w
1.4) Start-up studies completed	
2) Back-end Implementation	6w
3) Back-end Implementation Completed	
4) Performance Tests	2w
5) Performance Tests Completed	
6) Front-end Implementation	4w
7) Front-end Implementation Completed	
8) **Tests with users**	2w
8.1) Usability Tests	1w
8.2) Qualitative Tests	1w
8.3) Tests Completed	
9) Writing MSc Thesis	16w



Outline

Conclusions

- There is no commonly agreed set of metrics to compare facilities
- Analysis of existents standards
- Proposal of a set of KPIs
- Validation through the cloud proposal solution

Thank you!

Questions?