

Angelica Kim  
Clara Hoey  
Mia Jung  
Tae Lee

## Facilities Team Project Phase 3 Document: Initial Implementation

### 1. Our Final Relational Schema:

```
create table Elements (  
    eid SERIAL primary key,  
    assetName VARCHAR not null references Assets (name) on delete cascade,  
    L1Code VARCHAR,  
    L2Code VARCHAR,  
    L3Code VARCHAR,  
    component VARCHAR,  
    repairNotes VARCHAR,  
    eulife DECIMAL,  
    unit VARCHAR,  
    unitCost DECIMAL,  
    quantity DECIMAL,  
    installDate integer,  
    condition condition,  
    failureConsequence failureConsequence,  
    imageURL VARCHAR,  
    UNIQUE(assetName, component)  
);
```

```
create type failureConsequence as enum (  
    'Nuisance',  
    'Program Interruption',  
    'Partial Building Shutdown',  
    'Full Building Shutdown',  
    'Multi-Building Shutdown',  
    'Campus Shutdown',  
    'Fire/Lifesafety'  
);
```

```
create table Projects(  
    pid VARCHAR PRIMARY KEY,
```

```

    projectName VARCHAR,
    assetName VARCHAR not null references Assets (name) on delete cascade,
    eid INTEGER NOT NULL REFERENCES Elements ON DELETE cascade,
    category VARCHAR,
    description VARCHAR,
    relatedProjects VARCHAR REFERENCES Projects,
    complete BOOLEAN,
    inProgress BOOLEAN,
    renewal BOOLEAN,
    inspectedDate DATE,
    dueYear integer,
    baseCost DECIMAL CHECK(baseCost > 0),
    replacementFactor DECIMAL,
    softCostFactor DECIMAL,
    difficultyFactor DECIMAL,
    consultEstimateLow DECIMAL,
    consultEstimateHigh DECIMAL,
    calculatedCost DECIMAL,
    totalQuantity DECIMAL,
    quantity DECIMAL CHECK(quantity <= totalQuantity),
    completedDate DATE,
    actualCost DECIMAL,
    actualCostNotes VARCHAR,
    imageURL VARCHAR
);
create table Assets(
    bid CHAR(5),
    aname VARCHAR primary key,
    altName VARCHAR,
    class class,
    assettype purpose,
    streetAddr VARCHAR,
    gsf DECIMAL,
    replacementValue DECIMAL,
    latitude DECIMAL,
    longitude DECIMAL
);
create type class as enum ('Building', 'Court', 'Field', 'Road', 'Utility');

```

```
create type purpose as enum ('Academic', 'Administrative', 'Athletic', 'Campus', 'Faculty Housing', 'Residence Hall', 'Student Life');
```

```
CREATE TABLE ConditionWeights(
    condition condition PRIMARY KEY,
    weight DECIMAL
);
```

```
CREATE TABLE FailureConsequenceWeights(
    failureConsequence failureConsequence PRIMARY KEY,
    weight DECIMAL
);
```

```
CREATE TABLE AssetTypeWeights(
    assetType purpose PRIMARY KEY,
    weight DECIMAL
);
```

## 2. Our populated database and tables:

Our client is currently engaged in the ongoing refinement of table structures and the completion of certain unfilled fields. Consequently, the sample data within our tables comprises a combination of authentic client-provided data and placeholder example data. The inclusion of placeholder data serves as a temporary measure until our client furnishes us with all requisite field information.

Current Elements Table:

	123	ABC assetname	ABC I1c	ABC I2coi	ABC I3code	ABC component	ABC repairnotes
1	11	<a href="#">Cohan Residence Hall</a>	B Shell	B20 Exterior	B2010 Exterior Wall	Parapet Wall (Coping)	Coping shows severe signs of
2	31	<a href="#">Orr Rink</a>	B Shell	B30 Roofing	B3010 Roof Coverir	Roofing, PVC	
3	32	<a href="#">Orr Rink</a>	B Shell	B30 Roofing	B3010 Roof Coverir	Roofing, TPO	
4	17	<a href="#">Cohan Residence Hall</a>	D Services	D30 HVAC	D3020 Heat Genera	Mechanical, Heating,	
5	19	<a href="#">Cohan Residence Hall</a>	D Services	D30 HVAC	D3040 Distribution	Mechanical, Ventilatic	
6	20	<a href="#">Cohan Residence Hall</a>	D Services	D30 HVAC	D3040 Distribution	Mechanical, Ventilatic	

123 eulife	ABC unit	123 unitcost	123 quantity	ABC condition	ABC failureconsequence	ABC imageurl	123 installyear
1	LF	50	4	Poor	Nuisance		2,020
5	LF	60	10	Fair	Program Interruption		2,018
10	LF	80	5	Good	Program Interruption		2,019
2	EA	90	2	Poor	Nuisance	[NULL]	1,896
5	EA	100	1	Poor	Program Interruption	[NULL]	1,896
3	EA	110	3	Poor	Partial Building Shutdown	[NULL]	1,896

## Current Projects Table:

	ABC pid	ABC projectname	ABC assetname	123 eid	ABC category	ABC description
1	COHA-009	Replace Terminal Units	<a href="#">Cohan Residence Hall</a>	17	Lifecycle	Original to building, poor condition.
2	COHA-010	Replace Exhaust Fans	<a href="#">Cohan Residence Hall</a>	19	Lifecycle	Original to building, poor condition.
3	COHA-011	Replace Air Handling Unit	<a href="#">Cohan Residence Hall</a>	20	Lifecycle	Original to building, poor condition.
4	ORR-006	Replace PVC Vaulted Roof	<a href="#">Orr Rink</a>	31	Lifecycle	[NULL]
5	ORR-007	Replace TPO Roof	<a href="#">Orr Rink</a>	32	Lifecycle	[NULL]
6	COHA-004	Precast Coping Displacement Study	<a href="#">Cohan Residence Hall</a>	11	Reliability	Study to determine cause of precast coping displacement at sloped

ABC relatedprojects	<input checked="" type="checkbox"/> complete	<input checked="" type="checkbox"/> inprogress	<input checked="" type="checkbox"/> renewal	<input checked="" type="checkbox"/> inspecteddate	123 dueyear	123 basecost	123 replacementfactor	123 softcostfactor
[NULL]	[NULL]	[NULL]	[v]	[NULL]	[NULL]	[NULL]	1.25	1.2
[NULL]	[NULL]	[NULL]	[v]	[NULL]	[NULL]	[NULL]	1.25	1.2
[NULL]	[NULL]	[NULL]	[v]	[NULL]	[NULL]	[NULL]	1.25	1.2
[NULL]	[v]	[ ]	[v]	[NULL]	[NULL]	[NULL]	1.25	1.2
[NULL]	[v]	[ ]	[v]	[NULL]	[NULL]	[NULL]	1.25	1.2
[NULL]	[ ]	[ ]	[v]	2001-01-21	[NULL]	50,000	1.25	1.2

123 difficultyfactor	123 consultestimatelow	123 consultestimatehigh	123 calculatedcost	123 totalquantity	123 quantity	<input checked="" type="checkbox"/> completeddate	123 actualcost
1	1,500,000	1,750,000	[NULL]	[NULL]	2	[NULL]	[NULL]
1	40,000	60,000	[NULL]	[NULL]	1	[NULL]	[NULL]
1	50,000	75,000	[NULL]	[NULL]	3	[NULL]	[NULL]
1	600,000	700,000	[NULL]	10	1	[NULL]	500,000
1	60,000	80,000	[NULL]	5	3	[NULL]	100,000
1	[NULL]	1,000,000	[NULL]	4	2	[NULL]	[NULL]

ABC actualcostnotes	ABC imageurl	123 duedate
[NULL]	<a href="https://drive.google.com/drive/folders/1G5DJ8AIdvBddUja1JtnJJW">https://drive.google.com/drive/folders/1G5DJ8AIdvBddUja1JtnJJW</a>	2,028
[NULL]	<a href="https://drive.google.com/drive/folders/1pOWL7F_ooxI7YNHpXvGVI">https://drive.google.com/drive/folders/1pOWL7F_ooxI7YNHpXvGVI</a>	2,028
[NULL]	<a href="https://drive.google.com/drive/folders/1pUj6xgq0SDiG854HTEud7">https://drive.google.com/drive/folders/1pUj6xgq0SDiG854HTEud7</a>	2,033
[NULL]	[NULL]	2,028
[NULL]	[NULL]	2,033
[NULL]	[NULL]	2,022

## Current Assets Table:

	ABC bid	ABC aname	ABC altname	ABC class	ABC assettype
1	271S	271 South Pleasant Street	Hitchcock House	Building	Administrative
2	40DS	40 Dickinson Street	[NULL]	Building	Administrative
3	LINC	Lincoln House	[NULL]	Building	Residence Hall
4	79SP	79 South Pleasant Street	[NULL]	Building	Administrative
5	GYM	Alumni Gym	[NULL]	Building	Athletic
6	ALUM	Alumni House	[NULL]	Building	Administrative
7	APPL	Appleton Residence Hall	[NULL]	Building	Residence Hall
8	MUSI	Arms Music Center	[NULL]	Building	Academic

ABC streetaddr	123 gsf	123 replacementvalue	123 latitude	123 longitude
271 South Pleasant St.	6,800	2,047,830	[NULL]	[NULL]
40 Dickinson St.	6,900	6,760,852	[NULL]	[NULL]
405 South Pleasant St.	5,700	1,413,641	[NULL]	[NULL]
79 South Pleasant St.	17,200	5,789,195	[NULL]	[NULL]
266 South Pleasant St.	57,500	32,595,223	[NULL]	[NULL]
75 Churchill St.	9,200	2,770,594	[NULL]	[NULL]
19 Quadrangle Dr.	19,100	6,767,052	[NULL]	[NULL]
53 College St.	43,800	24,829,057	[NULL]	[NULL]

Our Current assettypeweights, failureconsequenceweights, and conditionweights tables:

assettype	weight	failureconsequence	weight	condition	weight
1 Academic	1	1 Nuisance	1	1 Excellent	1
2 Administrative	3	2 Program Interruption	3	2 Good	4
3 Athletic	4	3 Partial Building Shutdown	4	3 Fair	5
4 Campus	6	4 Multi-Building Shutdown	6	4 Poor	8
5 Faculty Housing	8	5 Campus Shutdown	8	5 Failed	10
6 Residence Hall	9	6 Fire/Lifesafety	10		
7 Student Life	10				

### 3. Our Example SQL Queries that showcase the different ways that the user would interact with our database:

The user can view the priority score bubble diagram through the following query:

```

SELECT
    p.projectname, a.assettype, cw."condition", fc."failureconsequence",
    atw.weight*10 + cw.weight*20 + fc.weight*30 AS priority_score
FROM
    projects p
JOIN
    elements e ON p.eid = e.eid
JOIN
    assets a ON e.assetname = a.aname
JOIN
    assettypeweights atw ON a.assettype = atw.assettype
JOIN
    conditionweights cw ON e.condition = cw.condition
JOIN
    fcweights fc ON e.failureconsequence = fc.failureconsequence

```

The user can view the FCI score bar chart through the following query:

```

select a.aname,
    (sum(e.quantity * e.unitcost) + sum(p.consultestimatehigh))/a.replacementvalue as fci
from projects p
join elements e on p.eid = e.eid
join assets a on e.assetname = a.aname
group by a.aname;

```

The user can view Replacement Value bar chart through the following query:

```

with recursive replacementValueInflation (year, replacementValueInf) AS (
  select
    2023 as year,
    SUM(replacementvalue)::numeric as replacementValueInf
  from assets a
  UNION ALL
  select year + 1, replacementValueInf * (1 + 3.5/100)
  from replacementValueInflation
  WHERE year < 2033
), replacementValueNext as (
  SELECT
    year,
    replacementValueInf,
    LEAD(replacementValueInf, 1) OVER (
      ORDER BY year
    ) replacementValNext
  FROM
    replacementValueInflation
)
select
  year,
  replacementValueInf,
  replacementValNext,
  (replacementValNext - replacementValueInf) loss_next_year
from
  replacementValueNext

```

The user can view the cost chart through the following query:

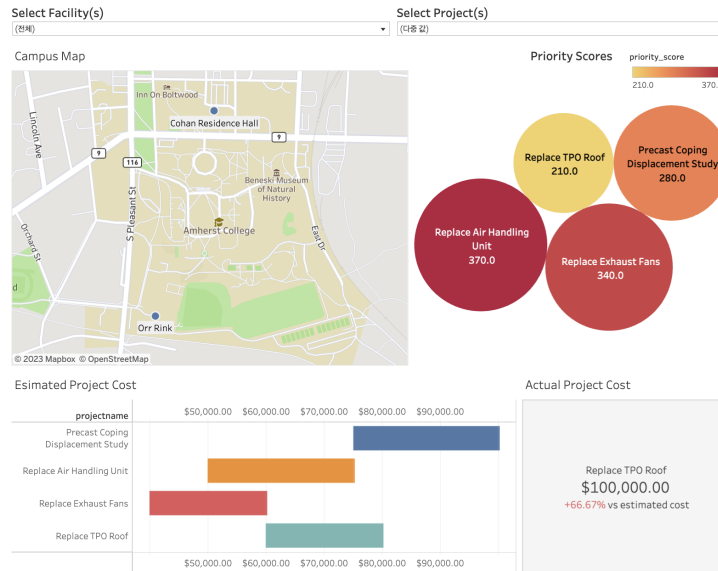
```

select
  --variables used for maps
  p.assetname as assetName, class,
  assettype, streetaddr, latitude, longitude,
  --variables used for project costs
  pid, projectname, consultestimatehigh,
  case when consultestimatelow is null
    then p.baseCost*replacementfactor*softcostfactor*difficultyfactor
    else consultestimatelow end as consultestimatelow,
  complete, inprogress, actualcost
from projects p
left join elements e
on p.eid = e.eid
left join assets a
on e.assetname = a.aname;

```

4. What we have in our Tableau dashboard, where the example SQL queries are performed to display useful and interactive displays:

<https://public.tableau.com/app/profile/angelica.kim1227/viz/FacilityDatabase/Story1?publsh=yes>



## 5. A second assignment of roles to team members for phase 3:

We stand by the role assignment description from phase 3, emphasizing a collaborative and contributory role from every team member.

## 6. A list of open questions about our project, which we plan to answer in phase 4:

- What other diagrams does our client need that are feasible for us to make?
- What is the final form of the data going to look like and what adjustments, if any, do we need to make?
  - For example, how does the client handle the missing data for calculated fields?
- How is our client going to interact with the database to input the data he needs to keep, and is it intuitive enough for more people to use it?

In general, we are curious to see how we can adjust and add to our current diagrams and displays to make it more helpful for our client, and we are curious to see how our client continues to reimagine and reorganize his data tables. We are currently waiting for him to finish this process so that we can populate our tables in full, with his newly updated and regorganized data.