Urban Node Project
Final Presentation

02/06/14, Vilanova I la Geltru
6 Members, 5 Nationalities

- Calley, London, Product Design
- Gerard, Barcelona, Mechanical Engineering
- Dieter, Antwerp, Civil Engineering
- Weronika, Lodz, Architectural Engineering
- Antoine, Reims, Packaging Engineering
- César, Grenoble, Industrial Engineering
The Urban Node Project Scopes

Design an innovative urban element

Urban Node Global Project

- Design
- Energy
- Features

2013 EPS Project
- Data Acquisition
- Intelligent Structure
- Electronics

2014 EPS Project
- Construction
- Manufacturing
- Business

UNIVERSITAT POLITÈCNICA DE CATALUNYA
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neàpolis
Introduction:

- Presentation of the Project
- SWOT Analysis from previous projects

1) From the Design to Construction

2) Strength Analysis

3) Company and Quality Control

4) Marketing Plan

5) Cost Benefit Analysis

Conclusion & Recommendations
SWOT Analysis from previous projects

**STRENGTHS**
- Ergonomics
  - User Profiles
- Aesthetics
  - Lighting
- Function
  - Features

**WEAKNESSES**
- Ergonomics
  - User profiles
- Aesthetics
  - Shape
- Function
  - Lighting

**OPPORTUNITIES**
- Location
- Tourism
- International/Globalization
- Maintenance

**THREATS**
- Competitors
- Cost
- Maintenance
- Smart City
From the Design to Construction

Design, Technical drawings and 3D Printing
Design Of Urban Node

- Red Turbine
- Solar Panel
- Steel ‘Spine’
- CCTV Camera
- Sensors
- 4G Antenna
- Transparent Lighting Part
- Streamlined Shape
- Interactive Screen
- Absorbing Apperance

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Urban Nodes in Vilanova i la Geltrú

- Plaza de la Vila
- Rambla Principal
Technical drawings

- Contact last year project teams
  \(\rightarrow\) Get the 3D model

- Analyze those drawings

- Transform drawings with the right extension for Solidworks
  - .igs \(\rightarrow\) .sldp

- Draw the missing component of the Urban Node
  - Wind turbine

- Create animations of the finished Urban Node
3D Printing

- Design to Construction
- Strength Analysis
- Company and Quality
- Marketing Plan
- Cost Benefit Analysis

Objective: Create a prototype

Neapolis produced the prototype

Special software and process

One week to produce the prototype

Use only ABS: Thermoplastic polymer

3D Printing

Design to Construction

Strength Analysis

Company and Quality

Marketing Plan

Cost Benefit Analysis

Company and Quality

Marketing Plan

Cost Benefit Analysis

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Strength Analysis
## Materials

<table>
<thead>
<tr>
<th></th>
<th>Steel</th>
<th>Concrete</th>
<th>Glassfibre</th>
<th>Vubonite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density (kg/m³)</td>
<td>7800</td>
<td>2500</td>
<td>2550</td>
<td>Low</td>
</tr>
<tr>
<td>Strength</td>
<td>Strong</td>
<td>Ok</td>
<td>Strong</td>
<td>Very strong</td>
</tr>
<tr>
<td>Thickness</td>
<td>Thin</td>
<td>Thick</td>
<td>Thin</td>
<td>Thin</td>
</tr>
<tr>
<td>Cost</td>
<td>Cheap</td>
<td>Cheap</td>
<td>Expensive</td>
<td>Very expensive</td>
</tr>
<tr>
<td>Production</td>
<td>Easy</td>
<td>Easy</td>
<td>Difficult</td>
<td>Difficult</td>
</tr>
<tr>
<td>Corrosion</td>
<td>Possible</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

### Glass fibre and Vubonite
- Very good characteristics
- Even too much for this project
- Not cost efficient

### Concrete
- Good characteristics and cost efficient
- But problem with thinnest part of Urban Node

### Steel
- Best solution
- Good characteristics and cost efficient
- Corrosion → Solution (protective paint, …)
Strength analysis (Eurocode 3)

- Classification of section
  - Slenderness
  - Distribution of compressive forces

→ Classification 1
Strength analysis

- **Control on buckling**
  \[ X = \frac{1}{\phi + (\phi^2 - \lambda^2)^{0.5}} = \frac{1}{6,1163 + (6,1163^2 - 3,13^2)^{0.5}} = 0,08 \leq 1 \]

- **Compression load**
  \[ N_{X,Sd} \leq N_{b,Rd} = A \cdot f_y \cdot \frac{\beta_A \cdot f_y}{\gamma_M} = 0,08 \cdot \frac{2400 \cdot 235}{1,1} = 41018N = 41,08kN \]
  \[ N_{X,Sd} \leq N_{b,Rd} \]
  \[ 2000N \leq 41080N \]

- **Bending load**
  \[ M_{pl,y,Rd} = \frac{W_{pl,y} \cdot f_y}{\gamma_M} = \frac{61000 \cdot 235}{1,1} = 13031818Nmm = 13031Nm \]
  \[ M_{pl,z,Rd} = \frac{W_{pl,z} \cdot f_z}{\gamma_M} = \frac{81000 \cdot 235}{1,1} = 17304545Nmm = 17304Nm \]
  \[ M_{sd,y} = 50N \cdot 0,3m = 15Nm \]
  \[ M_{sd,z} = 500N \cdot 0,75m = 375Nm \]
Strength analysis - Conclusion

- Urban node
  - Steel plate: 5 mm
  - Quality: S235

  ➔ Strong enough

- Corrosion & Protection
  - Galvanization
  - Rust-resistant alloys
  - Cathodic protection
  - Coatings and painting

  ➔ Painting ➔ Cheapest solution
  ➔ Possibility to choose the color
Company and Quality Control
Company Contact

- Letter
  - First Contact
  - By email
  → Have a meeting

- Presentation
  - Detailed explanation
  - By powerpoint
  → Convince & Sell
Quality Control

Urban Node Quality Controls

Common with street lamp
- Metallurgical
- Dimensional
- Resistance
- Painting
- Street situations

Specific for Urban Node
- Interactive screen
- Solar panel
- Wind turbine
- Sensors
- Antenna 4G
Marketing Plan
From a Vision...

Background
- The continuation of two previous projects

Our vision
- To develop and define the Urban Node

Objectives
- User interaction, additional features, energy generator, encourage smart cities

USP
- The ability to interact with its users through the use of technology
To a Strategy

Target users
- The Urban Node has a high number of User Profiles – Mass market product

Market position
- The Urban Node will be classed as high end product

Competitors
- Research indicates that there are no immediate competitors

Promotion Strategy
- The implementation of a Working prototype
  - Creating and Distribution using marketing materials

Design to Construction
Strength Analysis
Company and Quality
Marketing Plan
Cost Benefit Analysis
Expenses

- Raw materials: 1%
- Machines: 3%
- Manufacturing: 42%
- Quality Control: 40%
- Logistics: 14%

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Advertising Incomes

TV

Advertising Display

Internet Website

Dynamic Digital Signage
Economic Balance

ROI Evolution

- Advertising display
- Internet Website
- TV
- Dynamic Digital Signage
- CPM Model

Manufacturing time in months vs. ROI in years
Conclusion & Recommendations
Conclusion

Project as Innovative as Evolutionary
- Sensors and data gathering
- Sun power & Wind power
- Information point with an interactive screen

Objectives:
- Use management tools: Gantt chart, responsibility matrix, WBS, communication plan
- Define the dimensions, the shape and the modular aspect
- Define the materials
- Determine the components used for the urban node
- Find the 3D model (CAD drawings) & make technical drawings
- Company research
- Manufaturing processes
- Marketing Plan
- Cost Benefit Analysis
Recommendations

Next Steps:

- Work on the programming and electronics of the Urban Node
- Conduct a Marketing Action Plan with a company
- Update the Cost Benefit Analysis
- Implementation of a life size working prototype

Profiles required for next steps:

- Computer and Programming Engineer
- Electrical Engineer
- Electronic Engineer
- Industrial Engineer
- Mechanical Engineer

→ Arrange a partnership with a company (UPC)
Thank you for your attention!