Smart City - a Quest for Innovation within the EPS Framework

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“The name SmarTeam was chosen by team members as a symbol of connectivity. It is combination of two words, SMART from the Smart City project name, and (...) TEAM. The name is written only with one T to underline how important relations are for SmarTeam members. “

EPS Report: Smart City project 2013/2014, International Faculty of Engineering, TUL

Slogan: The best way to connect the city

SmarTeam logo – design: Joanna Mnarczyk
**Creativity** - an applied imagination using qualities such as *intelligence, inventiveness, and learning* along the way.


Original ideas result from initial curiosity and innovation and after a little lateral thinking they require a more convergent approach that takes them through a reality checker from which an innovation might emerge.
**Project Based Learning** methodology:
- allows a more efficient and useful learning process
- provides a framework for shaping innovative ideas

**European Project Semester (EPS)** at Lodz University of Technology, International Faculty of Engineering. Program addressed to bachelor level students in the 3rd year of their studies as maximum. EPS is offered by 13 universities in 11 EU countries.

The team of 5 students (aged 20 to 22), from various European countries:
- Spain
- France
- Poland

a wide range of fields of engineering:
- computer science
- biomedical engineering
- management
**Project Based Learning** methodology:

- the emphasis on team work
- entrepreneurial skills
- collaborative problem solving.

4 **main stages** of the project:

- **forming** – getting to know each other
- **storming** - developing of shared understanding of the defined problem, adjustment and adaptation to the group environment
- **norming** - deeper involvement of participants in the project
- **performing** - implementation, the stage of productive work

(Andersen, 2009).

The project is accompanied by Team Building and Project Management courses, giving students the opportunity to learn some presentation and communication skills.
a strongly collaborative environment, the team spirit, esprit, team morale, common bond, cooperation...
the team spirit, esprit, team morale, common bond, cooperation...

Rules for the group work:

- In case of a disagreement in the team: “Keep calm, make yourself a cup of tea or coffee, and find solutions.”
- Everybody has the opportunity to speak and express until he/she feels that the team understands. Too long comments will be stopped.
- It is important to discuss feelings but more important to discuss concrete knowledge.
- The best way to learn how to function in a team it is to listen to each other and work together.
Team building

Definition of smart city

State of art

Diagnosis: good/bad points, chances, obligations

Proposals/Ideas/Solutions

Selection of ideas

Development of ideas

Realisation

Report and final presentation

start

end

Gantt diagram of project in 1st stage

Task Name | Start | Finish |
---|---|---|
Project and team presentation | Thu 17-10-13 | Sun 20-10-13 |
Define Smart City | Thu 17-10-13 | Fri 15-11-13 |
Ideas to concretize the project | Mon 04-11-13 | Thu 07-11-13 |
Name, slogan, logo | Wed 13-11-13 | Fri 15-11-13 |
Schedule of the next work | Mon 18-11-13 | Wed 20-11-13 |
Preparation of midterm evaluation | Mon 18-11-13 | Sun 24-11-13 |
Midterm evaluation | Mon 25-11-13 | Fri 29-11-13 |
Team Building | Thu 17-10-13 | Fri 29-11-13 |
Gantt diagram of the project in 2nd stage
Smart city - “a developed urban area that creates **sustainable economic development** and **high quality of life** by excelling in multiple key areas; economy, mobility, environment, people, living, and government. Excelling in these key areas can be done so through **strong human capital, social capital, and/or ICT infrastructure**“


“Smart Cities have been characterized and defined by a number of factors including **sustainability, economic development and a high quality of life**. Enhancing these factors can be achieved through infrastructure (physical capital), human capital, social capital and/or ICT infrastructure.”


The emphasis on the **issues of governance and planning and the social participation and collaboration** in defining the goals for future.


The impact of smart cities' phenomena on science, technology and competitiveness and on society itself.

Smart city - "revolution intervening in terms of a new infrastructure and platform, made of both virtual and physical elements, enabling citizens, users and all different urban players to carry on activities and realize applications thanks to the opportunity allowed by improvements in technology and its widespread presence"


“A Smart City is a place where citizens interact with the city in order to satisfy their necessities (relationship, communication, green energy, economy, connectivity, accessibility, culture) and improve their quality of life using new technologies.” (EPS Report, 2014).

The emphasis on social and cultural aspects of urban development is also expressed e.g. by Carlo Ratti in his talk 'Decalogue for a “SENSEable” City' (2013), where he talked "not about technology, but about us".

As William H. Whyte (2009) discerns "what attracts people are first of all other people".
Key fields of urban and technology development and 4 potential areas of the project:

1. accessibility, with an emphasis on public transportation,
2. connectivity, including also the broader theme of improving the quality of interpersonal relations and building social capital,
3. green energy and environmental protection
4. "culture and innovation"
4 aspects of Smart City

**City environment**
- Cities as inherent parts of the environment.
- Bringing “nature” into the city.
- Lack of proper care for the environment in the past.
- The simplification of urban landscape generates a loss of biodiversity.
- Trials to respect and protect the environment inside the city, creating green areas, parks and using green energy in order to reduce the pollution of the atmosphere and prevent climate changes.

**Communication and relationship**
- Communication - “the process by which information is passed between individuals and/or organizations by means of previously agreed symbols” (P. Little 2012).
- Technology enables effective communication but its speed may constrain the ability to build meaningful relationships.
- Effective communication anticipates citizen’s requirements. It uses codes: colours, light, sounds, signs, it enhances mass collecting of information, i.e., crowd-sourcing, it assists process organisation or just provides a communication platform (Hanzl, 2007).

**Culture and innovation**
- Cities compete to provide comfort, which requires satisfaction of human needs: security and safety, education, etc.
- The recognition of the city’s own culture and history is key for knowledgeable and respectful development.
- Every area of human activity may be enhanced with the use of technology: education, sports or musical and theatre spectacles.
- The constraints are creativity and organisation, the background is the adjustment to local culture.

**Connectivity and accessibility**
- The transportation system: accessibility of goods and citizens' mobility – effective management.
- Availability of interactive information increases the comfort of commuters, thus significantly improving travel conditions.
- The role of pedestrian movement as a form of transportation.
- "(...) smart-smart urbanism should follow specific planning principles, privileging the complexity of ground-plane design, recognising the cognitive value of pedestrian experience." (Senett, 2012)
There is the need to understand “the implications of how the city is being wired, how it is generating new data, how this data might force new theories and models relevant to our understanding, how we might use our strategic models and intelligence to plan the city”


Severe critics of an approach favouring concentration on technology and infrastructure and overlooking the intelligence of citizens and human capacities, as leading to amounts of useless technological innovations.


Cities tend to urbanise technologies. How to implement intelligent systems enhancing urbanisation rather than deurbanising cities. How to put the technology “at the service of inhabitants, not the other way around: the inhabitants as incidental users.”

A visit of prof. Jan Gehl to Lodz, the event’s poster
Source: http://piotrkowska.pl
The use of remote media hasn't removed the need for direct social interaction. As "the constrains of geography are lifted, people, businesses and ultimately cities aggregate even more"


The Smart City concept at the local level:
1. to invent new means for consultation and conception of the city
2. to enhance local resources and identities of a territory
3. to experiment with new products and services on a digital city
4. to study new urban uses
5. to mobilize users, local stakeholders around the territorial project

the determinative use of technology
versus
the coordinative use of technology

closed systems
fixed and thus oppressive

open systems
may be further developed
allow flexibility
take into account citizens’ needs

Sassen, S.: Urbanising Technology, ibid
“So what is a Smart City? And how can we define it? As you can see in the previous parts, we tried to understand the main ideas and aspects of Smart Cities. How they should be. How people should feel in such cities. And we figured it out, that the really important thing is just to think smart! Think smart about how you can use new technologies and apply them in the city. How, in a smart way, you can make transportation in the city, easy, fast and comfortable. How not to waste energy but use it? How to make people feel safe and happy in their daily life. How to make them ACT smart.”

EPS Report 2014

Methods: lectures, internet and library queries, own observation based on individual experiences of cities which participants come from or are familiar with: Lyon, Paris, Madrid and Bilbao. These insights were contrasted with the reality of the former 19th century textile industry centre and post-socialist city - Lodz.

The project was focused on **smart solutions required to improve human life in urban areas**.

The [smartphone application](https://example.com) has been developed as a tangible result, as part of a general trend of development of **easy and available tools facilitating everyday citizens' life** (Townsed, 2013, pp.200-203).

An application enhancing citizens social needs of direct presence and acquiring knowledge about the city. The implementation phase: **a reality check** in the urban environment of Lodz city centre.
<table>
<thead>
<tr>
<th>Name</th>
<th>Short description</th>
<th>Platform</th>
<th>Food</th>
<th>Bar</th>
<th>Culture</th>
<th>Profile</th>
<th>Hotel</th>
<th>Comment</th>
<th>Transport</th>
<th>Vote</th>
<th>Handicap</th>
</tr>
</thead>
<tbody>
<tr>
<td>TripAdvisor</td>
<td>An application used all over the world to organise trips: visits, pubs, hotels, restaurants</td>
<td>Android, Apple</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>❌</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Avabar</td>
<td>Social application used to meet people and join friends in bars and clubs all over the world</td>
<td>Android, Apple</td>
<td>❌</td>
<td>✔</td>
<td>❌</td>
<td>❌</td>
<td>✔</td>
<td>✔</td>
<td>❌</td>
<td>✔</td>
<td>❌</td>
</tr>
<tr>
<td>Foursquare</td>
<td>An application to find out what there is to do / going out</td>
<td>Android, Apple</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<td>✔</td>
<td>❌</td>
<td>✔</td>
<td>❌</td>
</tr>
<tr>
<td>Ville de Lyon</td>
<td>An application used to go out (culture and gastronomy) find out everything that is taking place in this city.</td>
<td>Android, Apple</td>
<td>✔</td>
<td>✔</td>
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</tr>
<tr>
<td>RESAPPS</td>
<td>A set of applications enabling visitors to go out, visit, use transport. Just one function performed by one application.</td>
<td>Android, Apple, Blackberry, Windows</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<td>✔</td>
</tr>
<tr>
<td>Insiders' Amsterdam</td>
<td>An application for visiting and finding out what is happening in Amsterdam. Dedicated to tourists.</td>
<td>Android, Apple</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>❌</td>
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<td>❌</td>
<td>❌</td>
</tr>
</tbody>
</table>

Benchmarking. The key features of similar applications. Source EPS Report 2014.
U-place - a Smartphone, map based application

- a **social platform** allowing citizens to express their opinion on various spots in the city
- **crowd-sourcing methodology** to gather data on urban places - both commercial and public locations: cafes and restaurants, squares and parks
- **comments** on historical and natural heritage sites, evaluation of the experience
- **sharing** favourite places
- a way to communicate, sharing opinion about places in the city
- **promote direct meetings**

Users add places along with:
- geographical coordinates,
- type,
- photograph
- optionally, a description

Assessment on:
- quality
- price range
- system of comments

Search for location based on such criteria as: name, description, proximity, type, price range
Functional Requirements Specification

The application structure:
• a server-side app - stores data and performs the most important processing tasks, including receiving client requests and sending it appropriate responses
• a client-side app - on mobile phones, contains an interface to interact with the user and ask the server for the information the user requires.

The functional requirements:
• Adding Information
• Add a new user
• Add a new place
• Add comments on one place
• Modify place information
• Searching places
• Location Search
• User text input search
• Limited search
• Mixed search
• Voting for a place
• Displaying information on a place

A detailed description of the application is covered in the specification included in the EPS Report 2014
### Adding information:
1. adding new user,
2. adding new place,
3. adding comment to a place
2 ways of using U-place: 1. quickly find a good place to go, 2. find the best place for us according to our preferences. Source EPS Report 2014.
Evaluation, assessment, modifications: 1. voting a place, 2. displaying place info, 3. modifying info on a place

Properties of places
1. The first screen, 2a, b. Itemization (1,2) of the first screen, 3. The exemplary screen of the U-Place application, 4. Add a location. Source EPS Report 2014.
Entity-relationship diagram. EPS Report 2014
Client-side app module diagram. EPS Report 2014
Server-side app module diagram. EPS Report 2014
Work area map and a part of the table representing collected data, Quantum GIS
Statement of the final product

Finished parts:
• a complete analysis of the application, including:
  - functional requirements,
  - specification
  - interface design

• the most important stages of the design of the app, including:
  - the architecture design
  - database design
  - a complete module design

To be done:
• within the design process:
  - class diagrams for all the server code and most of the client code
• the implementation of the code
• testing and maintenance processes in an incremental process, building a small functional prototype in the first instance and improving it with some iterations, using Scrum methodology
Conclusions and further development

An innovation within the process of education in the field of Smart City technology

The initial research on Smart Cities let students define further activities and led them towards more citizen oriented solutions: "the project was focused on smart solutions required to improve human life in urban areas" the approach similar to the one of the chief researchers in the field, e.g. Ratti (2013)

The U-place Smartphone application - a social platform allowing citizens to express their opinion on various spots in the city. An objective: "to help people to be connected with the city and other citizens".

The current functionality of the application is simple and easy to manipulate. It allows users to find a desired location, to comment on a place, to add new places and to modify existing ones.

- The application architecture is open, more options:
  - connection to a database on historical heritage and reading of QR codes fixed in historical or other important locations
  - following, both places and other users.

Further development should cover other locations, e.g. Vienna.
Conclusions and further development

The EPS methodology, concentrated on problem solving, emphasises the **teamwork** and **entrepreneurship** of the participants.

The successful educational process - the EPS method is useful for projects which assume a certain **creativity** and **innovation**.

A high level of **identification** with the team and the project: "It was the opportunity (...) to meet people with another culture and way of working. Sometimes it was difficult for us to communicate and agree but we always found a solution to succeed. Living in another country, we learnt about ourselves too: punctuality, patience, responsibility and working in a team."
Acknowledgments:

Both the team and the project supervisor would like to express our thanks to the EPS staff and teachers. First of all we would like to thank the Director of the International Faculty of Engineering, Lodz University of Technology, dr Tomasz Wolski.

Than we would like to express thanks to Grazyna Budzyńska, who provided us with necessary teambuilding skills, to Prof. Zbigniew Kołaciński, who wrote the review of our work. Finally, we are truly grateful to Joanna Auguścik, who coordinated the whole European Project Semester and answered questions on the organisation of the whole process.
Thank you for your attention!

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