Innovative Product Service System Design of Ecological Public Toilets

Liu Xin  
Academy of Arts & Design, Tsinghua University, China, Beijing, 100084;  
Email: xinl@tsinghua.edu.cn

Zhong Fang  
Academy of Arts & Design, Tsinghua University, China, Beijing, 100084;  
Email: zhongfangpoli@gmail.com

Xia Nan  
Academy of Arts & Design, Tsinghua University, China, Beijing, 100084;  
Email: squallxn@hotmail.com

http://www.lens-china.org
HIGH-SPEED TRAIN Likely Symbolized the HIGH-SPEED Development Of China
In rural areas, many public toilets still lack basic sanitation, comfort and dignity; in urban areas, public toilets face the quantity, distribution and other problems as well as serious disproportion between men and women toilet seats; and some toilets are extremely luxurious as a face-saving project...
Existing problems that Chinese public toilets mainly face

- Insufficient quantity and uneven distribution;
- Disproportion between men and women toilet seats and area;
- Hygiene and health problems;
- Mismanagement, lack of standards;
- Excessive water wasting;
- Improper handling of manure and other waste, serious environmental pollution;
- Incompleteness of accessible facilities, inadequate attention to vulnerable groups;
- Lack of user-friendly design;
- Difficulty to find the toilet;
- A serious lack of public toilets in rural areas;
- ...
OPPORTUNITIES:
The Chinese government is calling for a "toilet revolution", in order to greatly enhance the quality of public health services; enterprises’ activeness in advancing, including technical research and development and financial support...

It is foreseeable that in the coming years, the number of public toilets in China will be greatly increased and toilet quality will be also improved. But some serious problem still exist ...
Why to redesign the toilets?

Flush toilet, which we are accustomed to now, is undoubtedly a landmark of the development of human civilization and the invention of modern sanitation equipment is also called the most important milestone by medical field in recent centuries. However, Due to waste of water resources, a huge investment in network construction, the huge cost of sewage treatment and loss of valuable organic matter (nitrogen, phosphorus in human excreta), the flushing sewage solution invented in 18th century to connect urban distribution network can no longer face a series of urban problems in the 21st century --- environmental degradation, population explosion, lack of resources ...

At the same time, a large number of people in underdeveloped areas still lack the most basic sanitation facilities, they do not have the capacity to undertake the construction of such sanitation projects and cannot fully adapt to this cosmopolitan lifestyle. And, in the absence of municipal pipeline network, the flushing toilets may lead to more serious environmental problems in the construction boom of "beautiful countryside".

Chinese traditional concept of recycling economy:
Recycling of excrement (human + livestock)
Pig raising and fish farming; decomposed organic fertilizer; biogas ...
Ecological Concern

系统思维
System Thinking

协同设计
Collaborative Design

Eco-Toilet Design
Design Principle

Evaluative Criteria

Solar Power
Rain Water
Human Power
Wastes

Social Trends
Regime & Culture
Environment
Tech & Cost

Demands

Thermal
SAFETY DISPOSAL
RECLAMATION

Electricity
Fuel
Salt
Clean Water
Organic Fertilizer

Service Design
Visual Design
Space Design
Architectural Design
Others

Regional planning
Eco-Technology
Product Design

Public Toilet

A New Culture of Toilet
Healthy Lifestyle
Nice Experience

Wastes

Design Principle

Evalative Criteria

SYSTEM DESIGN DIAGRAM
Beijing Environment Sanitation Engineering Group defines “public toilets” to the 5th Space, which in a manner quite different from the traditional one. It argues public toilets will be the fifth multi-function space following family space, work space, public space and virtual space (cyberspace). It’s a composite space with multiple functions that centres basically on satisfying people’s daily life needs and on this basis, gives rise to derivative services.
Establish design goals and assessment criteria based on characteristics of the project

Investigate and study relevant restriction elements

Propose different possibilities and system solutions on the basis of the study

Assess and improve the solutions

Technical testing, prototyping and implementation

- Sustainable goals: society, culture, environment and economy.
- Characteristics of public toilets: Basic requirements and specifications of public sanitation facilities.
- Enterprise demands: Design direction consistent with nature of enterprise and special needs of the enterprise.
- Demand: Include the study of real demands of manage staff and other users
- Trend: Overall behavior, preferences, fashion
- Condition: Geographical location, surrounding environment, space constraints, infrastructure of pipe network, etc.
- Policy: Study of relevant policies of government departments
- Cost: Cost estimate of investors
- Brand: Requirements for corporate brand image
- …

- Study and selection of Eco-toilet Technology
- Architecture and space design
- Service design concepts
- Study of corresponding business model
- Visual communication design in line with design concept and brand image
- Organizing interdisciplinary experts to assess the comprehensive solutions proposed, and design improvement
- Realization of a comprehensive service body in 5th space in Tongzhou area. Design testing and optimization, foundation laying for later comprehensive promotion as prototype design

- Questionnaire, interview, document research, Observation, Mind Map ……
- Concept Design, Story Board, Rendering, System Map, Blueprint, report ……
- Questionnaire, evaluation report……
- Testing, Engineering drawing, Prototype
Design Orientation and Target:

- Comprehensive Community public service space with the function of public toilets.
- Technical route for water saving, energy saving, resources recycling
- User-friendly multi-purpose community service facilities, building and space
- Selection of service type and business model under the concept of green recycling
- High identification, visual image design with brand influence
### Design Evaluation Criteria:

<table>
<thead>
<tr>
<th>Environment</th>
<th>Energy saving</th>
<th>Material recycling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Reduce resource consumption</td>
<td>• Choose materials easy to clean / compost / burn</td>
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<tr>
<td></td>
<td>• Effectively treat pollutants (harmless treatment)</td>
<td>• Choose renewable energy and biodegradable materials</td>
</tr>
<tr>
<td></td>
<td>• Try to promote waste recycling</td>
<td>• Try to promote waste recycling</td>
</tr>
<tr>
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<td>• Product / Service localization</td>
<td>• Product / Service localization</td>
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<table>
<thead>
<tr>
<th>Society</th>
<th>Social participation</th>
<th>Diversity and equity</th>
<th>Sustainable way of life</th>
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<tbody>
<tr>
<td></td>
<td>• Promote the building of social integration system among different cultures</td>
<td>• Enhance the user experience: safer, more comfortable, easier</td>
<td>• Encourage and drive user to participate in design</td>
</tr>
<tr>
<td></td>
<td>• Promote users’ behavioral change and guide sustainable lifestyles</td>
<td>• Effectively enhance the health and happiness</td>
<td>• Develop shared system, and promote resource sharing, cooperation and mutual assistance</td>
</tr>
<tr>
<td></td>
<td>• Be conductive to social security (reduce crime rate)</td>
<td>• Focus on the design for the vulnerable groups, help the integration of vulnerable and marginalized groups in mainstream society</td>
<td>• Healthy, safe and comfortable working environment</td>
</tr>
<tr>
<td></td>
<td>• Promote users’ behavioral change and guide sustainable lifestyles</td>
<td>• Be conductive to social security (reduce crime rate)</td>
<td>• Improve social life, strengthen social cohesion</td>
</tr>
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<td></td>
<td>• Cultivate the environment of using innovation and creativity</td>
<td>• Effectively enhance the health and happiness</td>
<td>• Develop shared system, and promote resource sharing, cooperation and mutual assistance</td>
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<tr>
<th>Culture</th>
<th>Localization</th>
<th>Sanitation and health</th>
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<tbody>
<tr>
<td></td>
<td>• Adapt to local architectural style</td>
<td>• Meet the diverse needs of different cultural backgrounds or not</td>
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<tr>
<td></td>
<td>• Meet the diverse needs of different cultural backgrounds or not</td>
<td>• Strengthen local residents’ sense of identity and belonging to</td>
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<tr>
<td></td>
<td>• Public health infrastructure and environment meeting basic physical needs, conductive to the shaping of new toilet culture</td>
<td>• Meet global standards or not</td>
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<table>
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<tr>
<th>Economy</th>
<th>Sustainable business model</th>
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<td></td>
<td>• ROI of products or services, sustainable profitability</td>
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<td></td>
<td>• Foster and strengthen the effect of brand image</td>
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<tr>
<td></td>
<td>• Nurture and develop potential business opportunities (such as: long-term competitiveness; continuous innovation capacity; macro-economic results)</td>
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<td></td>
<td>• The benefits of all partners (not only the supplier)</td>
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Field research and investigation
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<tr>
<th>ID</th>
<th>Code</th>
<th>Target</th>
<th>Possibilities &amp; Solution</th>
<th>Evaluate &amp; Improve</th>
<th>Test &amp; Realize</th>
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<tbody>
<tr>
<td>1</td>
<td>T1</td>
<td>Restriction</td>
<td>Behavior Research And Data Collection</td>
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This table represents the process flow from setting a target to testing and realizing a solution, focusing on behavior research and data collection.
Geographical location, surrounding environment, space constraints, infrastructure of pipe network, etc.
Study and selection of Eco-toilet Technology
The 5th space architecture design in Tongzhou district
The 5th space interior design
The 5th space planning design
The 5th space service research and design
target
Restriction research
Possibilities & solution
Evaluate & improve
Test & realize
The 5th space visual communication design

5th space

The 5th space visual communication design

"5" with "S" 共用
Space单调首写字母
数字 "5"
ON-GOING ......
DESIGN PRINCIPLE:

1. FUNCTIONAL RATIONALITY: confirm the function according to the type of toilets and the characteristics of population and their behavior so as to ensure necessary functional space and facilities, avoid excessive design and be flexible;

2. TECHNOLOGICAL APPROPRIATENESS: Choose proper techniques according to the limitation of costs and conditions. Technology adopted should be appropriate, no matter it’s new or old, advanced or outdated;

3. USER-CENTERED DESIGN: Give consideration equally to physical and psychological needs and attach importance to humanized and emotionalized design;

4. SATISFYING SERVICE: Find out critical points from the use of users and management staff and provide comprehensive value-added services, such as the finding of toilets, sale of necessities, health testing and display of management information;

5. QUALITY & AESTHETICS: Quality lies in the care for details and aesthetics is a type of harmony as well as an echo to environment, culture, need and emotion;

6. OPERATIONAL SUSTAINABILITY: Maintain a favorable and sustainable pattern of business operation;

7. DISTINCT PHILOSOPHY: The core value (recycling, ecological and service for communities) of the 5th Space should be embodied in each element of the system.
CONCLUSION

As the design of the 5th Space is a completely new topic, the challenges are derived from the value definition of innovative ecological toilets, a public and community space, besides the requirements on technology and building.

The 5th Space breaks through the traditional definition of public toilets and also brings the public toilet service system to a bigger and more complicated field of system design.

In the design of this prototype, lot of problems are discovered and identified, solutions are improved and design methodology and principle that can be applied in the future is explored. The project is in construction.
THANKS, TO BE CONTINUED......

刘新 博士，清华大学美术学院，副教授
清华大学美术学院“协同创新生态设计中心”主任
清华大学艺术与科学研究中心“可持续设计研究所”副所长
DESIS 社会创新与可持续设计国际联盟，清华Lab负责人
LeNS-China中国可持续设计学习网络，发起人、联合协调人

邮箱：xinl@tsinghua.edu.cn
更多信息：http://www.lens-china.org

Liu Xin, PhD. / Associate professor of Academy of Arts and Design, Tsinghua University / Director of Collaborative Innovation Center of Eco-Design / Deputy Director of Sustainable Design Research Institute of Art and Science Research Center / Coordinator of Tsinghua DESIS Lab / Initiator and Coordinator of LeNS-China /