

# Responsive Environment

Master Thesis  
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Dedicated to my beloved parents  
Sa'adah Ridwan and  
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# Contents

<b>0</b>	<b>Introduction</b>	<b>6</b>
<b>Part I</b>	<b>Discover</b>	
<b>1</b>	<b>Environment</b>	<b>10</b>
	1.1 Built Environment	
	1.2 Source of Information	
<b>2</b>	<b>Human Behavior</b>	<b>16</b>
	2.1 Broken Window Theory	
	2.2 Human Behavior Model	
	2.3 Destructive Behavior	
<b>Part II</b>	<b>Define</b>	
<b>3</b>	<b>Survey</b>	<b>24</b>
	3.1 Result	
	3.2 Analysis	
<b>4</b>	<b>Observation</b>	<b>28</b>
	4.1 Report	
	4.2 Analysis	
<b>Part III</b>	<b>Develop</b>	
<b>5</b>	<b>Ideation</b>	<b>36</b>
<b>6</b>	<b>Proposal</b>	<b>38</b>
	6.1 Concept	
	6.2 Design	
<b>7</b>	<b>Conclusion</b>	<b>52</b>
<b>8</b>	<b>Bibliography</b>	<b>54</b>
<b>9</b>	<b>Image Index</b>	<b>57</b>
<b>10</b>	<b>Appendix</b>	<b>58</b>
<b>11</b>	<b>Acknowledgement</b>	<b>62</b>
	<b>Confirmation of Authorship</b>	<b>63</b>

## 0 Introduction

Environmental design integrate and embraces many disciplines including architectural, interior, landscape, urban planning, user experience design, graphic design, industrial design, behavioral design, and psychology all concerned to examine the relationship between human and environment. The field that explores both the influence of human to the environment and the influence of environment to human.

In present decade, our spatial experience has been significantly transformed. Along with the rapid advances of technology, people tend to move further and more frequent than before. The need for a proper environment for living and personal development. As our environment in which we are living is getting diversified, there are increasing number of demand from decent living environment, means of transit, to a way we enjoy leisure time. This environmental tendency is not only provides us with comfort and life, but it also gives rise to stress and pressure. Thus, such an environment in anyway has a profound effect on our lives in a diverse way.

While environment is not only affected by human behavior, the environment is also can determine human behavior. We can easily spot the footprint of human behavior on the amenities in the public space, like vandalism. Vandalism is generally defined as the act of damaging others property without intention to gain material benefit (B. Van Dijk, et. al., 1984). Vandalism involves graffiti, littering, shoplifting, and littering as well as other related crimes in the environment. A number of such strategies are aimed to deter unwanted behavior in the environment, for instance, 'hostile architecture'.

In this study, the research will focus on how environment can shape human behavior. The thesis explores various aspects and strategies in order to understand as well as to develop new ideas of how to create certain behavior through environmental design. The primary step will be defining about two main subjects; the built environment, and human behavior. Followed by deeper in field investigation to find out what is really happening and taking insights from the people. The objective of this thesis is to earn the knowledge from the studies and apply into practice. Therefore the thesis will be accompanied by the project which tries to propose a speculative approach as an alternative way to achieve intended environmental behavior. This documentation is not only meant for professional who are deal with built environment and human behavior, but also for the students who have interest in it.





**Part I Discover**

# **1 Environment**

## **1.1 Built Environment**

Environment provides us with important factors to live. It includes every resources that we need to keep on living; source of food and shelter to keep our body works and protected, and even source of social living where allow us to interact with other people. In all the process of living in an environment, we gain emotional connection with other people and atmosphere around us. We call such process 'experience'. So to speak, the environment determines the quality of our life, our experience not only physically but also mentally.

Environment itself has a literal meaning of organism surrounding space which has everything that affect during its lifetime. It has two types; natural and built-environment. The main factor that define a difference between them is the way of how they become exist. The natural environment is clearly means the pure environment that occurs naturally without massive human intervention, whereas built-environment considered as man-made, the place in which most of human being lives in.

An article written by A. Kaklauskas et al. titled 'Multiple-Criteria Analysis of Life Cycle of Energy-Efficient Built Environment' define that the built environment is created to fulfill people's needs. In other word, it is built for the purpose of supporting human activities. Moreover, the authors also mentioned that people are prefer to have or live in a clean and noiseless environments, with opportunity for leisure, good ability for transit and social needs.

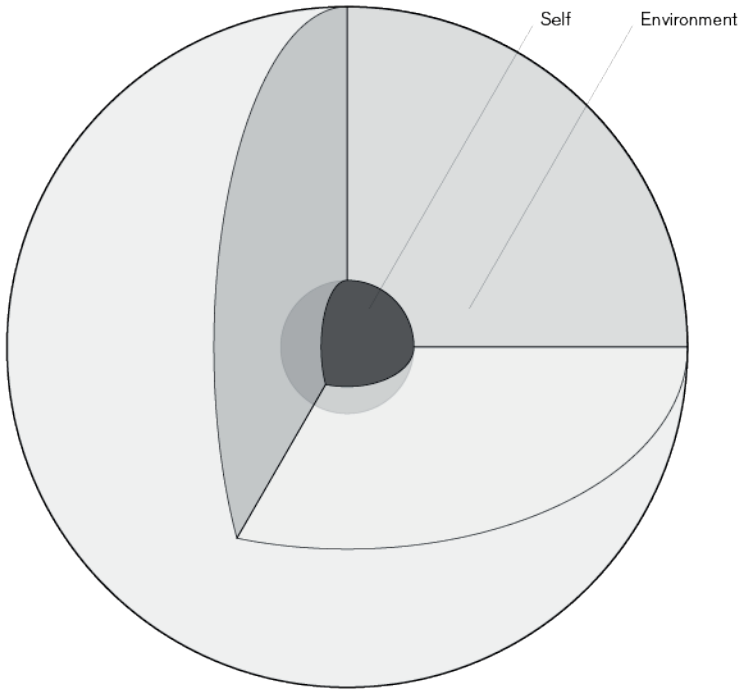


Figure 01. Built Environment

Throughout this project I would like to investigate the public built environment which means man-made environment or properties that built to be publicly used or shared with other people.

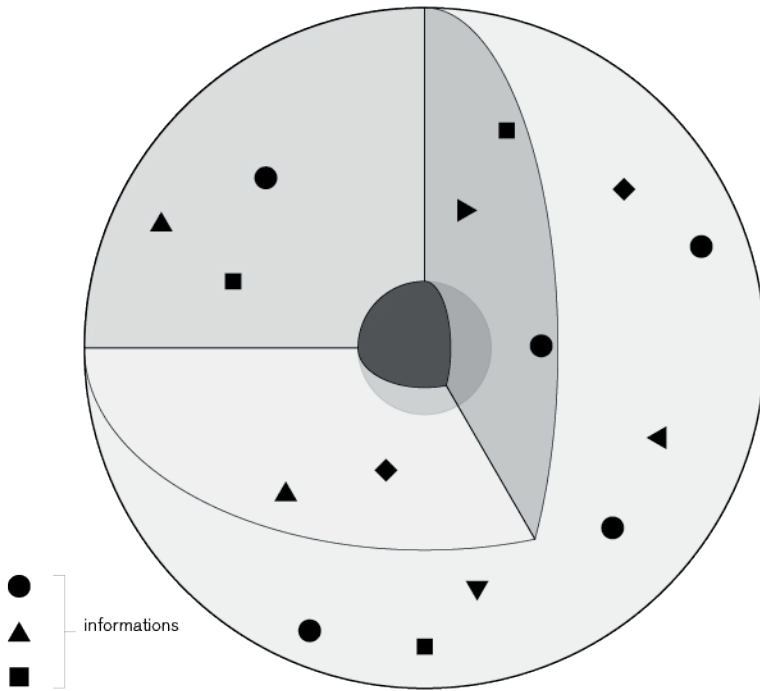


Figure 02. Environment as Source of Informations

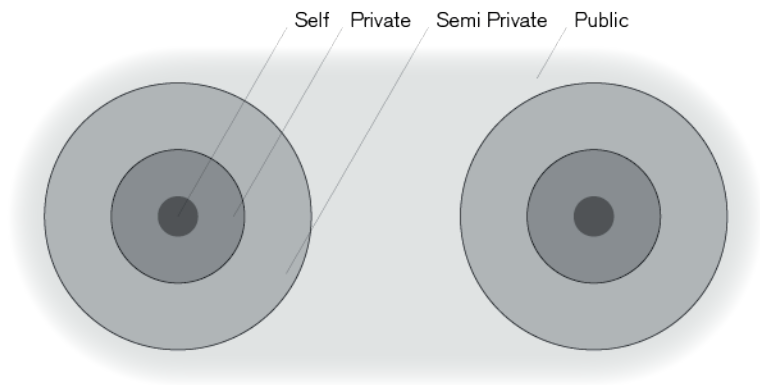


Figure 03. Space Classification

## 1.2 Source of Informations

In a paper titled 'Environmental Psychology Overview', Raymond De Young mentions that all environments are patterns of information and that people are fundamentally information-processing organisms. This notion becomes an evident of environment as the source of informations. People receive the informations from their environment and then attempt to analyse those informations. They compare between those informations, categorise it, try to make sense out of it and turn it into knowledge and terminology. The knowledge has been guaranteed human being to fulfil lives. In the prehistoric time, the pattern of informations were simple. However, in today's modern man-made environment, the patterns of informations are become more complex than before, it cannot be easily defined anymore. There are intepretation differences among people. Which means that, environment, as the source of informations should be guided lest to prevent anomie in the social life.

According to Christopher D. Wickens model of Human Information Processing, events in the environment are first enter to our brain through our senses; sight, sound, touch, smell, taste, and balance. Then our brain will process it internally before it exit from our brain as a response or feedback. At the last stage, processed stimulus turns into response execution and goes back to the environment in the new form of information which called behavior. In other word, environment effects us in a diverse way, in the form of visual, auditive, tactile, olfactory, gustatory, or vestibular experiences. It follows that how these impacts are used in our life defines our behaviour. And it eventually determines the quality of our lives.

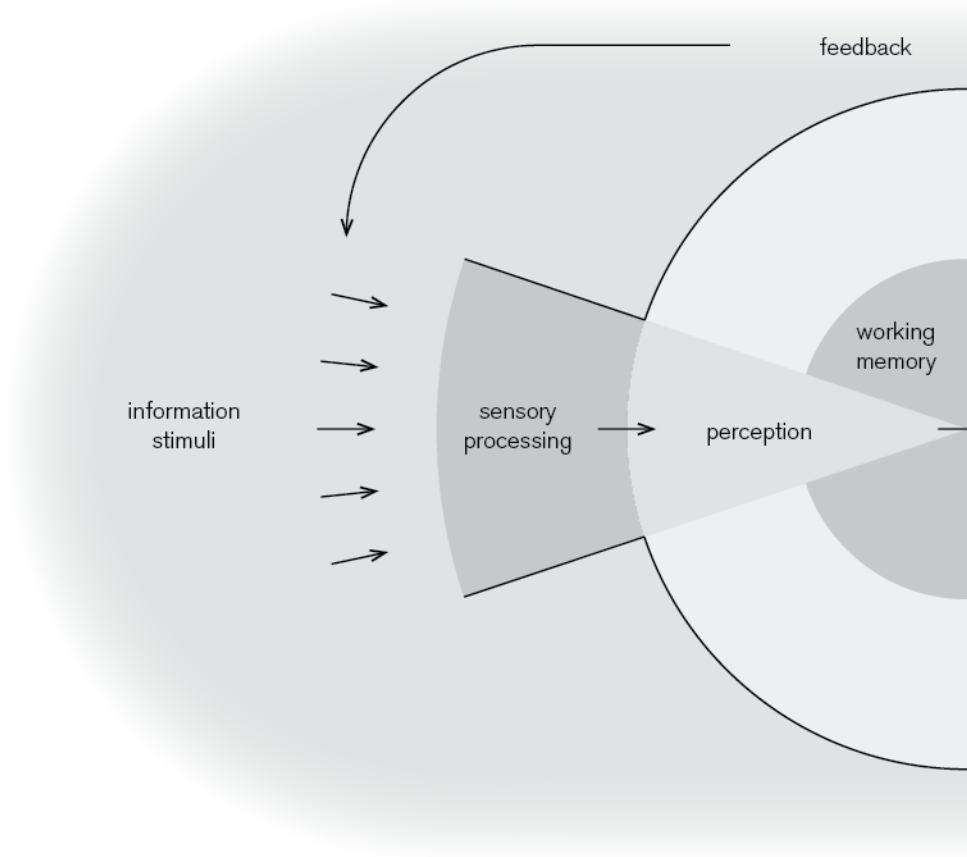
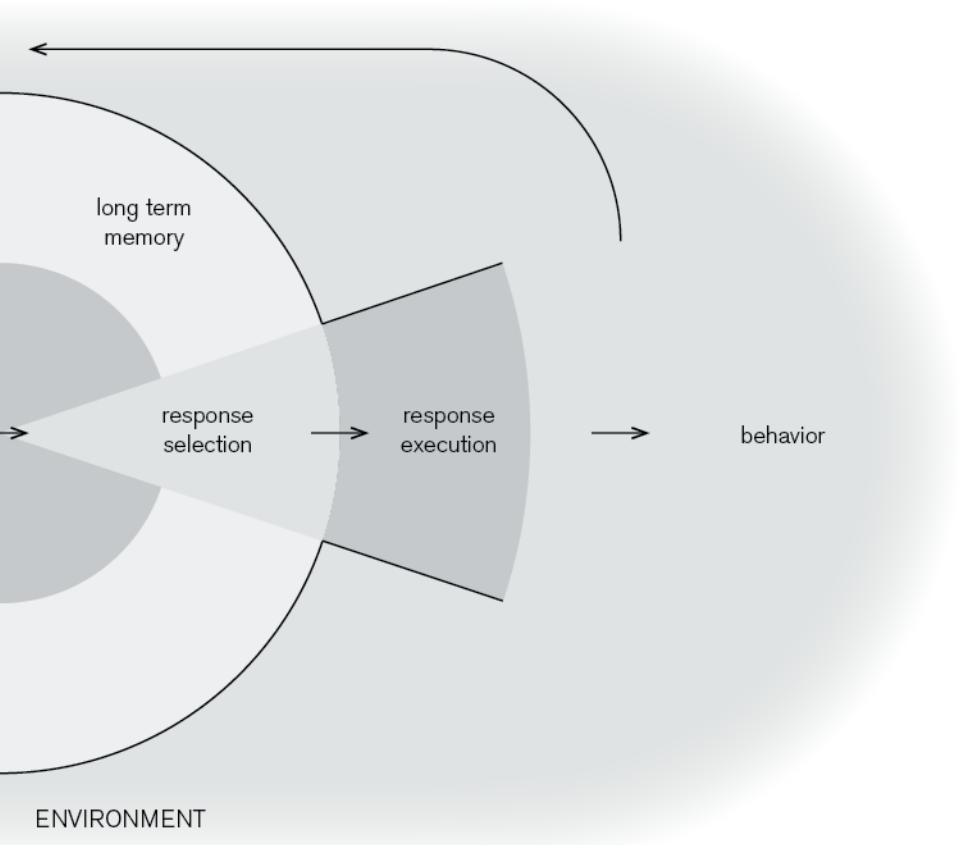


Figure 04. Human Information Processing Model

Source: Adapted from C.D. Wickens Human Information Processing Model



## 2 Human Behavior

### 2.1 Broken Window Theory

'Broken Windows', an article written by criminologists James Q. Wilson and George Keiling in 1982 generate a theory which assert that a signs of disorder can lead to more disorder. This theory is called broken window theory. For example, a broken window in a building that left unfixed will give a perception that there is nobody cares or in charge. This perception can trigger someone who have motivation and ability to vandal, breaking the rest of the windows, contaminating by drawing graffiti or litter around it. Even worse, this disorder can lead to deterioration in social aspect, encouraging other people to bad behaviour, and intriguing criminals.

In the United States, several major cities has been implementing this theory. For example, Rudy Giuliani, the mayor of New York which elected in 1994, instilled broken window theory into his policy. He cracked down graffiti and other smaller quality of crime. Consequently, the overall crime rate notably decreased.

This result unveils how environmental change influences on human's behaviour. And change of environment can induce human behaviour to a certain direction, worse or better.

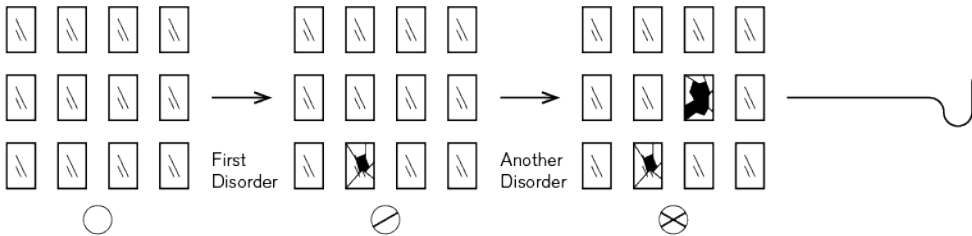
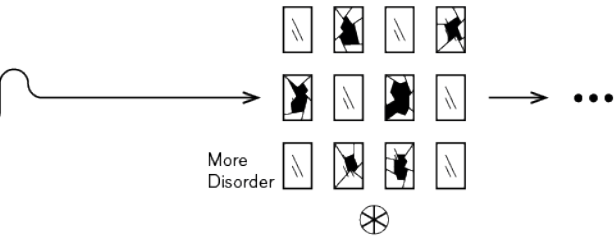


Figure 05. Broken Window Theory





## 2.2 Human Behavior Model

B.J. Fogg, a professor of Behavioral Psychology at Stanford, invented a human behavior model that called BJ Fogg's Behavior Model. He assured that as a guide this model can help us to find out the reason behind decision and to have better understanding of behavioral change. The main point of this model is that there are three things involved in the event of human action: Motivation, Ability, and Trigger. These three elements must integrate simultaneously to make an action happen. In other word, behavior is the result of combination of motivation, ability, and trigger at one moment.

As the first element, motivation categorised in three different core: Sensation, Anticipation, and Belonging. Each of these core has two opposite situations. Sensation is pleasure or pain. Anticipation is hope or fear. Belonging is social rejection or acceptance.

The second element is Ability. Ability is simply whether its easy or hard to do. As described by Fogg, there are six forms of ability: Money, Time, Energy, Social Pressure, Familiarity, and Brain Cycles or mental energy. When the requirement of ability is easier, greater chance a behavior will happen.

The third element is Trigger. Behavior objective will not happen without a trigger. This is what makes human take an action. A trigger can be from the environment like a traffic light, or can be from internal like a mood, an urge to do something, or even a habit that grows and affix in consciousness. Fogg noted a trigger can be very simple and can be an elegant natural persuasion by not making people aware that he or she is being persuaded.

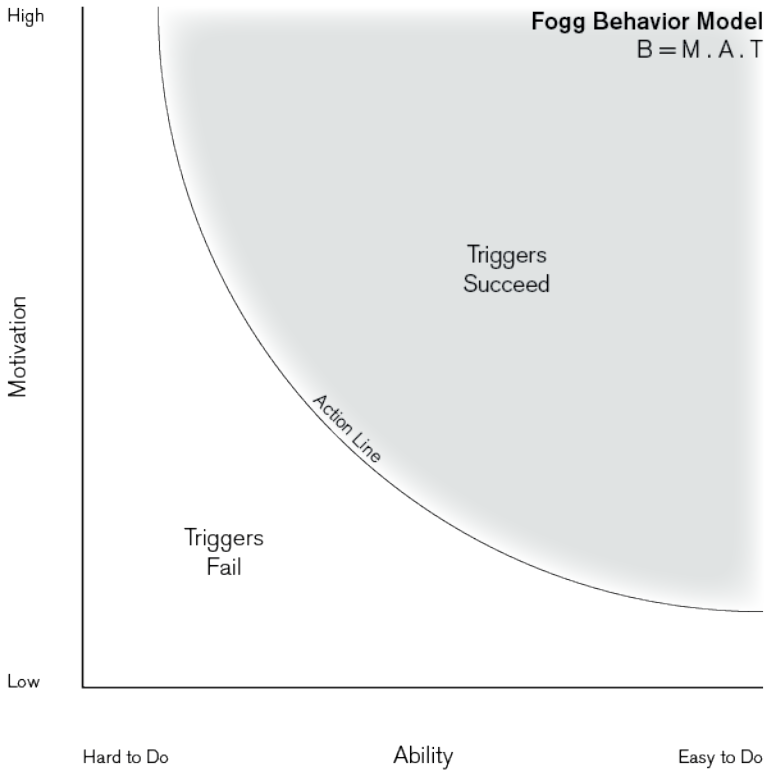


Figure 06. Fogg Behavior Model

Source: <http://www.behaviormodel.org/>

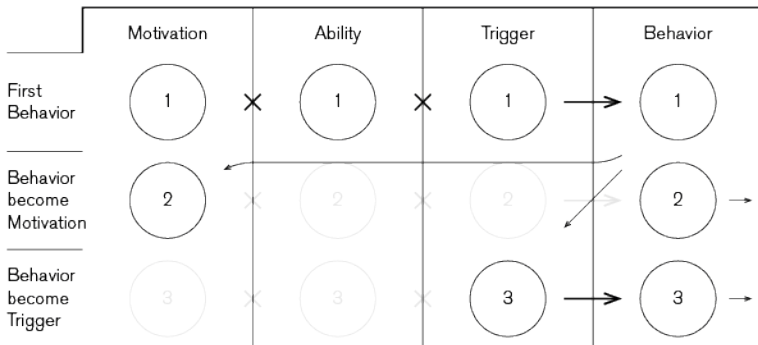


Figure 07. Implication of First Behavior based on Fogg Behavior Model

## 2.3 Destructive Behavior

The very fundamental act of destructive behavior in environmental context is often associated with vandalism. According to the research done by B. Van Dijk, et. al., vandalism defined as the act of damaging others property, without gaining material benefit from it. In this definition the term 'damaging' means making an object loses its intended function or useless. Vandalism are mostly done by youngsters (8-23 years old), and there are more children (8-12) and teenagers (13-16) than young adults (17-23) committed in vandalism.

There are also several motives stimulate the act of vandalism in youngsters; expression of anger or vindictiveness, exploration of the social or physical environment, experimentation of norms and the authority of adults, a way of gaining prestige in the peer group, and dissatisfaction of school or work. On the other hand, the authors also found two things that can keep youngsters from engaging vandalism; First, they called internal barrier, the feeling that vandalism is such a wasteful unnecessary thing to do. Second, the external barrier, the risk of being caught and punished. Besides, from the research done by J.F. Donnermeyer and G.H. Phillips, vandalism usually done on weekends and the evening hours.

These two studies shows that destructive behavior is way more than just fidgeting. It developed from negative motivation without ability to control the desire, easy access to the tools, and lack of visual control from the environment.

Looking back at the age aspect, to what extent this kind of destructive behavior typically committed by youngsters?

Vygotsky, a Soviet psychologist, coined the term 'Metacognition'. During Childhood, we absorb all the information and knowledge regardless of whether it is good or bad without cognizance. Therefore, following behaviours are also pure. It does not have any sort of intention: good or bad. But, as they get older, their behaviour is influenced and controlled by societal standard. From this stage, Metacognition starts to be formed. It is know-how that how we implant information and knowledge which is outcomes of cognitive process. Hence, how we experience adolescence profoundly effects one's character building

In addition, Erikson's stages of psychosocial development is worth mentioning with regard to character building in adolescence stage or teenager. Erikson emphasised the societal effect on individual's development. In lifecycle, each stage entails different physiological maturity and crisis emerged from different social requirement imposed on an individual. Character is formed by how we cope with tasks and crisis. Accordingly, he categorised the development into 8 stages. Particularly, stage 5, called Identity vs. Role Confusion, began from puberty and ended around 18 or 20 years old. Teenager tend to gaining a sense of self by experimenting with roles, then fuse them to form an identity. Confussion in role identity could turn them into an uncertainty about one's place in society and the world, this uncertainty called identity crisis. And this critical moment can lead them to be involved in destructive behaviour.

For these reasons, it is relatively easy to discover destructive behaviour in childhood and adolescence than any other lifecycle. Most importantly this destructive behaviour can occur even in the later stage of life due to how these early stages are negotiated.



**Part II Define**

### **3 Survey**

In order to investigate deeper about what is really happening in the environment, a survey is conducted online within the period of 20 April 2017 - 2 May 2017. The survey contains interviews focused on the amenities within the public space. The questions that underlie this survey are; Are there many public amenities found in bad conditions? What are the opinions on what causes the destruction of public amenities? And how satisfied are they with the public amenities provided by the local municipal government where they are currently living in?

#### **3.1 Result**

This survey gathered from a total of 48 respondents who mostly are currently living in Indonesia (58%). As many as 60% of them are workers, the rest are students. 56% of them traveled more than 5 km to their working place or school. In addition, the majority of 54% were found using public transportation, either as a main transport or as an option.

From figure 09, we can see that the majority of 85% of them find public amenities in bad conditions, i.e. dirty, damaged, broken, or even just not working properly as it was designed for. In the next segment, figure 10, the interview tells us that most of the respondents think that the main reason of the destruction is because of human bad behavior. From figure 11, it was found that the majority of 48% of them were quite satisfied with the public amenities provided by their municipal government where they are currently living in.



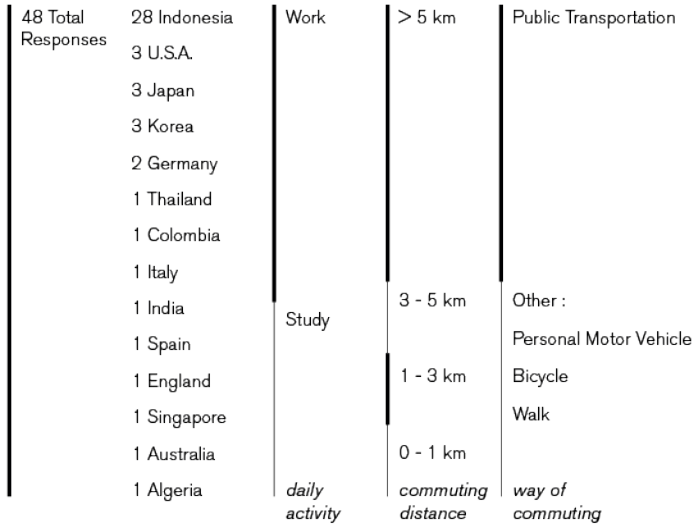


Figure 08. Basic Respondent Data

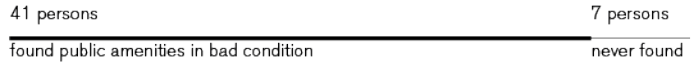


Figure 09. Public Amenities in Bad Condition Finding

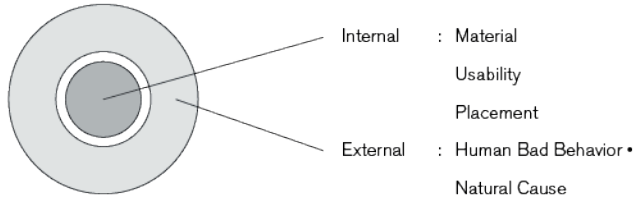


Figure 10. Damage Causes of Public Amenities

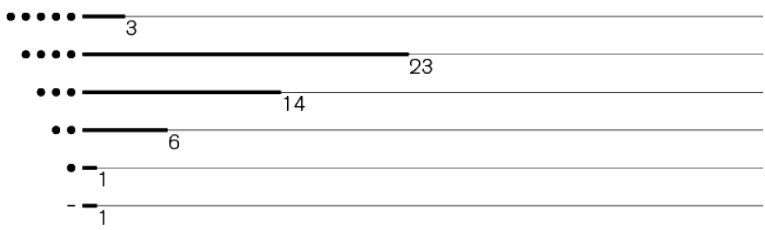


Figure 11. Satisfaction Level of using Public Amenities

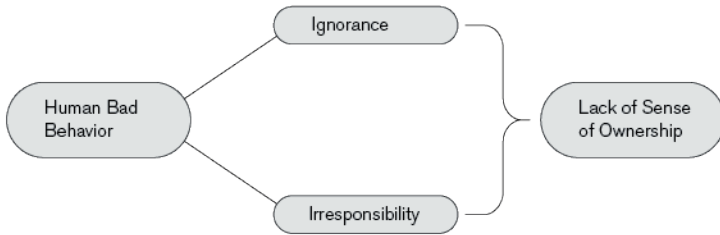


Figure 12. Lack of Sense of Ownership

### 3.2 Analysis

From the opinions gathered about what causes the destruction of public amenities, can be concluded that there are two main behavioral factors that underlie this phenomenon, namely: Irresponsibility and Ignorance. Both of these can also be redefined to the lack of 'sense of ownership', where people feel that public amenities do not belong to them, and they think there are already other authorities responsible for maintaining the facilities. In fact, the logic of all these facilities is public property because it is funded from taxes that the public paid, the public entitled to use it, and also be responsible for maintaining its function. But this logic is not directly felt by the public, the way people's money goes to the object is too far, and the money they paid was also too cheap for every facilities they use because many people are also funding the same facilities.

This phenomenon, the lack of sense of ownership, is closely related to the Endowment Effect theory. The term of endowment effect is the idea that describe when a person gives more value on something simply because they own it. The personal possession of the object and pleasure of using it creates the variation in value. There will be a personal relationship developed between the object and the possessor.

'Possession, feelings of ownership and the endowment effect', a research journal done by Jochen Reb and Terry Connolly examine the role of subjective ownership by conducting a series of experiment. The result shows that the personal or abstract feelings of ownership may be works as primary motivation of endowment effect rather than a fact of concrete ownership. In other words, a subjective sense of endowment may be more required than a statutory of ownership for creating sense of ownership. They also found that possession on monetary valuation and physical possession of the object are affecting and enhancing the feelings of ownership.

## 4 Observation

In addition to the surveys, naturalistic observations are made without intervention to deepen the sense of ownership, particularly to observe how people behave with semi-public objects. Observations were carried out in three places; First at a fast food restaurant, the second in the grocery market, and the third local restaurant, all places in Berlin.

### 4.1 Report

A. Fast-food Restaurant

Date : 09.06.2017

Time : 12:35 - 14:00

Field note attached in appendix



Figure 13. Fast-food Restaurant

B. Grocery Market

Date : 09.06.2017

Time : 15:00 - 15:20

Field note attached in appendix



Figure 14. Grocery Market

C. Local Restaurant

Date : 09.06.2017

Time : 18:30 - 20:15

Field note attached in appendix



Figure 15. Local Restaurant

## 4.2 Analysis

Two interesting situations has been discovered from the first observation; First, even though waste bin placed in the very accessible place inside the restaurant, there are still many people who did not clean up their table and just leave the table messy. Second, there are persons who is willing to clean trash from others before taking a seat.

Basically, the waste bin provided by the fast-food restaurant are intended for the customer to throw their waste by themselves to keep their used table clean and can be use by other customers. However, some people don't understand or just ignore this simple rule, some of them are tend to think that it is somebody else's job to clean their mess (the restaurant staff). I assume that this situation is related to sense of responsibility. By having no disadvantage in mind and belief that there is responsibility of others make them feel free to leave their mess on the table.

Even more interesting fact is that the other customer who wanted to take the seat, cleaned other's mess without hesitation. This situation shows the concept of self extension. Once a person decide to have a seat, the seat becomes considered as the one's temporary territory or reserved table. Therefore, he cleaned the trash without hesitation to make the table usable for him.

From the second observation, the interesting part is that people use their coin to be able to use trolley to help themselves carry many or heavy stuffs while shopping. By incorporating a valuable object that one possesses into another object, this can cause this object to be mentally his/her. With the sense of 'mine' of the object that are not actually their's, people can secure the ownership and maintain it until the end of its function.

The third observation shows similar situation to observations in the fast-food restaurant and grocery market. Some customers who come to dine-in tend to firstly tag the seat before queuing for ordering food. They put their belonging in an empty chair or table, to indicate that the chair is reserved for them.

From those three observations, we can see the tendency of people's behavior towards semi-public objects, they are trying to investing 'self' in the object. With that, they develop sense of ownership and attain what we called 'me' and 'mine'. Moreover, along with the sense of ownership, they also establish the responsibility to keep the object usable and pleasurable for them. And we can see these cases as possession and self extension phenomenon.

But, we should put a consideration that possession and self extension concept are not merely about me and mine. Russell W. Belk, in his journal titled 'Possession and the Extended Self', conclude that self extension in the context of human-object relationship can be achieved through control or being controlled by the object, through creation of an object, through understanding of an object, and through contamination to an object. As he mentioned from other study about the relationship between human and object, that it is never two-way relationship (human-object), but always three-way relationship (human-object-human). In addition, he also summarise the categories of extended self: body, internal processes, ideas, experiences, and persons, places, and things which one feels being attached with.

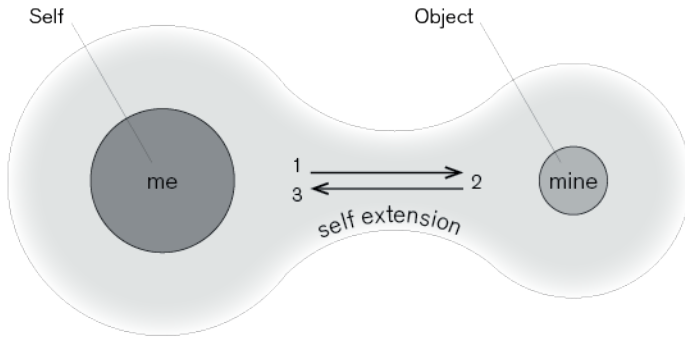


Figure 16. Basic Concept of Self Extension

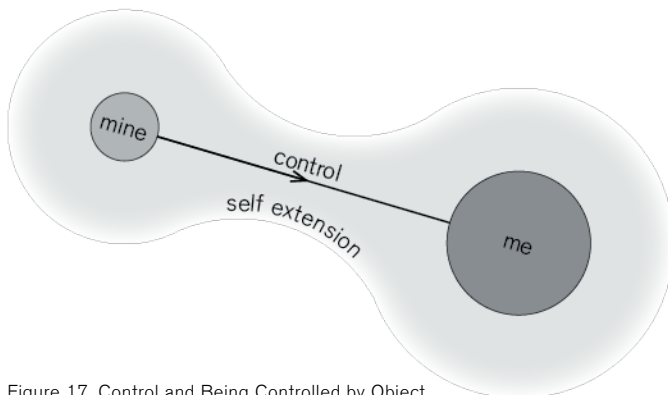
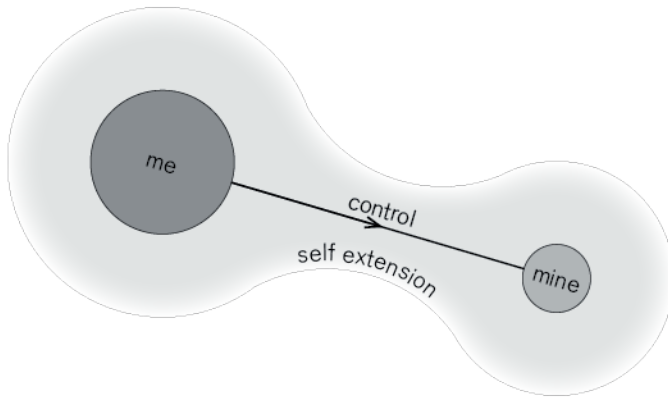


Figure 17. Control and Being Controlled by Object



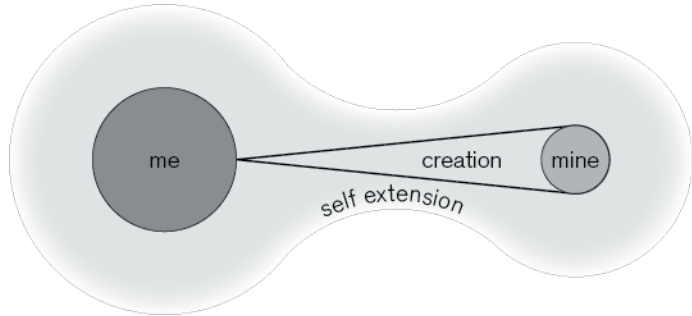


Figure 18. Creation of an Object

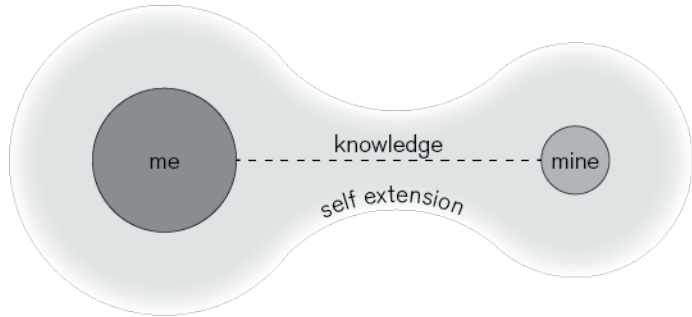


Figure 19. Knowledge of the Object

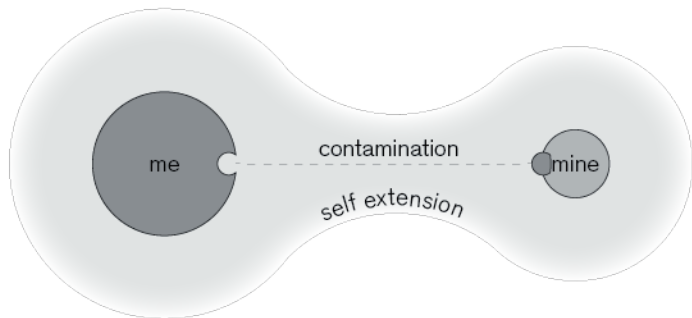


Figure 20. Object Contamination



## Part III Develop

## 5 Ideation

The previous discoveries brings out new questions: What possible solution that can be done to deal with the challenging situation of destructive behavior in built environment? And Is there any opportunity of endowment effect and self extension to accommodate sense of ownership?

First, taking deeper examination regarding property destruction, we can see from fig.x that most of the time environment act as trigger which ignite motivation and ability to result in destructive behavior according to the human behavior model. Moreover, contaminated environment can also become a new motivation or new trigger for other destructive behavior. For example, person x feels resentment because he was unrespectfully fired from his previous work and get bored because he have nothing to do. This become his high motivation to do something exciting. Then he realised that he have some cans of unused spray paint in his room, and this ability encourage him to do graffiti. Then it just the matter of opportunity and time, when the day is getting dark at the bus stop and no one's around, means no one will watch him drawing. This kind of environment just trigger him to do so. By the end of the dawn, he succeeded to create a graffiti on the bus stop wall. But later, person y saw the graffiti, and he motivated and triggered by that to make another graffiti on the wall next to the bus stop. And he have some money to buy several cans of spray paint. Short story, another graffiti appears on the next day and so on. So, the challenge from this occurrence is to eliminate the first triggering environment.

Second, reviewing the concept of endowment effect, that people will give more value and appreciation on something they own, and also taking a consideration to the concept of possession and self extension, that there is possibility to generate sense of ownership by allowing people to invest their 'self', connect their valuable 'mine' to the environment. This way, expected result will establish the awareness and responsibility towards the environment to keep its function. In other words, to subtly persuade people to protect the public property.

Then two main objectives arises; eliminate the trigger and use endowment effect and self extension to create a better environmental experience. The suggestion is to create a set of environmental design which consist of the most used public properties that supports daily activity; streetlight, street bench, and bus/tram stop. The design solution combine two basic ideas: adaptive environment and self extension.

## 6 Proposal

### 6.1 Concept

Responsive Environment is a conceptual design configuration uses of two basic ideas: Adaptive and Self Extension. The built environment designed to be adaptable to the human needs, and establish an ownership connection between human and the environment. Firstly, by being adaptive, the responsive environment will exist if only there is a needs of function, and it intended to prevent environment to trigger destructive behavior. Second, by being self extension of the user, the responsive environment will require the user to invest their valuable object to be a key to enjoy the built environment, and it intended to subtly persuade human to maintain the function of the built environment.

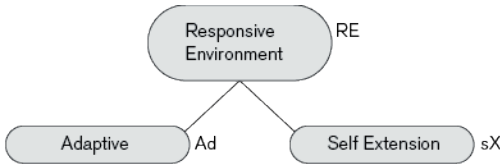


Figure 21. Responsive Environment Basic Concept

### 6.2 Design

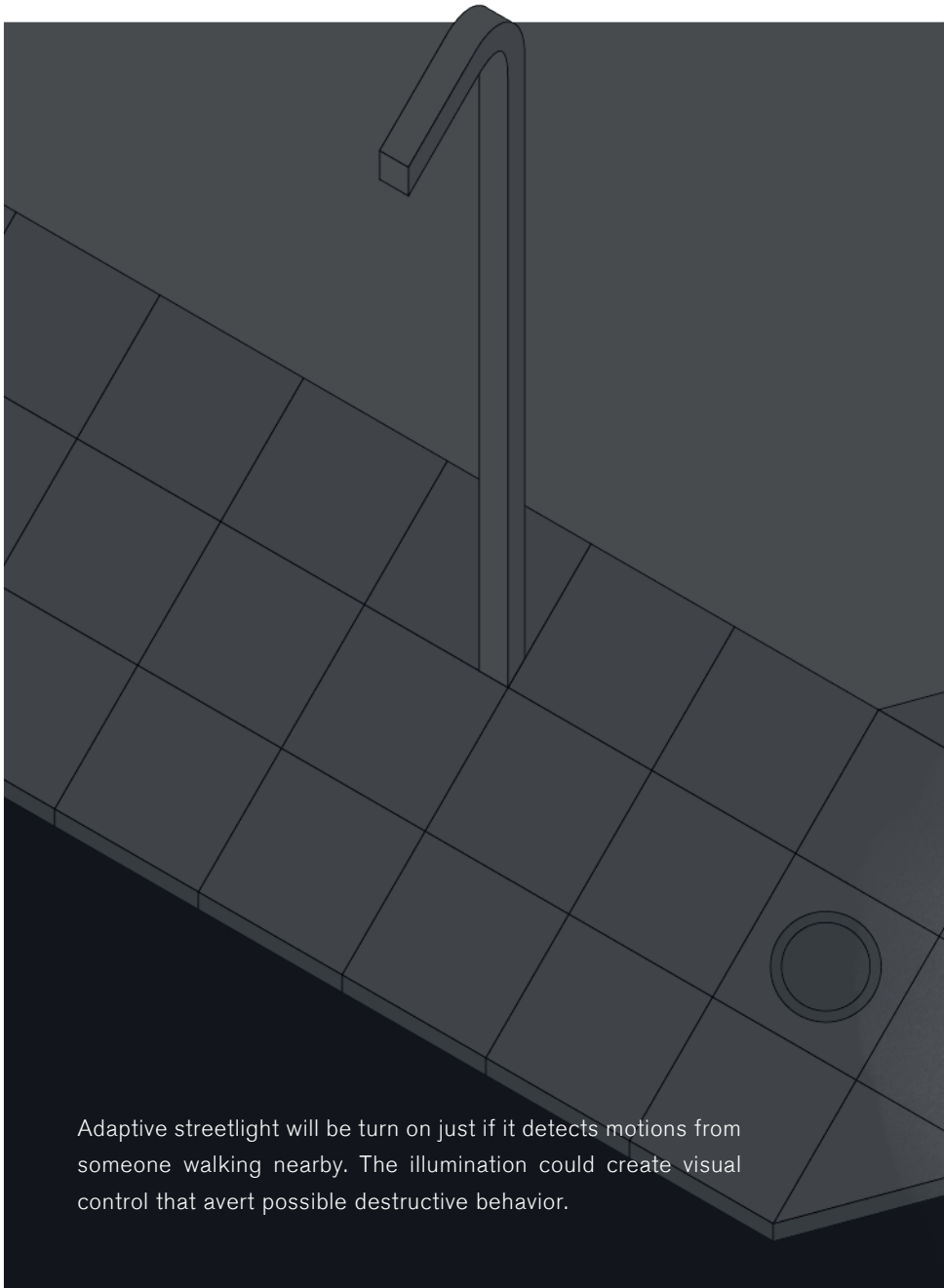
A series of public amenities, streetlight, street bench, and bus/tram stop designed based on the concept of Responsive Environment.

RE Features	Streetlight	Street Bench	Bus/Tram Stop
Adaptive	○	—	○
Self Extension	—	○	○

Figure 22. Responsive Environment Features

Figure 23. Responsive Environment



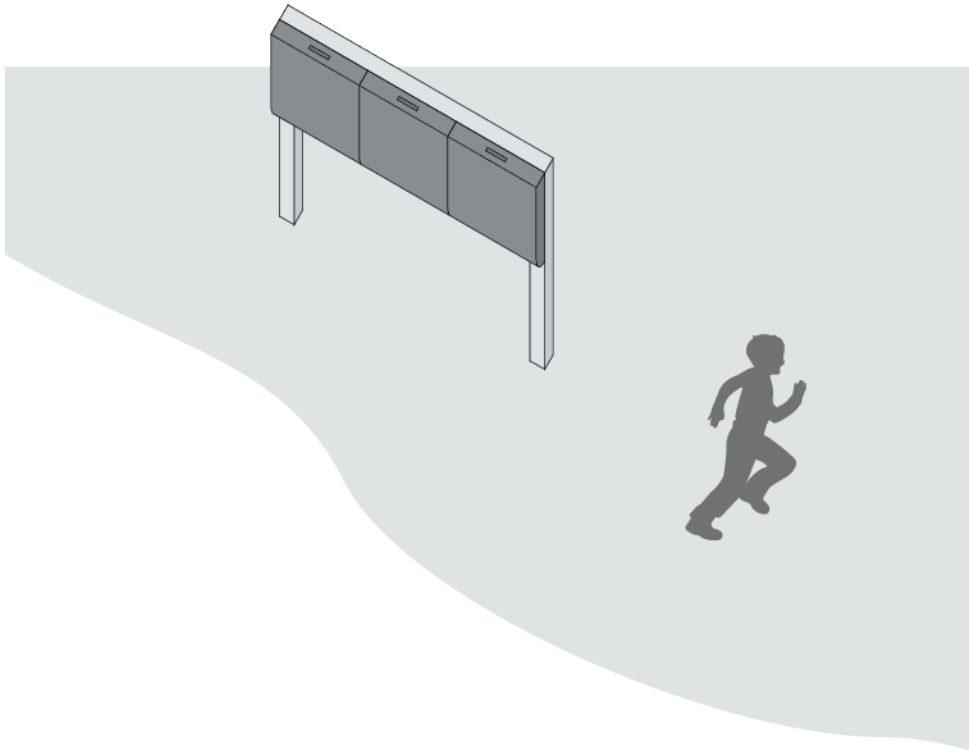


Adaptive streetlight will be turn on just if it detects motions from someone walking nearby. The illumination could create visual control that avert possible destructive behavior.





Figure 24. Adaptive Streetlight



The street bench requires a coin to unfold the seat, so it can be used. Inspired by trolley at the grocery market, a coin act as valuable self extension, when it inserted to the seat, the seat become mentally self extension. Then the user will attain a sense of ownership and gain responsibility to maintain its function.

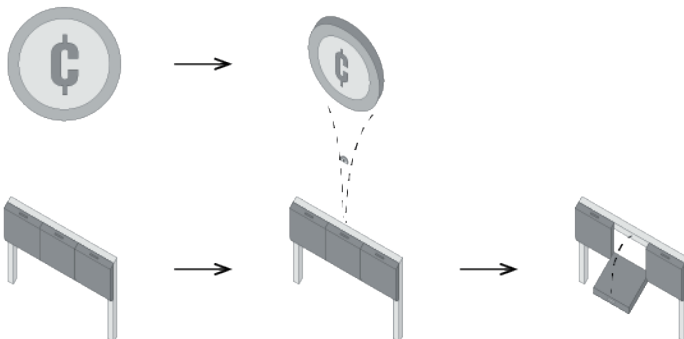
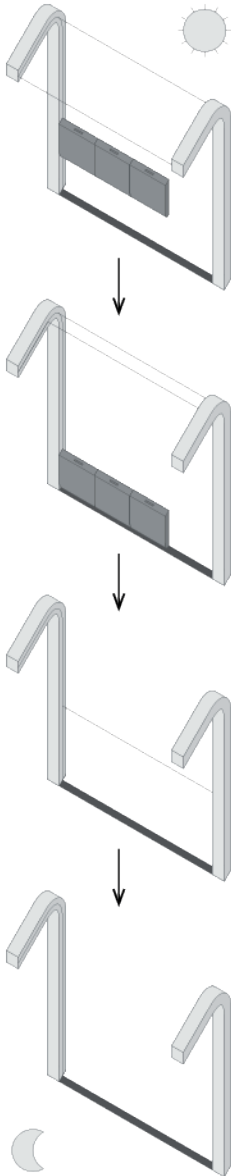




Figure 25. Self Extension Street Bench



Figure 26. Adaptive and Self Extension Bus Stop



Adaptive bus/tram stop will only exist when there is schedule for bus/tram trip (daytime). When the trip of the day finished, the shelter will rolled down and the stop will disappear. This way can prevent the bus/tram stop to be a trigger for destructive behavior, which usually happen when there is lack of visual control (evening hours).

The self extension feature is also embeded to the seat.



Additionally, at evening hours, the stop will be function shift into adaptive streetlight. It will be turn on just if it detects motions from someone walking nearby. And the illumination could create visual control that avert possible destructive behavior.

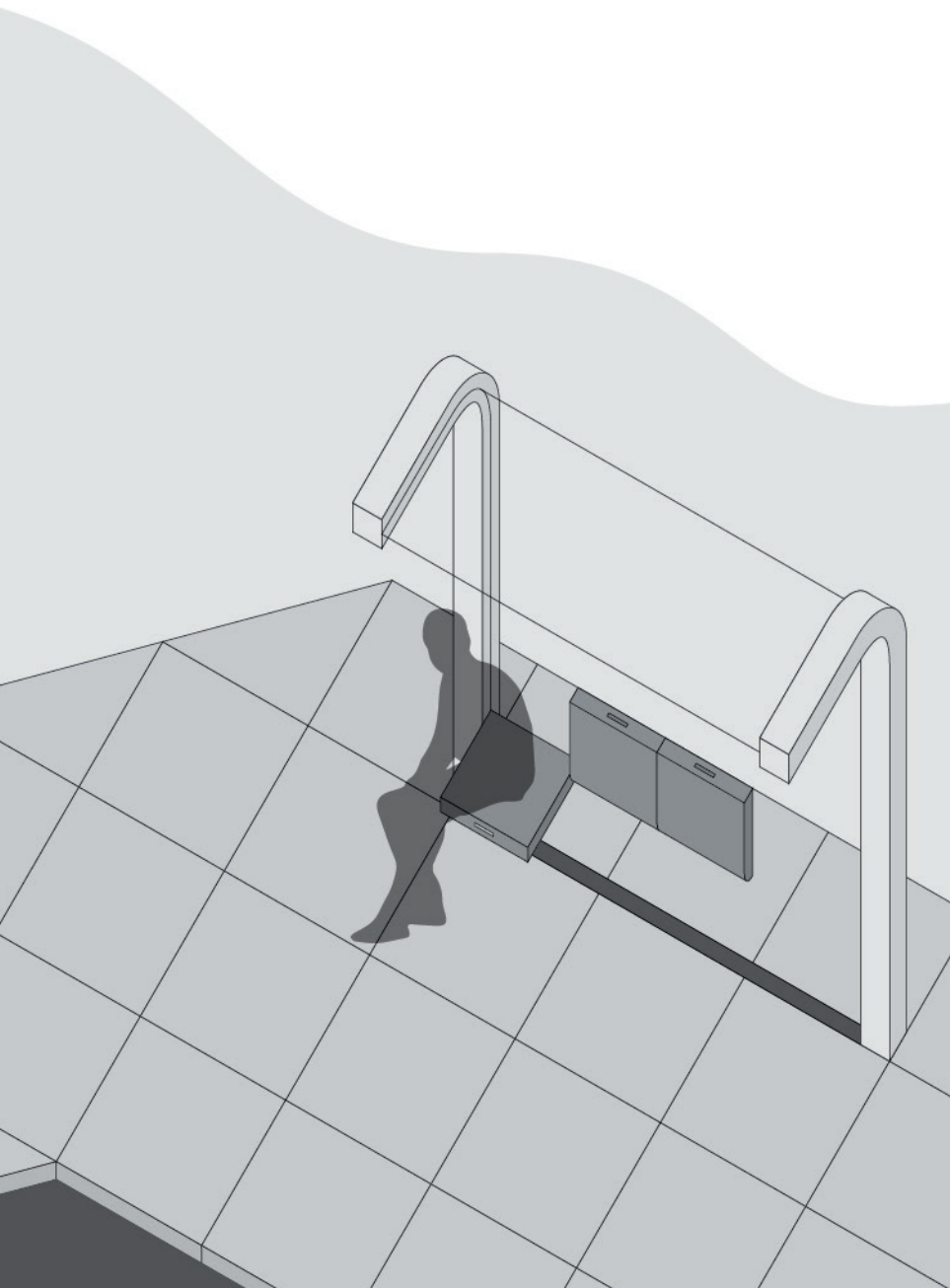


Figure 27. Adaptive and Self Extension Bus Stop



Figure 28. Responsive Environment









## 7 Conclusion

The environment, including natural and built environment, both serve as an important role in human life. The experience it gives will nurture our character, as well as our behavior towards the environment. Especially for the built environment, as a source of formed information, it should give more advantage than disadvantage.

Learning from Broken Window Theory, the environment can be a contagious medium for any kind of behavior, whether destructive or constructive behavior, and directing either towards worse or better living. Fogg's Behavior Model can help us to investigate the reason behind behavior, as well as to create a new or changes in behavior. It also helps us find out that environment usually acts as a first trigger in destructive behavior. Destructive behavior towards environment is mostly committed by youngsters, developed from negative motivation, and usually occurs in the place or time that no one is watching, like evening hours. But destructive behavior is not only has a negative motivation, in some cases it can also come from exploration or experimentation motives towards the environment.

Among other factors, there are two main behavioral factors that underlie the reason behind the damages in public amenities: Irresponsibility and Ignorance. Both of these can also be redefined as lack of 'sense of ownership', where people feel that public amenities do not belong to them so they can not get the sense of responsibility to maintain the goodness of public amenities. This finding is closely related to the Endowment Effect theory that says when a person owns an object, he/she will give more value on it.

The possession and self extension approach can be use as a strategic way to achieve sense of ownership. It may requires a little investment of 'self' in the object, but it can obtain the feeling of ownership and makes the object become mentally 'mine'.

Responsive Environment might be the alternative solution to answer the challenge of how to prevent unwanted environmental behavior. It has adaptive feature which can prevent the amenities to be a trigger for destructive behavior by adapting its existence to the people needs. It also has user self extension feature to obtain the feeling of ownership which can lead to responsible behavior.

At the end, the relation between human and environment is always three way relationship (human-environment-human). Therefore we can confirm that our environment affect our behavior, and we can also consider our environment as a mirror, a reflection of our behavior.

As a final conclusion, the most important thing to consider when designing an environment is human needs regarding the environment itself, before taking consideration how it might be designed and might change current behavior. The possibilities for environmental design of the future will be even more exciting. We should not lose our sight in the excitement, and keep asking the fundamental questions of any design practice: what we are trying to design, why and for who we are designing for.

## 8 Bibliography

Belk, R. W. (1988): Possessions and the Extended Self. In *The Journal of Consumer Research*, Vol. 15, No. 2. 139-168. The University of Chicago Press

[https://www.researchgate.net/publication/24098554\\_Possessions\\_as\\_the\\_Extended\\_Self](https://www.researchgate.net/publication/24098554_Possessions_as_the_Extended_Self)  
(Accessed 19.06.2017)

Carswell, C. D. and Stephens, E. C. (2006): Information Processing. In Waldemar Karwowski: *International Encyclopedia of Ergonomics and Human Factors*, Vol. 1. 2nd ed. 408-411. Boca Raton: Taylor & Francis

<https://books.google.de/books?id=Ih-z6IkTO8EC&pg=PA408&lpg=PA408&ots=oSxzwn8YI-&sig=g7FAOVX9IKsJESEMexR1WPYzirM&hl=en&sa=X&ved=0ahUKEwiS1pTPntvUAhWCUIAKHVshDSIQ6AEIWD AJ#v=onepage&q&f=false>  
(Accessed 20.06.2017)

De Young, R. (2013): Environmental psychology overview. In Ann H. Huffman & Stephanie Klein (Eds.) *Green Organizations: Driving Change with IO Psychology*. 17-33. New York: Routledge.  
<http://hdl.handle.net/2027.42/101927>

(Accessed 14.12.2016)

Donnermeyer, J. F. and Phillips, G. H. (1984): Vandals and vandalism in the USA. In Levy-Leboyer, C.: *Vandalism, Behaviour and Motivations*. 319-334. Amsterdam: Elsevier Science Publisher B.V.

[http://publicaties.dsp-groep.nl/getFile.cfm?file=/84\\_12\\_Vandalism%20behavior%20and%20motivations\\_12-1984.pdf](http://publicaties.dsp-groep.nl/getFile.cfm?file=/84_12_Vandalism%20behavior%20and%20motivations_12-1984.pdf)  
(Accessed 19.06.2017)

Fogg, B.J. (2007). BJ Fogg's Behavior Model. Persuasive Technology Lab Stanford University.  
<http://behaviormodel.org/index.html>  
(Accessed 20.11.2016)

Kaklauskas, A. et al. (2013): Multiple-Criteria Analysis of Life Cycle of Energy-Efficient Built Environment. In Nearly Zero Energy Building Refurbishment. 299-324. London: Springer.  
[https://www.researchgate.net/publication/258836223\\_Multiple-Criteria\\_Analysis\\_of\\_Life\\_Cycle\\_of\\_Energy-Efficient\\_Built\\_Environment](https://www.researchgate.net/publication/258836223_Multiple-Criteria_Analysis_of_Life_Cycle_of_Energy-Efficient_Built_Environment)  
(Accessed 17.06.2017)

Kelling, G. L. and Wilson, J. Q. (1982). Broken Windows. The Atlantic, March 1982 Issue  
<https://www.theatlantic.com/magazine/archive/1982/03/broken-windows/304465/>  
(Accessed 19.06.2017)

Kelling, G. L. (2009). How New York Became Safe: The Full Story. City Journal, Special Issue 2009  
<https://www.city-journal.org/html/how-new-york-became-safe-full-story-13197.html>  
(Accessed 20.06.2017)

McLeod, S. (2008, 2017). Erik Erikson. SimplyPsychology  
<https://www.simplypsychology.org/Erik-Erikson.html>  
(Accessed 15.06.2017)

Reb, J. and Connolly, T. (2007): Possession, feelings of ownership and the endowment effect. In *Judgment and Decision Making*, Vol. 2, No. 2. 107–114. Society for Judgment and Decision Making  
<http://journal.sjdm.org/jdm06131.pdf>  
(Accessed 09.06.2017)

Van Dijk, B. et al. (1984): Vandalism in Amsterdam. In Levy-Leboyer, C.: *Vandalism, Behaviour and Motivations*. 319-334. Amsterdam: Elsevier Science Publisher B.V.  
[http://publicaties.dsp-groep.nl/getFile.cfm?file=/84\\_12\\_Vandalism%20behavior%20and%20motivations\\_12-1984.pdf&dir=rapport](http://publicaties.dsp-groep.nl/getFile.cfm?file=/84_12_Vandalism%20behavior%20and%20motivations_12-1984.pdf&dir=rapport)  
(Accessed 19.06.2017)



## 9 Image Index

Figure 01. Built Environment	11
Figure 02. Environment as Source of Informations	12
Figure 03. Space Classification	12
Figure 04. Human Information Processing Model	14
Figure 05. Broken Window Theory	16
Figure 06. Fogg Behavior Model	19
Figure 07. Implication of First Behavior based on Fogg Behavior Model	19
Figure 08. Basic Respondent Data	25
Figure 09. Public Amenities in Bad Condition Finding	25
Figure 10. Damage Causes of Public Amenities	25
Figure 11. Satisfaction Level of using Public Amenities	25
Figure 12. Lack of Sense of Ownership	26
Figure 13. Fast-food Restaurant	28
Figure 14. Grocery Market	29
Figure 15. Local Restaurant	29
Figure 16. Basic Concept of Self Extension	32
Figure 17. Control and Being Controlled by Object	32
Figure 18. Creation of an Object	33
Figure 19. Knowledge of the Object	33
Figure 20. Object Contamination	33
Figure 21. Responsive Environment Basic Concept	38
Figure 22. Responsive Environment Features	38
Figure 23. Responsive Environment	39
Figure 24. Adaptive Streetlight	40
Figure 25. Self Extension Street Bench	42
Figure 26. Adaptive and Self Extension Bus Stop	44
Figure 27. Adaptive and Self Extension Bus Stop	46
Figure 28. Responsive Environment	48

## 10 Appendix

### Ap3. Survey Questions

1. Personal Details  
Hello, my name is \_\_\_\_\_. I am \_\_\_\_\_ years old. And I come from \_\_\_\_\_(nationality). I am currently living in \_\_\_\_\_(city), \_\_\_\_\_(country).
  
2. Daily Routine
  - 2.A. My current daily routine on weekdays is \_\_\_\_\_.
    - a. study
    - b. work
  
  2. B. I am studying/working at \_\_\_\_\_.
  
  2. C. My study-place located around \_\_\_\_\_ from my home.
    - a. 0 - 1 km
    - b. 1 - 3 km
    - c. 3 - 5 km
    - d. more than 5 km
  
  2. D. And I commute to my study-place by \_\_\_\_\_.  
choose as many as you like
    - a. walking
    - b. riding a bicycle
    - c. driving a motorcycle
    - d. driving a car
    - e. ride-sharing
    - f. using public transportation
    - g. other, you name it

3. Public Amenities

3.A. What public amenities objects that you usually found on your way to your working/study-place?

choose from the following options whether you have been experienced to utilise it by yourself or even just saw it on your way to your working/studyplace.

[pictograms of public amenities + optional answer]

3.B. Which of the public amenities objects you found that you think was in bad condition? i.e. dirty, damaged, broken, or even just not working properly as it was designed for.

[pictograms of public amenities + optional answer]

3.C. Why do you think the public amenities that you found was/were in bad condition?

3.D. Can you please elaborate more details of how that/those reason(s) makes the public amenities in bad condition?

4. Satisfaction Level & Opinion

4.A. Overall, I \_\_\_\_ public furniture objects in a. how would you rate it? from [a] Excellent -to- [e] Awful.

- a. really enjoy using
- b. am just glad that there is
- c. just use whatever
- d. am not interested to use
- e. really hate
- f. don't have any idea about

4.B. I have something more to say about this. \_\_\_\_\_.

Please state your reason why or how you rate that level. and/or/ If you have any ideas, hope, experiences, opinions about the public amenities objects anywhere, please feel free to write here.

#### **Ap4.A. Fast-food Restaurant Field Note**

Date : 09.06.2017

Time : 12:35 - 14:00

- get in to the restaurant
- queuing for order (waiting for 4 customers)
- order, wait, and get the food
- find a seat
- eat
- 1 customer from the table across left their waste on the table even though the waste bin was just beside them.
- one of restaurant staff clean up the mess
- all of the seat seems almost full
- another customer from another table also left their waste
- new customer just clean that up, so he can use the table
- for the last 30 minutes of observation there are 5 other waste leave cases, and 1 other customer clean the table.
- observation finished.

#### **Ap4.B. Grocery Market Field Note**

Date : 09.06.2017

Time : 15:00 - 15:20

- get in to the market
- saw 1 customer taking a cart using her coin
- roam around, picking up some stuff
- saw another 4 customer who uses cart
- pay at the cashier
- shopping finished
- observation finished

#### **Ap4.C.Local Restaurant**

Date : 09.06.2017

Time : 18:30 - 20:15

- get in to the restaurant
- order at the ordering bar
- find a seat
- 2 new customers just get in, one of them put their bag on one of the empty seat, i guess for tagging the seat
- order come, eat
- another customer get in, order, and find a seat.
- for the last 1 hour of observation there are 3 other seat tagging cases.
- observation finished

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## Confirmation of Authorship

I hereby formally declare that the work submitted is entirely my own and does not involve any additional human assistance. I also confirm that it has not been submitted for credit before, neither as a whole nor in part and neither by myself nor by any other person.

All quotations and paraphrases but also information and ideas that have been taken from sources used are cited appropriately with the corresponding bibliographical references provided. The same is true of all drawings, sketches, pictures and the like that appear in the text, as well as of all Internet resources used.

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Imam M Ridwan

26 June 2017

Name

Date

Signature

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