



**10<sup>th</sup> SENVAR**

**International Seminar  
on Environment & Architecture**

**1<sup>st</sup> CONVEEESH**

Sam Ratulangi University  
Faculty of Engineering  
Manado - Indonesia



International Seminar  
on Environment & Architecture

International Conference  
on Engineering, Environment,  
Economic, Safety & Health

# PROCEEDINGS

**1<sup>st</sup> 10<sup>th</sup> SENVAR  
CONVEEESH**  
*26-27<sup>th</sup> October 2009*



SAM RATULANGI UNIVERSITY  
FACULTY OF ENGINEERING  
MANADO - INDONESIA  
2009

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## **Welcome Speech** **Rector of Sam Ratulangi University, Manado**

*Excellencies,  
Keynote Speakers, Prominent Researcher, Professors, Graduate Students,  
Distinguished Guests, Ladies and Gentlemen.*

Welcome to the International Seminar in Sustainable Environment and Architecture (10<sup>th</sup> SENVAR), and International Conference on Engineering, Environment, Economic, Safety and Health (1<sup>st</sup> CONFEEESH).

I am very pleased to be here to attend the opening ceremony of this event, and it is a great honor for the Sam Ratulangi University to host this a back-to-back event. As a rector, let me give you a brief introduction about Sam Ratulangi University. This university consists of eleven faculties including Medicine, Engineering, Animal Science, Fisheries and Marine Sciences, Economics, Law, Social and Political Sciences, Letters, Mathematics and Natural Sciences, and Public Health. We run various academic programs for undergraduate and postgraduate level. We have several research centres, and one of them is the centre for environment.

In order to increase the quality, we set up several programs which one of them is to increase cooperation and collaboration with international universities and other related institutions. Currently we have some collaborations with institution abroad, and looking forward to having more cooperation and collaborations with others.

As we know, SENVAR has been hosted at both Indonesia and Malaysia for ten times, while CONFEEESH is the first conference that is originally initiated by faculty of engineering, Sam Ratulangi University. CONFEEESH is a platform for dissemination on knowledge of engineering for better life involving aspect of environment, economics, safety and health. Obviously, these two events provide a common platform for discourse, and are proudly organised together as both have similar objectives and obsession.

This event has successfully brought together experts and professional in diverse disciplines that are striving to give answer to engineering for better life. I believe that this even will be



an important forum for the exchange of information between different educational and research institutions, or between intellectual and industries.

I hope that this event would be fruitful in terms of sharing knowledge between us. I expect that the relationships established among participants during the conference will end up with more joint research projects and friendship among us.

This event is taking place with the support and coordination of many parties. Therefore, on behalf of Sam Ratulangi University I would like to sincerely thank to Organizing Committee. I would like also to express our gratitude to keynote speakers, presenters, all delegates and participants.

Thank you for visiting us in Manado Indonesia, I wish you all a successful seminar and an enjoying stay. May God bless us all.

**Prof. Dr. Donald A. Rumokoy, SH., MH.**  
*Rector*



## **Welcome Speech Dean of The Faculty of Engineering Sam Ratulangi University, Manado**

I am very pleased to welcome all speakers and participants of the First International Conference on Engineering, Environment, Economic, Safety and Health (1<sup>st</sup> CONVEEESH) and the Tenth International Seminar on Environment and Architecture (10<sup>th</sup> SENVAR).

It is a great honor for us to organize and hold this very prestigious scientific event. As a leading Engineering Educational Institution in North Sulawesi Province, Faculty of Engineering Sam Ratulangi University always commits to be in the front line in the development of knowledge and technology. In facing the global challenge, this institution continues to improve itself by always developing and maintaining communication, networking and collaboration with various government and private institutions, profession organizations and other universities in country and overseas.

During 45 years since its establishment, Faculty of Engineering Sam Ratulangi University has produced more than 5000 graduates and currently has about 2500 students and 230 academic staffs distributed in four departments, Civil, Architecture, Electrical and Mechanical Engineering. This year, in the celebration of the 45<sup>th</sup> Anniversary of Faculty of Engineering Sam Ratulangi, we want to state again our commitment through a series of events with the theme 'Science and Engineering for Better Life', in which this International Conference and Seminar becomes one of the main programs.

I really appreciate the attendance of all speakers and participants from various institutions in country and overseas. I believe this conference and seminar will become a good forum for sharing information and experience, and with all your expertise I also believe that this forum could give significant contribution to the development of knowledge and technology that in turn could contribute to 'better life'.



Finally I would like to express my special thanks to the Organizing Committee, Technical Conference Chair and International Scientific Committee Members for all your hard work to make this event possible and my sincere thanks also to all speakers and participants, I hope you will have enjoyable conference and seminar. And for those who come from outside of Manado, I also hope you enjoy your stay here.

**Prof. Dr. Ir. Ellen J. Kumaat, MSc., DEA**  
*Dean*



## PREFACE

Sustainable development is one of the key issues for modern society and requiring new ideas to advance the technologies and strategies currently in use. The main fields, which are the focus of many research efforts, are engineering, ecosystems, planning sustainability and many others. These and other aspects are the focus of the presentation and discussions that will be carried out at the Conference.

The way in which our society exists, operates and develops is strongly influenced by the way in which sustainable development is applied and implemented. No function in sustainable development can be created without sufficient knowledge, and without sustainable development there can be no innovation on which the existence of modern society depends. However, this international Conference will focus on topics related to Sustainable Development in Engineering, Ecology, Ecosystems, Economics and Planning.

Editors



## ***Preface***

### ***CHAIRMAN***

It is a great honor that Faculty of Engineering, Sam Ratulangi University has been chosen as the host of a prestigious conference, First International Conference on Engineering, Environment, Economics, Safety and Health (1<sup>st</sup> CONVEEESH) in collaboration with Seminar on Environment Sustainable and Architectural (10<sup>th</sup> SENVAR), 2009.

As we are aware of globalization's impact that has resulted in very competitive business environment, which makes the fulfillment of customer sophisticated projects, products or services faces many challenges. With a great cooperation between CONVEEESH and SENVAR, we have successfully brought together experts and professionals in diverse disciplines who are striving to provide solution to global problems in term of energy consumption and its effect on sustainability and global climate. They do not only have an innate concern for environment but also for the human prosperity and the whole mankind.

We appreciate to receive more than 140 papers come from 14 countries which give contribution for this International events, which will be making our discussion more interesting and we hope these could give valuable contribution to various solutions for the environmental issues.

The organizing committee is also very grateful to invite 4 keynote speakers from Germany, Malaysia and Indonesia who have willingness to share their expertise and experiences with the participants.

I wish you a very pleasant stay in Manado and wish you all a meaningful and fruitful conference. Thank you.

**Prof. Dr. Ir. Sangkertadi, DEA**  
*Chairman*

*Prof. Dr. Ir. Sangkertadi is architect and specialist in Building science at The Department of Architecture, Faculty of Engineering Sam Ratulangi University.*





## *Preface*

### *Co-chairman*

On behalf of the organizing committee, it is a pleasure to welcome all participants to the inaugural First International Conference on Engineering, Environment, Economics, Safety and Health (1<sup>st</sup> CONVEEESH) in collaboration with Seminar on Environment Sustainable and Architectural (10<sup>th</sup> SENVAR), 2009, hosted by the Faculty of Engineering, University of Sam Ratulangi in Manado, Indonesia at the celebration of 45<sup>th</sup> Anniversary of establishing the Faculty of Engineering. The aims of this International Conference are to exchange noble ideas and opinions on matters relevance to sustainable development and climate changes and to bring together engineers, environmental engineers and economists in both academic and industry to reflect upon the current status, the achievements and progresses in all main aspects of engineering, environmental, economics, safety and health and to share insights to the various attractive opportunities from a global perspectives.

I am looking forward to an active and productive exchange of views and information among all the participants gathered from a wide variety of associated disciplines. I am sure that your contribution will help to advance research in engineering, environmental, economics, safety and health in our countries in particular and the world in general.

It is a great opportunity indeed, to host the 1<sup>st</sup> International Conference on Engineering, Environmental, Economics, Safety and Health (CONVEEESH'09) Jointed Seminar on Environment Sustainable and Architectural (10<sup>th</sup> SENVAR) in Manado, Indonesia, which featuring 4 keynote papers by professors and experts, on various issues related to the conference's themes and more the 170 research-based papers drawing from various scientist, researchers and students in different fields. I would like to express our appreciation to paper presenters and the session chairpersons for their contribution. I also wish to extend our thanks to the Vice



Chancellor of University of Sam Ratulangi, and the Dean of the Faculty of Engineering for gracing this event. Our appreciation also goes to corporate and individual sponsors for their support. Last but not least, I would like to thank the members of the organizing committee and other individuals for their commitment to make this event a success.

Thank you very much.

**Dr. Abdelnaser Omran Al-Amroni**

Co - Chairman

*Dr. Abdelnaser Omran is specialist in field of environmental engineering and management at the School of Housing, Building and Planning, Universiti Sains Malaysia. He is an avid writer, contributed many publication in environmental sciences, construction and project management.*



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# Keynote Speakers

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**Dr. Odile Schwarz-Herion**, born 1970 in Ettlingen near Karlsruhe, Germany, gained her PhD degree in economic sciences, focusing on Environmental and Sustainability Management, from the University of Hohenheim. An MBA as well as an undergraduate in law, Dr. Odile Schwarz-Herion who had previously worked as project manager and account manager in large international enterprises of the car component and electrical equipment industry, is now Sustainable Development Consultant for private enterprises in Germany and abroad as well as speaker on international Sustainability conferences. Furthermore, Dr. Schwarz-Herion is author, co-author and co-editor for books and articles in international journals in the field of Environmental and Sustainability Management. Her scientific focus is the evaluation of the performance of private enterprises in the field of Sustainability and Environmental Management on the base of the triple-bottom line approach.



**Professor Ir. Dr. Mahyuddin Ramli** is currently the Dean and the Professor of Building Technology at the School of Housing, Building and Planning, USM. He started work as a civil engineer in Development Department, USM in March 1980. In Oct 1985, Ir. Dr. Mahyuddin resumed a lecturer post in the School of HBP, after 5 years in professional practice. He has served the School of Housing, Building and Planning for 20 years. During this period, he has also been appointed as the Head of Department of Building Engineering, Deputy Dean and also Acting Dean of the School of Housing, Building and Planning, USM. As an academician, Ir. Dr. Mahyuddin has already written 9 books and 1 monograph and research papers in both local and international journals on advanced concrete materials and ferrocements, which also become his main area of interest. He was the recipient of the 13th International Year of Shelters for the Homeless Award (IYSH) and the Matsushita Prize 2000, Tokyo, Japan. He is the First Malaysian to be awarded such prestigious award which were participated by many countries all over the world. He is also the recipient of the Human Settlement Award (Research Project) organised by the Ministry of Housing and Local Government, Malaysia in conjunction with the World Habitat Day in Kuala Lumpur in October 2000. Professor Ir. Dr. Mahyuddin is actively involved in conducting research and consultancy in the development of ferrocement structures to marine and housing development.



**Prof. Dr. Adnyana Manuaba** was born on 8 May 1936, at Yogyakarta, Indonesia. He has given most of his time to the development of Ergonomics-OSH-Industrial Hygiene, Tourism Planning and Development, Human Ecology and Sustainable Development, Sport Health and Performance, Human Resource Development and Management through Institutional-Human Resource Capacity Building and Development. Recently, through Total Ergonomics, he give more attention to the problems of technology choice and transfer, disasters, public utilities design, transportation accidents, etc., with goals to attain better life through human, competitive and sustainable works system and products.

# **Systemic, Holistic, Interdisciplinary and Participatory (SHIP) approach is a must to obtain Humane, Competitive and Sustainable Work System and Products.**

**Adnyana Manuaba**

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## **Abstract**

*Since Indonesia starting using science and technology for her Five Years Development Plan in 1969, a lot of disadvantages have been faced beside the advantages. They consist of Work related Occupational Health diseases, accidents, environmental destruction, pollution, intoxication, casualties, beside complaints and pain raised by the users. Efforts to remedy through one or two disciplines application did not successfully result. It was indicated that in holistic planning and poor law enforcement are the main causes.*

*A Systemic, Holistic, Interdisciplinary and Participatory (SHIP) approach has been introduced since 1999 to identify and to solve the problems. And an ergonomics appropriate technology approach has been encouraged in selecting the technology being used. Legally it was already written in TAP MPR No 4/1999 or National Development Main Guideline 1999-2004 especially related to tourism development. Meanwhile engineering education conference in Madrid 2006 emphasized strongly the need of Ethics in their curriculum. It should be no hazards for the human being in producing tools, and give high consideration of sustainable development in using the space. To attain such a condition, engineers should stop their arrogant and egoism by starting working in a holistic way with other disciplines.*

*At Udayana University, human resource development to support the approach through education, research, and services have been carried out intensively and extensively within the Ergonomics, Tourism and Environmental Study Programs. Human resource empowerment and conditioning to think and act holistically have been carried out through various Integrated Ergonomics SHIP approach Workshops and various communication opportunities. The goals are to strengthening the capability to think and act holistically and to solve problems properly and appropriately to attain humane, competitive and sustainable work system and products.*

**Keywords:** *SHIP ergonomics technology, humane-competitive-sustainable work system and products.*

## **1. INTRODUCTION**

Until recently since Indonesia starting using science and technology in 1969 for her Five Years Development Plan, a lot of disadvantages have been faced beside the advantages. They consist of problems and issues of Work related Occupational Health diseases in various workplaces; accidents which are very high in numbers in transportation; environmental destruction which covers various sectors likes in forestry, beaches; various types of pollution among others scenery pollution beside water, air and land; food intoxication; transportation and flooded casualties; beside complaints and pain raised by the users in doing and after the work processes ended. In such a situation, social, economical, and physical impacts have to be faced. Productivity shall be low, quality of the products shall not be as expected, error and rejected goods shall be higher. Extra costs to remedy the impacts are tremendously high. High cost economy emerged as consequences. Obviously competition in this global free market shall be difficult. Nor to say in developing and maintaining sustainability.

Efforts to remedy through one or two disciplines application, in fact, did not successfully result. Waste of time and financial disadvantages are the end results. Very often new problems emerged, which made the previous problems becoming more complex in character.

Through several studies being done it was indicated that in holistic planning and poor law enforcement are the principle causes. Serious, effective, efficient and comprehensive effort must be done to stop the problems from making it more badly.

## **2. CHALLENGES**

Holistic planning meant that problems should be solved and planned through a multi and interdisciplinary approach, in which relevant and significant disciplines must be involved. To carry out such an approach an effort must be started by gathering people in a team who should have the thinking and then act in a holistic way. Prerequisite as a team member must be developed. Individual capacity building must be customized and institutionalized. Started with having similar perception, trust and ready to collaborate each others, having empathy, appreciate differences, avoid discipline ego and arrogant attitude, accept and conduct democracy and human rights principle, dare to give critics and to be critiqued politely. Human resource empowerment to think and act holistically through a team representing various relevant and significant disciplines must be really developed. The end results must come out with people who really appreciate to work together in a team to identify and solve problems properly and appropriately. By so doing there will be no left behind problems and more holistic solution could be attained.

With all those capability, to hinder all those negative impacts and disadvantages from happening again, efforts should be directed to develop healthy, safety, comfortable and efficient working conditions and environment. This must be done as earlier as possible in designing or planning the work system to be used and products to be produced. Human center oriented policy must be utilized in this process. Human being should not only consider as object but also as subject as well. In every development processes.

The orientation that human being is only just one of the production factors must be avoided. Evidence that in any working process human being is considered as the prime factor, support strongly this new thinking. Significant role in every industrial activity showed this. Product design is an outcome of sustained personal innovation; manufacturing is the result of teamwork applied to technology; marketing is the sum of people-devised service added to products; restructuring is the redeployment of people and their knowledge; TQM is the application of human intelligence to improve processes. This new mind set must be developed among designers, policy and decision makers, especially how to put it built-in within all those processes the capability and limitation of the human resource with aim to attain humane, competitive and sustainable work system and products at the end.

In this context ergonomics could be use as an effort to bridge the gap, to fill in the needs and to solve the problems in designing or making decision. As ergonomics design is the design of tools, machine, equipment, organization, environment, job, task, work system and product using human being characteristics with aim to have optimal functioning of human capability and limitation; it is really a significant answer the above thinking.

## **3. OPPORTUNITIES**

Globalization with its 3Cs, complexity, competition and change is really a relevant and significant answer to start working in a team, to enhance the ability to compete and to change in our approach to face the demanding future. Facing so many development projects recently is a good opportunity to carry out the ideas. So many losses being faced taught us to conduct improvement. Many good examples of good ergonomics are good economics encourage us to start using team approach in which ergonomics built-in there in. Encouraging any related disciplines to work together in a team becoming a need not only to survive but also to win the competition and to be sustained. Ones felt need is really meet the demanded need.

## **4. ANTICIPATION**

To improve the quality of life in general and working life in particular through a team consist of various related significant disciplines is really becoming a must. Human center design or policy through ergonomics application built-in within any work process initiated by related and significant disciplines should be carried out to attain humane, competitive and sustainable work system and products. As consequences, there is a prime need of individual capacity building to think and act holistically to make the effort successfully done.



#### **4.1. SHIP and Ergonomics Technology**

A Systemic, Holistic, Interdisciplinary and Participatory (SHIP) approach has been introduced since 1999. This approach must be used in identifying and solving the existing problems as well as in proposing and carrying out new development projects. The concept was started years before and it grows in parallel with tourism sector development as one of the economical potentials of Bali. It began with holistic, systemic, and interdisciplinary elements consecutively. Then the participatory element was added to the concept. The name SHIP was proposed and used during the Tri Partite Conference in Manila in 1999.

And in choosing the technology being used, a holistic ergonomics technology/ ergonomics appropriate technology approach has been utilized in which technology must be assessed through 6(six) criteria namely it must be technically, economically, ergonomically, social culturally sound, safe energy and preserve not destructing the environment. Both approaches have been familiarized as Total Approach in Ergonomics.

Legally it was already written in TAP MPR No 4/1999 or National Development Main Guideline 1999-2004 especially related to tourism development.

It has been used to tackle various issue and problems, started by introducing the goals and objectives, its role in many aspects of life activities, up to considering it as the right means to be used in technological transfer (1-15).

#### **4.2. Ethics in engineering curriculum**

the Ethics and Sustainable Development issues in Engineering Education Symposium in Madrid last 27 March to 2 April 2006 stressed that Ethics and Holistic approach must be built within the curriculum for engineering education. The Ethics has strongly emphasized that no hazards in producing tools for human being as users, and strong concern and commitment of sustainable development in using the space for development. To attain such a condition, engineers should stop their arrogant and starting working in a holistic way with other disciplines. This information has been informed through communication and participation in various conferences organized by faculties of technology in various parts of Indonesia. Is is highly hoped that slowly but surely, we are going to develop team approach in designing and tackling the complex problems being faced lately. For this purpose ones should start to throw away the discipline arrogant and ego, and trying so hard to work with holistic thinking and act.

#### **4.3. Integrated Ergonomics SHIP approach workshop**

Integrated Ergonomics SHIP approach workshop have been launched in various institutions to empower the human resource enable them to think and act holistically. Each workshop started with problem identification, and ended with action plans through a certain processes.. The process consist of problems identification, prioritizing, change into positive looking forward sentences, SWOT analysis, write strategic planning, vision, mission, work plan, and action plans. The workshop which at least took 2 days will be ended by action plans as output, and empowerment of participants as the outcome. A lot of issues and problems have been solved in form of action plans which will be used by the respected stakeholders. In various places, these action plans have been as such organized and legally accepted to become their development program. Bantul Regency in Yogyakarta as an example, which did altogether three workshops in 2005, 2006 and 2008 involving all key persons in the area. How important this approach to empower their human resource and solving their problems holistically has been indicated by the evidence that universities in Bali and Yogyakarta, foreign oil and gas industry in East Kalimantan, have conducted the workshops.

#### **4.4. Education, Research and Services**

At Udayana University, human resource development to support the approach through education, research, and services have been carried out intensively and extensively within the Ergonomics, Tourism and Environmental post graduate curriculum. Various examples and evident based researches have been carried out using Total Ergonomic Approach to attain better working life (16-23). Petiga Village as an example how ergonomics and other disciplines are working together to enhance better life has been organized (25). An International Seminar on Ergofuture has been carried out in 2006 in Bali with aim to familiarize Total Ergonomic approach for attaining better life (10). An Integrated Ergonomics SHIP approach workshop was

done also in this event. The result which consists of many action plans as output and conditioning of how the participants start to think and act holistically have also been done as outcome.

Communication with government and private institutions have been launched with aim to strengthening the capability to think and act holistically of their human resources, and to solve their problems to attain humane, competitive and sustainable work system and products. Campaigning the thinking and act holistically seems greatly successful, as the word is now frequently used in many events or opportunities by many different people with different backgrounds.

## 5. DISCUSSION

### 5.1. Successful story

SHIP approach needs a team approach representing related and significant various disciplines as active members. So is also when selecting the most appropriate technology being used. To conduct the role properly, each member should have new mind set, it is to think and act holistically. In conditioning these changes, Integrated Ergonomics SHIP approach workshops have been launched since 1999, and up to now more than 60 workshops have been conducted. More than 5000 participants from various backgrounds disciplines, position, levels, ages, representing different institution from government as well as private sectors were involved. Each workshop has its own theme, and the output will always be in form of action plans, and empowerment of the participants to think and act holistically as outcome. The workshops took at least two days time on the average, and were organized ergonomically to keep them always fit to carry out their task.

From evaluation being done, it seems that in all workshops the participants were so happy to get the opportunity to follow the workshops, and practically in all aspects of the processes in two days, they felt so happy to be empowered to face the future. and fully satisfied. to what they have been learned.

**Table 1.** Participants' comments after following a workshop

Items	Number of participants answering "yes"
Being appreciated as individual from friends at the same table	98.9%
Feeling more self confident	97.8
More opportunity, freedom and capability to communicate	97.8
More capability and freedom to propose opinion without any pressure	98.9
More willingness, ability and courage to appreciate differences	100.00
More understanding how to get together, and to collaborate	100.00
More capability to give empathy	100.00
More capability to work together in a team	100.00
More capability to write vision, mission, and work plan	97.8
Felt Time elapsed so fast in following the workshop	90.10
Feeling unhappy to leave the workshop in the midden of activity	96.7
Anxious to give maximal contribution	100.00
Dare to accept and give critics	95.6
Dare to give different opinion	98.9
Start to change the mind set and thinking	98.9
Having a lot of new knowledge, experiences and perspective	95.6
Having a lot of friends and new network in communication	96.7
Start to know new friends with various character, who shall taught me	98.9
Start to know who could just talk only, lazy, keep silent but work hard,	92.3
Do a lot of work and having a lot of work	
Many already start not to be arrogant anymore, not monopolizing time, and Not trying to win always	89.0

*Source: Evaluation Data of Integrated Ergonomics SHIP approach Workshop, of Banks in Bali,*

16-17 October 2008

Note: Similar illustration also happened in various workshops done previously. Reports submitted from implementation of action plans, it seems that A SHIP approach has already being done by many stakeholders successfully, although still sporadically and incidentally.

## 5.2. Constrains and Obstacles

There are (24) some action plans are not being touched or done yet due to financial obstacles and constraints. It could be the fund is still in the process, or still unavailable, or still need a fight to get it. Lack of leader ship especially to gather team members are another constraint. Time availability to conduct team meeting is still a crucial problem. Tight program owned by each team member is also a big obstacle, especially if everybody said has to meet the deadline schedule. The most obstacles and constraints are lack of concern and commitment to the problems beside of no serious attention has been given by those having the authority to make the snow keep rolling. They consist of individuals who do not like openness, transparency, working in a team, having strong egoism, arrogant attitude, and last but not least having instant noodle or short term gains mind set. They do not like a change and felt more comfortable in a statuesque situation. In such a situation, slowly but sure wise approach must be done, to aware, understand conscious and starting a step to start the change.

## 6. CONCLUSION

In Indonesia disadvantages negative impacts still exist until today in using science and technology in development processes. As the issue and problems becoming more complex, it is useless to solve the problems with one or two disciplines approach only. Systemic and holistic approach must be done instead. Various relevant and significant disciplines must be interdisciplinary utilized, through a team approach. And the target group must be involved as earlier as possible. Not only the body but the mind and soul as well. The SHIP approach needs to be familiarized and customized since the plan has been firstly proposed. While in using, choosing and electing the technology, the proposed technology must be assessed comprehensively through 6 (six) criteria, namely it must be technically, economically, ergonomically, social culturally sound, safe energy and preserve not created environmental destruction. Both approaches are called as Total Ergonomics Approach in which various relevant and significant disciplines should be involved actively. To support the approaches, empowerment of human resource to think and act holistically must be carried out. Meanwhile at the University of Udayana, Master and PhD students in doing their Thesis and Dissertation have already used this approach intensively. All efforts are directed to attain humane, competitive and sustainable work system and products.

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# AFFORDANCES OF PLANTS AND ANIMALS IN GARDENS FOR CHILDREN'S PERFORMANCES

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## ABSTRACT

*This study investigated the performances of children playing with plant and animals in home and neighborhood gardens. Physical and social performances of middle childhood children in outdoor environments influenced their sensorial and motoric developments. Sensorial and motoric actions involved scanning and manipulating plant and animals in their own imaginative and creativity ways. Ecological perceptual responses of 120 children, aged 6-12, were elicited using a survey questionnaire and an interview in urban and rural outdoor environments. The purpose of the survey and interview was to measure children's physical, cognitive and social performances with the plant and animals that lead to the amount and level of affordances of the outdoor elements experienced by the children. The data was analyzed using SPSS version 15, and it was found that the urban and rural children played actively in the outdoor. Spatially, rural children played in five areas: front yard, side yard, back yard, barn area and bushed area. On the other hand, urban children played in playground, street, abandoned spaces and nearby forest. The rural children perceived trees as element to perform symbolic and constructive plays utilizing branches, stick and twigs, fruits and seeds to construct play tools such as slingshot and tops. Slightly different, their urban counterparts performed less constructive play but equally understood the natural links between plant and animal and between animal and other animal. Inasmuch, the study found that rural outdoors afforded more functional significances for children to physically and socially engage with the elements of plant and animals.*

**Keywords:** Middle childhood children, affordances, plant and animals, functioning, gardens

## INTRODUCTION

Studies on children's environment found that children play with structure equipments affords less physical and emotional development. Moreover, the studies have revealed that children are found to feel bored after a few visits to playgrounds with play equipments (Ismail, 2008, Christensen and O'Brien, 2006, Louv et al., 2008). In contrast, children perceived green spaces as a playscape affording a variety of functional properties, examples include rumbling and tumbling, running, sitting on grass, observing animals in field, and collecting ornamental grass flowers. Therefore, play in outdoor environment enables children to roam far distant places. The places can be abandoned spaces, vacant lands, and wild spaces that afford fascinating activities and independent movement which playground could not provide. In other word, these places offered private activities and out of parent or adults supervision and surveillance. Therefore, elements in nature afford attention stimuli toward children cognition (Wilson, 1995; Ulrich, 1993) and declarative knowledge (Kaplan, 1991).

Plants and animals are the most recognizable natural elements when children play in the outdoors. Children found plants and animal afford fascinating interactive and imaginative activities (Hart, 1992). Plants and animals also afford multi-functional affordances in constructive, functional, and symbolic play (Fjortoft, 2004). Studies by Chawla (2002) and Percy-Smith (2002) revealed that children are the best manipulator of outdoor element as well as

users of local environments; playgrounds, parks, gardens and natural open spaces. The children perceived the natural environment as a place for them to socialize and physically active with peers, siblings or accompanied by parent or adults occasionally (Ladd and Coleman, 1993; Ladd, 1999).

## HOME AND NEIGHBORHOOD GARDENS

This study examined children's functioning in home and neighborhood gardens in a terraced house community and a village. A home garden of rural house is referred as legal proximity territory of spaces demarcated by plant including fruit trees. The outdoor spaces are front yard, side yard, back yard, barn yard, and bush area (Figure 1). These spaces are connected to neighboring houses which are generally houses of relatives. The spaces and the trees afforded a variety of functional properties to children for outdoor experience. On the other hand, a home garden of urban house is a fenced or walled space in front of building. Its shape is similar to one another in a neighborhood that is having a standardized design as shown in Figure 2. Its typical spaces are car porch area, side yard and back yard. Like the rural outdoor spaces, they provide space for children to play. However, its functional properties are less varied than the rural ones due to its monotony in form and layout.

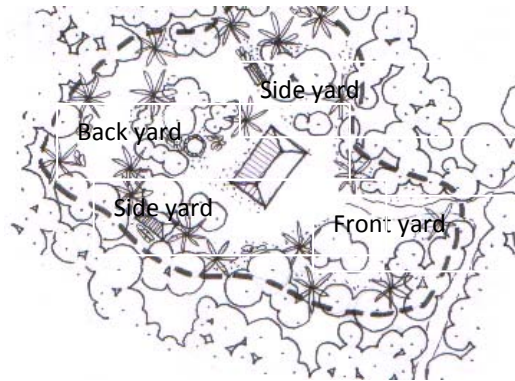


Figure 1: Schematic layout of home garden in a rural setting

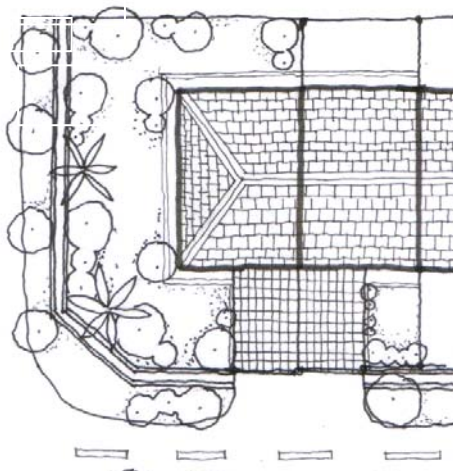


Figure 2: Schematic layout of a terrace home garden

A neighbourhood garden of urban setting is a composite of playgrounds, parks, paved open spaces, and abandoned open spaces affording more and larger spaces for children to discover, to explore and to socialize with peers in their play. The parks and playground are equipped with play structures and trees planted in organized layout. They afforded the children with regulated play and few manipulating opportunities. On the other hand, the abandoned spaces are wild place with treelets, tall shrubs and weeds affording the children to play loose and be manipulative. A neighborhood garden of rural setting are composed with varied spaces that include farm, orchard, nearby forest, and bushed area. These spaces afforded children to play freely to perform and explore intuitively on natural elements as their play tools.

## METHODS

The study elicited 120 perceptual responses of middle childhood children, aged 6-12, who lived in urban terrace-house (n=60) and a rural village (n=60). It investigated on children preferences on gardens; home and neighborhood gardens. The interaction in both gardens involves with plant and animals in spaces; and the properties of affordances in garden by comparing with both residential setting; urban and rural setting. The children were interviewed on their experiences with the home and neighborhood garden. Both were social space for the children to play involving sensorial and motoric activities. The children were interviewed in the gardens or at their schools. They were randomly selected, and were interviewed either individually or in a group of five. In urban neighborhood gardens children were interviewed by the author while playing in the playground. In the school, the survey was conducted in the classrooms with the permission of the class teachers. The children were rewarded with knick-knacks after completed the questionnaires. The survey last for about one hour for each classroom and 10 to 15 minutes per individual or per group in the gardens.

## MEASUREMENTS AND DATA ANALYSIS

The instruments to elicit the perceptual responses of the children were survey questionnaire and open-ended interview. The questions in the survey were divided into two settings according to children participation: (1) home garden, and (2) neighbourhood garden. The survey questionnaire and interview of urban and rural children was conducted in school, playground of terrace house and home garden. The interview was conducted into two groups; individuals and groups of five. The survey elicited children range, properties categorization and affordances of the gardens for cognitive, physical and social functioning. The actual places for the children to play performing motoric and social activities in urban neighbourhood garden were categorized into four types: playground, green or abandoned spaces, nearby forest, and paved open spaces. On the other hand, the actual places in rural neighbourhood were composed into five types: farm, orchard, river and stream, home settings, and nearby forest. During the interview, the children were asked on their definitions of home and neighbourhood gardens, their interactions with plant and animals in their play, and the places that they regularly visited.

## RESULTS

The results are divided into three categories: (1) actual places in the home and neighbourhood gardens, (2) categorization on plant and animals, and (3) categories of affordances including levels of affordances, taxonomy of affordances and types of affordances.

### Places of Children Experienced in Home and Neighborhood Gardens

As can be seen in Figure 3, the urban children played in nine places whereas their rural counterparts experienced in six places. The result suggests that the former were exposed to more variety of spaces than the latter. It also indicates that home and neighborhood garden in both settings afforded an array of functional properties for the children to play and enjoy. As such, the rural children seem satisfied experiencing in the bushes and orchard areas whereas their urban counterparts preferred to play in nearby forest and home garden. It appears that natural places in residential areas are play spaces for the children.



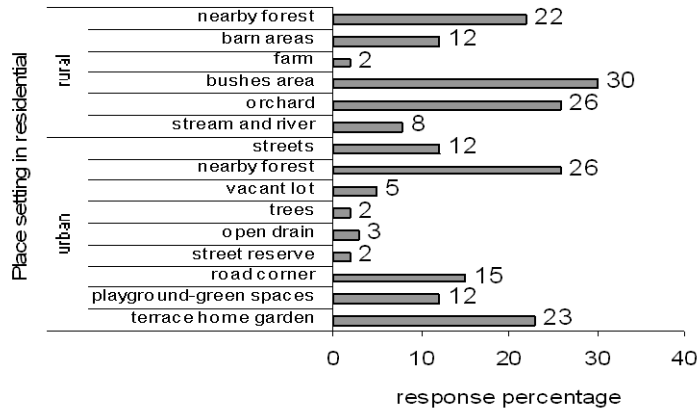


Figure 3: Places experienced by urban and rural children

In aspects of function, territory, and context of play, rural children preferred to play in home garden (42%) and orchard (26%) whereas the rural ones selected green and abandoned spaces (36%), nearby forest (26%) and terraced home gardens (23%)—Figure 4. It suggests that the rural children felt safe and comfortable playing within accompanied by parents or adults and felt familiar spaces. Inasmuch, they felt the orchard setting offered more familiar attention because the vegetation are seem familiar for them as home garden such as trees of rambutan, durian, and guava. Moreover, the orchard setting offered them refuge for play with peers. In additional, it suggests that the urban children were attracted to play with natural elements that offered them fascination and being away from parent’s surveillances (Taylor and Kuo, 2006) rather than playing with structured equipments in playground. However, 23% of them were actively playing in the terraced home garden due to many social factor that forced them confined in terrace home garden such as parental concern of stranger in neighbourhood garden, an early year of middle childhood children, gender and many more (Walsh, 2006).

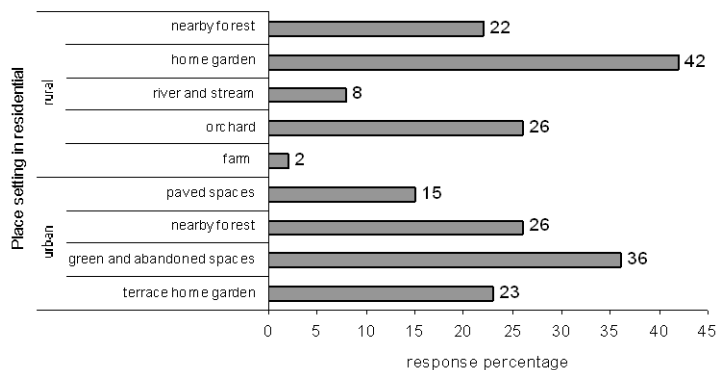


Figure 4: Categorization of places experienced by urban and rural children

Categorization of Plants and Animals as Play Tools

As can be seen in Figure 5, the children played with plants as play tools in the gardens and the analysis categorized the tools into five categories: (1) branches, sticks and twigs, (2) fruits and seeds, (3) trees, (4) leaves, and (4) flowers and buds. Children preferred to play with branches, sticks and twigs (37%), followed by fruits and seeds (28%), trees (19%), leaves (11%), and flowers and buds (5%). It suggests that the children see the tree and bamboo parts—branches, sticks and twigs—as manipulables. For example, bamboo pole afforded them nine affordances including self- made of gasoline lamp, cannon, musical instruments, fishing rods, kite frame, shooter stick, raft, bird trap, and

bird cage. Thus, it means that direct contact with the plant elements branches enabled the children to perform constructive and symbolic plays. As such, in symbolic play, sticks and twigs were turned into self-made sword for pretend play (Figure 6).

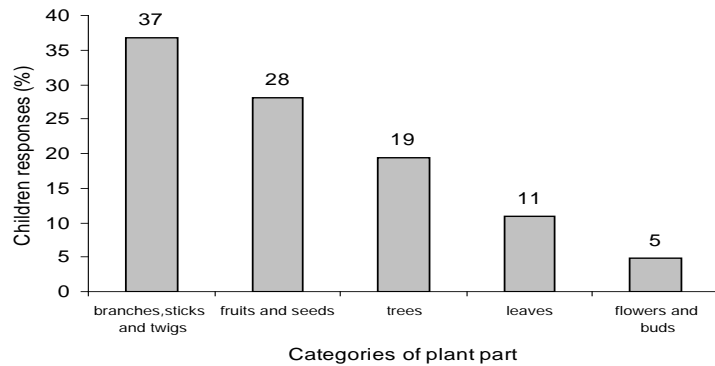


Figure 5: Plant categorization in gardens



Figure 6: Stick is symbolically represented a sword in pretend play

The study also suggests that the children were familiarized with garden fruits and seeds such as rambutan and betel nuts by eating them and turning them into play accessories, respectively. In the rural setting, children make spinning tops from betel nuts (Figure 7). The process of making a top begins with searching and collecting the betel-nut fruits under a palm tree. The husk of the fruit is peeled using secateurs to get the nut. Then the children cut a small piece of bamboo and punch it into the nut, and the top is ready for play. In summary, the children perceived the nut as top-make-able-to. Thus, the process of the top making involves at least six affordances: search-nut-able-to, collect-nut-able-to, cut-husk-able-to, cut-bamboo-into-stick-able-to, punch-stick-into-nut-able-to, and spin-top-able-to. This suggests that natural elements in the home and neighborhood gardens afford plenty of functions for children learning development (Kellert, 2002).

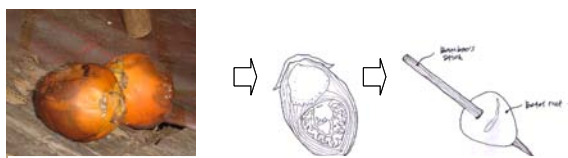


Figure 7: A betel nut is a material used by children to make manipulable such as a top

The children perceived trees as a property affording them with physical competency to play with peers. The activities were climbing, clinging, moving from branches to branches, viewing from top, and shaking or bending that led to exciting and fascinating play (Figure 8). Therefore, children viewed trees as primary affordances that offered them physical and emotional rewards. They found tree properties such as leaves, flowers and buds, fruits and

seeds, and branches, sticks and twigs as complementary materials for mutual activities. They favorite trees were fruiting species including water apple (*Syzygium aqueum*), mangosteen (*Garcinia mangostana*), rambutan (*Naphelium lappaceum*), Langsat (*Langium domesticum*), guava (*Psidium acutangulum*), sentol (*Sandoricum koetjape*).



Figure 8: Trees afforded physical challenges during socialization

In the home and neighborhood gardens, children played with four categories of animals: birds, insects, spiders, and small animals. As can be seen in Figure 9, children preferred to play with insects (42%), followed by birds (35%), small animals (15%) and spider (8%) suggesting that insects such as ants and birds were plentiful in the garden and attracted their attention.

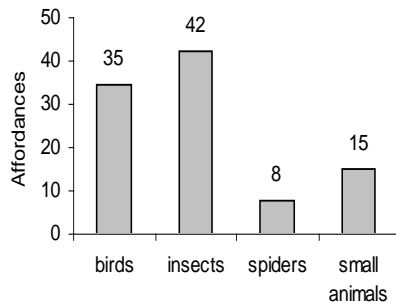


Figure 9: Categories of animals that children experienced in their play

The children encountered with birds in abandoned spaces, vacant land, and nearby forest. This is because these places where secondary forest tree species grew that provided seeds and flowers for food and place for shelter. The result suggests that the children recognized birds such as bulbul nested in the trees or kingfisher burrowed at stream bank. They also caught small animals such as squirrels and tortoises as pet. Most of these animals are found in the nearby forest and stream. In addition, relative to urban children, the rural ones were knowledgeable to search and to catch these animals.

Finally, both rural and urban children loved to play with jumping spiders and recognized the habitat the animal that is in Pandanus and a few flowering shrubs. Through play with the creature, they were able to differentiate the species of spider by the spider's size and color. It means that experiencing the garden environment afforded the children to recognize and actively interact with the animals.

## Taxonomy of Affordances

The affordances of plants and animals in the home and neighborhood garden were categorized into taxonomy of affordances and levels of affordances. In the taxonomy, affordances were divided into positive and negative, and in the levels of affordances were classified as perceived, utilized or shaped (Kytta, 2002).

### A. Affordances of Home Gardens

As can be seen in Figure 9, the rural home gardens offered more positive affordances than the urban ones. Likewise, positive affordances of both rural and urban home gardens were far exceeding the negative ones. The differences were in flat relatively smooth, non-rigid attached objects, graspable objects, climbable feature, vegetation, animals, microclimate, affordances for sociality and affordance for nature-link. It means the sensorial and motoric activities of rural children with the garden properties were more active than those of the urban ones. These activities were mostly performed and explored with peers and siblings. The activities were performatory and exploratory involving manipulation of plants and animals into play tools (Chawla and Heft, 2002). For example, the rural children searching for a betel sheath to make a sliding carriage, making a top from a betel nut, seeing weevil beetle at banana's blossom, making a musical instrument from mid rib of banana leaf petiole, and making a boat from banana's bracts. These children competences of activities in environment are paralleled with theory by Kytta (2003) that children perceived and recognized the functional properties of the environment through their active experiencing and discovering of materials.

Affordances for nature-link or cross-modal match and children cross-species interaction was a new finding of affordances that is expanded of taxonomy of affordances of urban and rural home garden. In other words, the children understood the links between a plant species to an animal. For example, in order to get a jumping spider, a child knew that he has to search for a pandanus shrub where the creature inhabited.

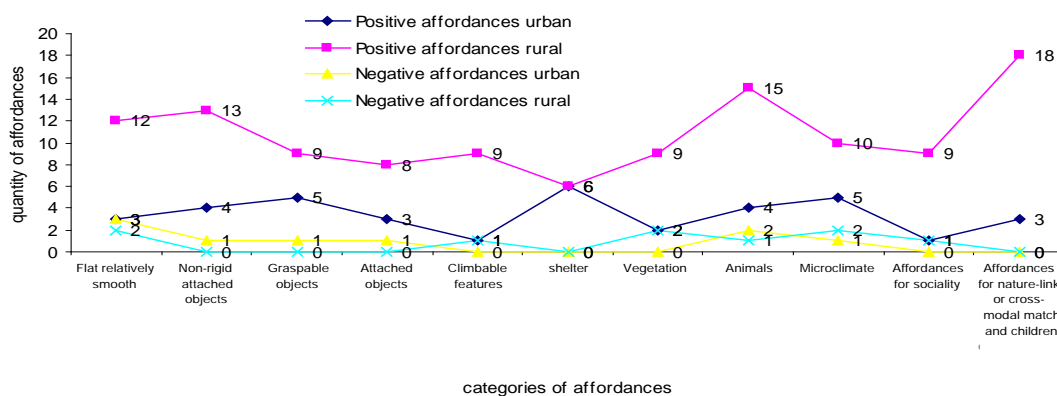


Figure 9: Affordances of the urban and rural home gardens

In summary, the rural home gardens afforded most positive affordances than the urban home gardens in the following categories: nature-link (n=18), non-rigid attached objects (n=13), flat relatively smooth (n=12) and animals (n=15). In perception of the children, the rural home gardens were more diverse in plants and animals species than the urban ones.

### B. Affordances of Neighbourhood Gardens

The taxonomy of neighbourhood garden of urban and rural setting is analyzed through 12 taxonomies. The urban neighbourhood garden offered the children with 93 positive and 130 positive affordances of rural children.

Meanwhile, the negative affordances in urban is n=9 and rural is n=12 affordances (Figure 11). It means that the neighbourhood gardens are offered the children 223 positive affordances and 21 negative affordances. Thus, the rural neighbourhood garden afforded 1.4 times more positive affordances to the urban neighbourhood garden. It means the rural children’s sensorial and motoric action activities were more active with the rural neighbourhood garden properties and attributes than those of the urban home garden. These activities were mostly performed and explored with peers that involved more performatory and exploratory materials of manipulation garden features as their play tools. In neighbourhood garden the urban and rural children found freely movement and independent mobility of decision making upon demonstrating their private and socially activities rather than in home garden. They were reported that play in place that considered private place is to avoiding from parent recognition. This finding is paralleled with study by Hill (2005) and Sobel (2002) that children occasionally need a private and special place that are consider as their refuge that are unrecognized by parent or adults.

The differences of the affordances between the urban and rural neighbourhood gardens were less than the home gardens (Figure 10). In general, rural neighborhood gardens offered more affordances than the urban ones particularly in properties pertaining to water, vegetations, animals and natural links. Similar to the home gardens, the negative affordances offered by the neighborhood garden were far fewer than positive ones. The results suggest that through performatory and exploratory performances in the neighborhood gardens afforded the children with a variety of positive sensorial, motoric and social activities.

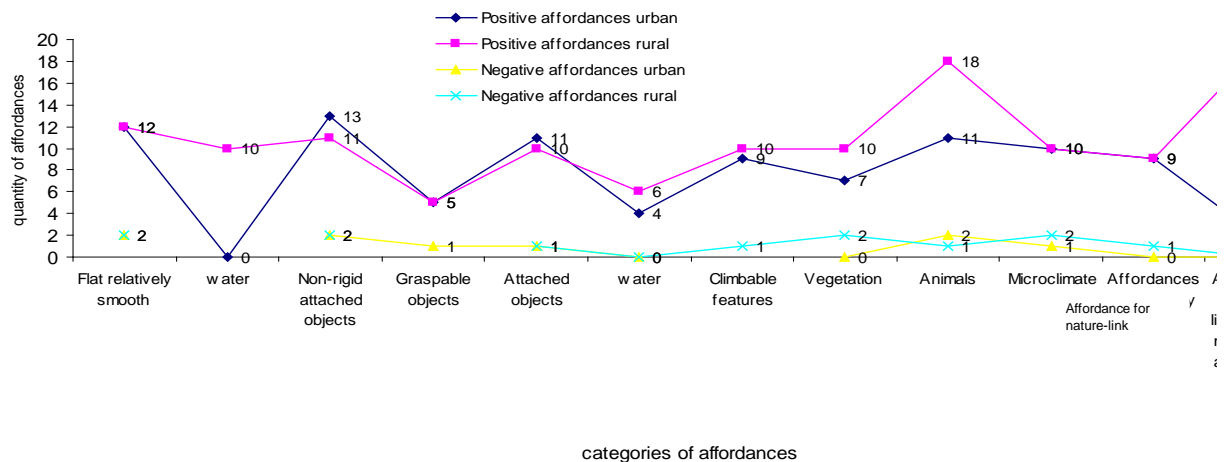


Figure 10: Affordances of the urban and rural neighborhood gardens

In summary, the neighbourhood gardens in rural and urban residential communities in Malaysia were functional affordances to engage middle childhood children in a variety of functional and perceptual as well as social activities. The outdoor engagement allowed the children to be independent and set their own boundaries to perform social play. Inasmuch, the children knew how to produce play tools from the natural elements, plants and animals.

### Levels of Affordances

The levels of affordances in home and neighbourhood gardens were categorized into three: perceived, utilized and shaped (Kyttä, 2002). The differences of level of affordances between the rural and urban home gardens, and rural and urban neighbourhood gardens are shown in Figures 12 and Figure 13.

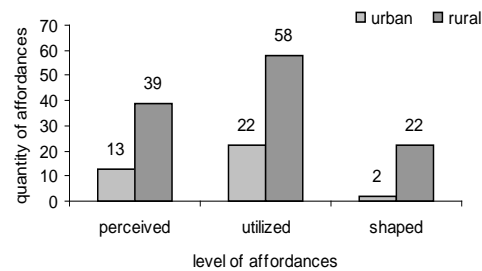


Figure 11: Levels of affordances of the urban and rural home gardens

As can be seen in Figure 11, home gardens provided the rural children with 58 utilized affordances, 39 perceived affordances and 22 shaped ones. On the other hand, far less affordances were experienced by the urban children. The result suggests that the properties of the rural home gardens offered the children more functions than the urban home gardens. For example, with bamboo poles, the rural children managed to make at least eleven play tools, namely, gasoline lamp, bamboo cannon, musical instrument, fishing rod, kite frame, gun, raft, birds trap, and bird cage.

The result also suggests that interaction with the plants and animals afforded the children more benefits than adversities. The benefits were gained through physical movement and perception of the outdoor spaces in the home environment.

However, the neighbourhood gardens also afforded the rural and urban children almost equal number of utilized affordances that is 54 for urban and 60 for rural (Figure 12). It means that the neighbourhood gardens offered many functional properties such as fallen branches, fruits and insects to the children and to utilize them as play tools through sensorial and motoric actions.

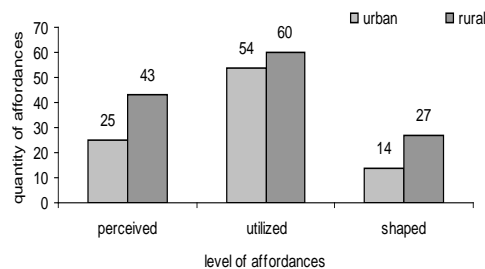


Figure 12: Levels of affordances of the urban and rural neighbourhood garden

The utilized affordances were performatory and exploratory activities involving play performances. Thus, it means that children were actively performed motoric actions through sensorial actions. Examples of the performatory activities were involved with children climbing trees, clinging on flexibility branches, shaking and bending the flexibility branches, and moved into monopodial branches with peers. Meanwhile the exploratory activities were involved with searching ground ant burrow in the back yard, pulling out jumping legs of grasshopper as their fascinating play, tiding flying weevil beetle with thread as interactive activities, and searching jumping spiders at shrubs plant in home garden. It seems to confirm that children were responding actively and diligently with properties and attributes. Thus this finding are consistently accorded with literature on children experiencing outdoor spaces, that suggests that those middle childhood children contact with natural world, occupies an important place in a child's emotional responsiveness and receptivity (Kellert, 2002 pp.126).

## CONCLUSION

The results of this study suggested that middle childhood children in urban and rural settings preferred to play with plants and animals as their play tools rather than play equipments. The home and neighborhood gardens afforded different plants and animals for symbolic and constructive plays. Much of their physical interactions involved with plant and animals. To them, trees were seen as living elements that afforded to climb and cling on, to bend and cut branches, and to manipulate their parts into play tools such as bamboo was crafted into home-made gun. Interaction with the trees afforded social acquaintanceship, and in turn allowed children to assimilate and accommodate peers' behaviors.

Apart from the commonalities of behaviors between the urban and rural children, there existed few differences. Noticeably, urban children preferred to play in the neighborhood gardens whereas their counterparts, the rural children, preferred to play in their home gardens. In other words, the urban children went further away from their home to play in the outdoor environment. This is because the terrace-housed neighborhood offered little variety of landscape elements for physical and social play. Therefore, the children extended their range of play further away from their home gardens. On the other hand, the rural children were much occupied by the diversity of plants (e.g. seeds and fruits, bamboo poles) and animals (e.g. spiders, worms, birds and insects), and topographical elements (streams and differences in elevation) in their home gardens. Apart from the diversity of biotic and abiotic elements, the home gardens in rural communities were large and thus affording many active activities such as running, swimming, and catching animals.

In summary, home garden and neighborhood gardens in urban and rural communities were places for children to perform their physical and social activities. These activities were triggered by cognitive (sensorial) performances, and in turn, generated more motoric and social actions. Outdoor experience afforded middle childhood children to understand the physical properties of plants, animals and topography, as well as ecological and functional links between plants and animals, and between play tools and plants or animals.

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# The Identification of Employees on the Attendance Machine by Using the Keyboard Keystroke Rhythm Based on the Neural Network

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## **Abstract**

*The development of biometric technology has made it possible for a computer to identify individuals based on their biological characteristics. This technology identifies individuals based on their physical or behavior characteristics. This biometric has some characteristics such as not being lost, being unforgettable, and being not able to be forged because their existence is inside human beings. This also has unique characteristics, among others one is never the same as others. Some examples of biometric are finger prints, retina, facial structure, voice and keyboard keystroke.*

*The goal of this research is to develop computer based attendance machine with keyboard keystroke rhythm. This research is done by developing the software to capture the keyboard keystroke rhythm, and developing neural network to classify the keyboard keystroke. The rhythm of keyboard keystroke is measured by calculating the time intervals when the button are pushed to form the word YOGYAKARTA. The capturing software is made with Borland Delphi 7.0 and the Neural Network is simulated with Neural Network Toolbox Matlab. The Neural Network Model used in this research is backpropagation neural network with momentum and adaptive learning rate.*

*Three-layers neural network was trained with the back propagation algorithm. After the research was done, it was found that the attendance machine can identity 5 person with accuracy 84%.*

**Keywords:** *neural network, keyboard keystroke, attendance machine*

## **1. INTRODUCTION**

Every organization must have an objective to be achieved. To achieve its objective, an organization has many sources to be managed. It cannot be denied that human resources play an important role in an organization. Antariksa<sup>1</sup> states that the main task of a director is not to manage business, but to manage human resources. There are two important things related to human resources, they are skill and attitude. One aspect of the attitude is discipline. There are many forms of discipline. One of them is coming and leaving on time.

In Indonesia there are companies which use the presence record by using a manual presence list which is known as punching machine. Some other bigger companies use presence record by using a more sophisticated means such as barcode or magnetic card. The presence recording machine can be reliable enough. However, a company must realize that the employees can do cheating, such as asking a colleague to do the presence recording by having their colleague print their presence cards.

The current technology has been able to identify an individual from his/her own biological characteristic. The individual biological characteristic is called biometric. It is a specific characteristic which can be used to identify an individual based on his/her physical characteristic or attitude. It has a special characteristic such as that it cannot be lost, or forgotten, or it cannot be forged because its existence is in human body<sup>2</sup>. Biometric has a unique characteristic, being different from person to person.

Some examples of biometric are finger print, retina, face structure, voice, and the rhythm of keyboard beat. In biometric technology there are two systems of recognizing, using the physical characteristic such as finger print, retina and face structure, and using the attitude characteristic such as voice and rhythm of keyboard keystroke.

At the beginning of the twentieth century some experts in psychology conducted researches related to human's routine activities<sup>3</sup>. The result of the studies showed that the routine activities conducted by human being could always be predicted. For example, a telegraph operator who always sends messages everyday can be recognized from his/her beating rhythm on the telegraph machine. Another example, someone can be recognized from his/her step rhythm.

Recognizing the rhythm of keyboard keystroke can be exercised by using the method introduced by Obaidat and Sadoun<sup>3</sup>, by measuring the time intervals between the characters which are used to form words. In this study, the researcher will try to develop the attendance machine by using keyboard keystroke rhythm based on the neural network. Neural network is a system of processing information by using a computer which has a characteristic similar to human nerve. Alexander and Morton<sup>4</sup>, Bose<sup>5</sup>, Dayhoff<sup>6</sup> and Schalkoff<sup>7</sup> mention that one of the applications of neural network is identifying patterns.

## 2. METHODS

This research consist of 5 steps:

- (i) Developing software to record the time interval of keyboard keystroke.
- (ii) Collecting the data of the keyboard keystroke patterns. The keyboard keystroke patterns are taken from the employees of Faculty of Science and Technology (FST), Yogyakarta University of Technology (UTY). The employees are asked to type their names and the word YOGYAKARTA, and the software will record the time interval to form the character pairs (Y,O), (O,G), (G,Y), (Y,A), (A,K), (K,A), (A,R), (R,T), and (T,A) (figure 1). The data was taken from May 3, 2006 to June 20, 2006.



**Figure 1.** the software that record the time interval of keyboard keystroke

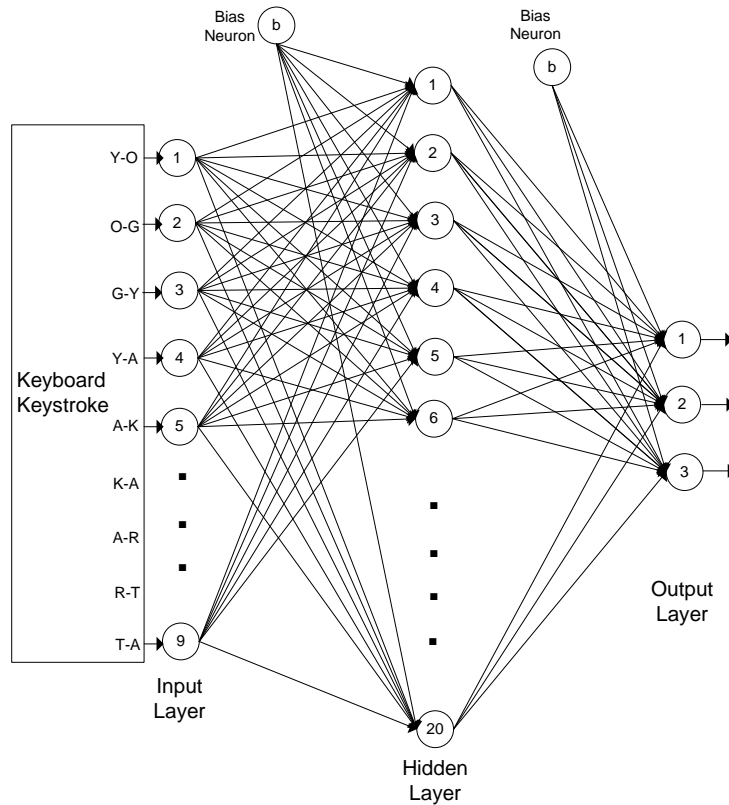
- (ii) Developing software to simulate Back Propagation Neural Network with momentum and adaptive learning rate. Simulation was done by using Neural Network toolbox Matlab<sup>8</sup>.

Figure 2 shows the topology of the neural network and table 1 list the parameter of neural network. The architecture of neural network used for this study consists of three layers; the input layers will receive the interval times between characters which are pushed, the hidden input will calculate them, and the output layer will identify the persons who type. The representation of the persons is done with the sequence of combination of 0 and 1.

**Table 1.** Neural network parameter

Input Neurons	9
Hidden Neurons	20
Output Neurons	N
Initial Learning Rate	0.1
Momentum	0.9
SSE	0.1





**Figure 2.** The topology of the neural network

(iii) After the data and the software for simulator of neural network are ready, the neural network is trained and tested with different number of the staff. The training is done from 2 persons with 25 examples of patterns for each person. The training is done by using trainbpx function. The testing is done by using the same persons, each with 5 keystroke patterns. In each training, the speed of convergence of neural network was recorded. In each testing, the accuracy of neural network in recognizing the patterns was recorded.

### 3. RESULT AND DISCUSSION

Table 2 list the result of training and testing of neural network with different number of staff

Table 2. The result of training and testing

	The number of staff				
	2	3	4	5	6
Training (iteration)	44	149	8039	24180	*
Testing (accuracy)	100%	100%	100%	84%	-

\* not convergent up to the iteration of 100,000

From Table 2, it is seen that the more staff should be recognized, the number of iterations required by neural networks to achieve convergency become more numerous and the accuracy of testing tended to decline. These results indicate that the more staff to recognize, the more varied patterns to be classified by artificial neural networks. Many researchers suggest many things to accelerate the iteration and improve the accuracy of testing, Das<sup>9</sup> suggests the data sampling is done in a long time span, while Purbo<sup>10</sup> states that the number of samples keyboard keystroke for each person is about 30 samples. Das<sup>9</sup> and Ilonen<sup>11</sup> mentions that, beside the interval between the characters, the pattern of keyboard keystroke can be gained through:

- (i) Duration of the keystroke, hold time,
- (ii) Overall typing speed
- (iii) Frequency of errors (how often the user has to use backspace)

- (iv) The habit of using additional key in keyboard, for example writing numbers with keypad
  - (v) In what order does the user press keys when writing capital letter, is shift key or the letter key released first
- Villani *et al*<sup>11</sup> found that the type of keyboard is very decisive to determine the success of identification.

#### 4. CONCLUSION

The attendance machine can be done by the Back Propagation neural network as an identifier. The Back Propagation neural network with the momentum value is 0.9 and the initial learning rate is 0.1 can identify the pattern of keyboard stroke. The pattern of keyboard keystroke was done by calculating the time intervals when the button of keyboard are pushed to form the word. With the word YOGYAKARTA, attendance machine can identify 5 persons with accuracy 84%. The more persons to be identified, the number of iterations required by neural networks to achieve convergency become more numerous and the accuracy of testing tended to decline.

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