Design for All

Sharing ... Blessings have been bestowed on us

200 th issue

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Other Regular features

Rachna Khare is full Professor at School of Planning and Architecture Bhopal and served the institute in several administrative positions like Dean and Head of the Departments (Architecture, Conservation and Landscape). Prior to this she was a Senior Research Fellow with Jamshedji Tata Universal Design Research Chair at National Institute of Design, Ahmedabad and taught at Birla Institute of Technology, Mesra. Starting her career in the early nineties as an Exhibition Officer cum Designer in Jawahar Kala Kendra, Jaipur, she practiced for eight years in the field and then joined academia. She is a dedicated teacher and keen researcher for last twenty years. She was recognized as 'Inspired Teacher' by Hon'ble President of India and stayed Scholar-in-Residence at Rashtrapati Bhavan in 2016. Rachna won prestigious Fulbright scholarship twice with her second Fulbright-Nehru selection in 2020 as education administrator. She will avail this fellowship in 2021with select cohort in the USA. In her first Fulbright Fellowship (2007 onwards), Rachna was affiliated with the Georgia Institute of Technology, Atlanta, USA during her PhD. Her research interests in the field of 'Universal Design' and 'Designing for Special Needs' have earned her grants and awards nationally and internationally. Apart from the Fulbright award, she is recipient of

IMFAR-2009, Professionals from Developing Country Award, Chicago; Friends of Fulbright India Grant-2008, Lewisburg; Universal Design Award for Working professional-2011 by NEPEDP-MPhasiS, India and R&D projects from All India Council of Technical Education and University Grants Commission in India. She works closely with the United Nations and consults internationally on disability issues and public access. She has lectured extensively on Inclusive Design all over the world and has many papers in various National and International journals and conferences to her credit. Her papers appeared in the publications like Taylor and Francis, Sage, HFES, EDRA, RESNA and Archnet MIT. Her book 'Designing Inclusive Educational Spaces for Autism' published by the Institute of Human Centered Design, Boston, USA was released in 2010 at 'Build Boston', the book received 'Certificate of Merit' in ArchiDesign Award-2010. She has also edited special issues of internationally refereed journals called 'SPANDREL'on 'Social sustenance' in 2012 and 'ABACUS' on 'Architecture for All' in 2007. Some major events organized by her are 'Universal Design Workshop(2011,2012,2014,2017,2019)' and National Student Design Competition on 'Universal Design/Design for All, with the National Institute of Orthropaedically Handicapped, Kolkata, Archaeological Survey of India, Ministry of Social Justice & Empowerment and UNESCO. She is one of the authors of Universal Design India Principles developed at the National Institute of Design, Ahmedabad in 2011. She serves as reviewer in many publications like EDRA, HFES, The Design Journal, and was also a jury member of Berkeley Prize Essay Competition-2013, endorsed by UC Berkeley, USA. Rachna is well known as an activist and is a founder member of three NGOs called 'M

MESSAGE

With deep humility, I am writing this message for the 200thissue of 'Design for All' published by Design for All Institute of India. The journey of this monthly publication has been incredible. It is an example of perseverance, hard work and patience which brought the strength to sustain it for so long.

Mr Sunil Bhatia and Prof Lalit Das started this initiative about fifteen years back when there were hardly any publications on the subject. Also in India,people had limited understanding about design for all/inclusive design/universal design at that time. Ahead of its times, the newsletter is published online since the beginning,with open access and wide circulation.As a result, this publication reached across the world and impacted the understanding of the term 'Design for All'worldwide. It brought so many national and international experts onboard and made their perspectiveeasily accessible to all. These experts regularly shared their work, work of their colleagues and organisations. The articles ranged from formal research papers to the informal write-ups which showcased work of designers.

The roots of Universal design lie in equal opportunity, social justice and non-discrimination. It has emerged from twenty years of experience with the 'Barrier Free Design' movement for persons with disabilities in the United States. Through practical experience, Ron Mace and Ruth Hall Lusher, two experts in accessibility and both architects with disabilities conceptualized the idea of universal design in early 1990s. In the mid 1990's the concept of universal design was further elaborated by the development of the Principles

of Universal Design (1997). Since then, the concept has been re-thought and re-defined by diverse researchers and writers around the world. The UD principles were expanded, UD goals were defined and contextual derivations of the principles like UDIP (Universal Design India Principles-2011) also came up over the period of time. Today, it is recognized that the goals of universal design must go beyond usability to address promotion of health and wellness and also the promotion of social participation for all citizens. This evolution of thoughts on the subject is reflected in the DFA newsletters through thematic special issues published over the years. The newsletter keeps its focus on all target vulnerable groups and includes interdisciplinary and multidisciplinary viewpoint on the subject as well.

I take deep pridein my association with the newsletter(Journal) and wish the team all the best for the future.

Prof Rachana Khare

Dr. Gaurav Raheja is an Associate Professor of Architecture at the Indian Institute of Technology (IIT), Roorkee with over thirteen years of teaching and research experience. He is also an Associated Faculty at the Centre for Excellence in Transportation Systems (CTRANS) and has been recently appointed as Co-Cordinator of Design Innovation Center at IIT Roorkee. Driven by a passion for human centric focus on built environments, he is guided by sociological and participatory approaches to urban and architectural reality. His professional interests in research and practice include human-space interaction studies, inclusive designs for persons with disabilities, children and ageing populations, accessibility planning and universal design, environment behavior studies, urban futures, contemporary world architecture and pedagogy of architectural education. Dr. Raheja, has developed and initiated Laboratory of Inclusive Design at the Department of Architecture and Planning at IIT Roorkee towards spearheading research initiatives in inclusive futures. Based on his doctoral research, he has recently authored a book titled Enabling Environments for the Mobility Impaired in Rural

Areas foreworded by Prof. Edward Steinfeld, Director, IdeA Center, at State University of New York (SUNY), Buffalo and published by Lambert Academic Publications, Germany (2016). His doctoral research focuses on accessibility issues in low resource contexts of India including sanitation and other mobility perspectives. He has been a DAAD (German Academic Exchange Service) Fellow under the DAAD IIT Faculty Exchange Fellowship for 2016 and 2019 and was a visiting professor to various German Universities including Technische Universität Berlin, University of Duisburg-Essen and Technische Universität Darmstadt. He has also received a Fellowship for International Research Stay as Guest Scientist for 2017 at T U Berlin. He is a recipient of the Mphasis Universal Design Award in 2010, conferred upon him by the National Centre for Promotion and Employment of Disabled Persons (NCPEDP), India for his professional design and research contributions in the domain of accessibility and creation of barrier free environments for persons with disabilities. He has also contributed towards the development of the National Standards on Accessibility published in 2016 by Ministry of Urban Development, titled as Harmonised Guidelines for Accessibility for Persons with Disability and Elderly Persons. Dr. Raheja was one of the thirty International Scholars selected for 'City of the Future', the DAAD Science Tour held during February, 2016. Further, he was selected as an expert for the 'Smart Cities: Challenges and Opportunities' organized by the Indo German Science Technology Centre held in Berlin. He has also been a recipient of the funding by the Excellence Initiative of the German Federal Government to participate in an International Summer School on Smart Cities titled 'SynCity: The City of the Future' in 2014 and 'Construction Bionics : Bio inspired concepts for Built

Environment' in 2017 at Technical University of Dresden, Germany. He serves advisory roles as Expert Member in various national committees on accessibility standards, conceptualization of National Institute of Universal Design (NIUD) and National Associate Professor Department of Architecture & Planning Indian Institute of Technology (IIT), Roorkee Roorkee - 247667, Uttarakhand State, INDIA Email: gr.iitroorkee@gmail.com Phone: +91-1332-285709 (O) Fax : +91 - 1332 - 285214 (O) Website: www.iitr.ac.in Page 2 of 12 Awards on Barrier Free Environment by Govt. of India in Ministry of Urban Development and Ministry of Social Justice and Empowerment, respectively. Dr. Raheja is one of the co-authors of the Universal Design India Principles(UDIP), copyrighted and released by National Institute of Design (NID), Ahmedabad in 2011. He is a key consultant and an empaneled access auditor to the Ministry of Social Justice and Empowerment, Govt. of India

MESSAGE:

Dear Readers, Friends and Curious Humans of the world,

It's a moment of deep humility that I get to write this message as a member of the Editorial Team for "Design for All" and reach your minds through this two hundredth edition of this journal. Two Hundred as a number is not a mere figure of Two and Two zeros but perhaps has a power and message of the relationship between one and the other signified in the number 'Two'. Design as a discipline and as a profession, while enjoys the confluence of many and manyness, yet in simplified terms can be seen as a relationship between material and immaterial, user and experience alongwith the creator and the created.

In a world, as vulnerable and as visionary as today, it's time to reflect on the role Design has played in the past century and in the advancing millennium. Design, both as a thing and as an activity has shown the promise of agility and adaptability to COVID times while it has also shown the power and impact of designs that continue to exclude humans as part of it's understanding. The key message is to reiterate a human well being and a non discriminatory focus of design as an activity of intellect, creative imagination and social impact.

I urge to you all to raise a simple question to every design and every act of design that you experience in daily lives, "So What ?" Each one of us, irrespective of our training in design as a discipline or not has an important role to play.The role of sharing the user experience, the role of informing the pains of design usage, the possibilities of design improvisations and directions for transforming the world through new ideas and ideologies.

The world of twenty first century perhaps has more choices than the past, has greater advancements than the past yet has new challenges of it's own. With recent impacts of COVID'19 as a pandemic, we've rekindled mixed emotions globally to bring back a human focus to every pursuit of development. Ranging from sectors of health to information technology, products to built environments, systems to communication design, even design has got challenged with new questions and new opportunities. While, the world is exploring new innovations as solutions, a realization does dawn upon us that "Time is the greatest test of every design." Excluding humans on the basis of ability, economic condition, gender, age or other socio cultural attributes unfortunately still remain unwiped issues, despite several good and encouraging design innovations.

The Two Hundredth Issue is a testimonial to perseverance and continuity of spirits in the world of design such that we all as one family embrace the idea of "Design for All." Let this phrase not be a mere text on a piece of paper or a virtual journal but be a phrase that is shared with all to make a difference in every act of your lives. Let design be the tool, let design be the message and let including all lives with equity be the goal.

Wishing you all "Happy (Reading) Times", through the articles published and greetings across all physical boundaries of nationalities or regions, for your continued support.

May we all resolve to enlighten the world through the spirit of "Design for All" and an applause for   Dr. Sunil Bhatia for leading it this far to a two hundredth milestone.

Prof Dr.Gaurav Raheja

Sugandh Malhotra, Ph.D.

Associate Professor,

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Dr. Sugandh Malhotra has over seventeen years of professional experience in industrial design and automotive design industry. He has worked on design projects for marquees in the industry that include Honda R&D, Hero Global Design, Hi-Tech Robotic Systemz Ltd., SETI Labs Berkley, Aprilia Motors Italy, Bombardier Canada and most of the leading automotive and consumer brands of India. He has worked on over 75 projects and has been instrumental in design of over 23 techno-commercially successful launched products at a pan India level. He has won many International and National level design awards. Dr. Malhotra takes keen interest in teaching design and had been mentoring students from many leading institutions such as IIT Delhi, IIT Roorkee, SPA Delhi, Lady Irving College, IILM, Pearl Academy among others.

Since 2016, Dr. Sugandh Malhotra is working as an Associate Professor and the Coordinator of MVD program in IDC School of Design at IIT Bombay.

His research interest areas include design research methods, future design possibilities, trend research and design forecasting and intelligent mobility systems.

Dear friends,

Namaste ._/_.

It is an overwhelming moment for Design for All team. With this 200th issue of our newsletter, we have completed our double century. This is a moment of humility, rejoice but also a moment of self-reflection to brace up for the next lap of our long journey, a journey in which everyone is traveling together. Design for All (DFA) has been a unique platform that has offered global audience to be a part of the design movement itself. With all sincerity and earnest offering, DFA has been providing authors a platform to present their ideas and views / opinions freely. The issues have featured contributions from all the continents (excusing Antarctica) and over 60 countries, and reaches out to a reader base of over one million readers every month. Through past 1.5 decades, we have received emails full of your tremendous support, love and criticism. Your suggestions have helped us align ourselves to be more inclusive in our approach all through.

We are now full of vigor and commitment to serve to make the next lap even more exciting. We have set interesting yet challenging targets for ourselves. With the registration to be a research journal, we aim to build an online open-access knowledge platform where we can offer more ways to share content that can be cited, listed, used and referenced by everybody. We plan to introduce new engaging features like workshops, tutorials, video logs, etc. to take interactions to the next level.

We sincerely wish and hope for your continuous support and encouragement.

Best wishes and warm regards

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INDIA.

Dr. Ravindra Singh is an Assistant Professor of Design at Delhi Technological University, Delhi. He is passionate about human-centric design; designing a product for an extensive variety of users. His major research interest is Universal Design, Innovative Product Design, Sustainability, and Frugal Design. Ravindra Singh has done BTech in Mechanical Engineering from UP Technical University. He received his Master of Design (MDes) and Doctoral degree (Ph.D.) in Design from Indian Institute of Information Technology, Design and Manufacturing, Jabalpur (IIITDM) and has authored research papers in referred journals and international conferences.

MESSAGE
Dear Readers,

The Design for All journey has been rewarding to all of us. I am delighted to be a part of this platform, which aims to create products and services with Design Thinking processes at the core, keeping in mind user needs and requirements. We have seen tremendous growth in contributions and discussions in these years, which brought forth our aim to bring together different approaches and ideas under one common platform. Our understanding of building better products and services has strengthened, and our mindset broadened with our ever-growing community.

We are publishing our 200th issue this month, and this is a matter of pride and joy for all of us. I am happy to be associated with such a fantastic team with diverse perspectives and equal fervor to explore and contribute in the fields of Design and innovation. The enthusiasm and contributions of our readers are worth mentioning. Your support encouraged us to grow and facilitated a forum to discuss, share and express ideas with an innovative community of designers, innovators, and practitioners in different fields. This milestone is indeed an achievement for everyone connected with Design for All. Thanks to everyone for making it an inclusive community for ideas, and looking forward to celebrating more milestones together and creating a positive impact in the community using more collaborations and contributions. Let us all make Designinclusive, delightful, and helpful for all.

Regards

Dr. Ravindra Singh

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Democracy, Trust & Universal Design

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Abstract

This paper explores Universal Design in the context of the Indian Election, often termed as a festival of democracy. The study derives its understanding from a student design project (4) and discovers that Universal Design must embrace 'Trust' as an important principle. Large-scale public services more often than not overlook the importance of trust in designing the delivery mechanisms.

Keywords

Principles, Universal Design, Trust, Democracy

One of the most seminal definitions of Democracy was given by Abraham Lincoln. He said, "Democracy is a rule of the people, for the people and by the people".

This definition has been detailed further.

Democracy is a political system for choosing and replacing the government through free and fair elections.

Democracy is a political system that allows active participation of the people, as citizens, in politics and civic life.

Democracy is a political system that protects the human rights of all citizens.

Democracy is a political system that supports a rule of law, in which the laws and procedures are created with the consensus of the people for all citizens.

People, protocols, procedures, and institutions

Resources of nations become available to all for their development

Resources are fellow people, protocols, procedures, institutions materials, energy, knowledge, income, benefits.

In a democracy, there is competition for power. People are the arbitrator. They cast their preference. Their preference is governed by their perception and experience. Manipulation of perception & experience becomes the driving force that will decide the direction in which the scales will tilt. Perceptions are moulded through enticement, freebees, and social polarization. My man, their man, our man. Governments rush to announce policies before the elections are announced. Enticements are offered as the elections draw nearer.

Parties cultivate their 'vote banks'. They ensure that members of their vote bank are very much there in the 'electoral rolls' and have no difficulty in casting when they arrive at the polling booth on the day of the elections. In the absence of any proactive initiative by the Election Commission of India, the process of registering eligible voters remain partisan. The Election commission has no pro-active mechanisms to register a voter. Either the individual has to register as a voter or political parties help them out in the process of registering. Election Commission does not say, look you are a PAN Card Holder, you are paying taxes, you are paying electricity, water, or property taxes, you have been receiving letters on this address. The police station records say you live at this address. Here is your Voters Identity Card.

By God's grace, if one has a voter's ID and on the election day one goes to the election booth to cast your vote, you may be turned away either because your name is not in the electoral rolls compiled specifically for a scheduled election.

A voter may cross this hurdle, their name is there in the electoral rolls but they are unable to prove their identity and may not be allowed to exercise their franchise.

Lucky are those who can enter the polling station. Their finger has been marked with indelible ink. One is all set to vote. One casts the vote. There is still doubt if the vote cast will be counted in favor of the candidate one has voted for. Electronic Voting Machine has often been a subject of doubt. Supreme Court of India recommended a verification system. Voter Verifiable Paper Audit Trail (VVPAT). It is said that the voter can verify through a window, a paper copy of the vote that they have cast. Doubts here have also been raised, but to raise doubts could lead to penal action. It was also proposed that VVPAT results and EVM results will be tallied. However, this has been implemented on a very limited scale. The reason given is that it will delay the results by 5 days. Is a 5-day delay not acceptable if it removes doubts and establishes the integrity of the Electronic Voting Machine and the rightful election of the winning candidate.

Then comes the final day of counting when results from all the EVM are compiled together. Doubts have been often been raised of fairness in the compiling process. Often there are complaints of hustling the compilation. Doubts are looked down upon.

Entertaining doubts, addressing doubts, checking, rechecking is essential to establishing truth and integrity. Only when doubts are addressed & truth and integrity are established than trust emerges. Trust is the bedrock foundation of democracy. But this bedrock cannot be an a priori assumption. It has to be cultivated.

Overcoming Trust Deficit

Trust according to the Oxford dictionary is defined as

Firm belief in the reliability, truth, or ability of someone or something.

Amit Khanna(1) has written a beautiful essay on trust deficit.

Quest for power is an important flavor of politics. Service to the people can often become secondary. Trust becomes a victim of it. Extensive use of technology in the execution of procedures & decisions is often assumed to be more trustworthy. But this is a fallacy and the common man can become a victim of the power-mongering political parties, self-styled hackers & crypto-criminals. One would have hoped better communication and access to information will instill confidence and respect in society but this often has added fuel to the fire of distrust. Such distrust shaped the events of the epic age Mahabharata, and other empires in the history of mankind, and it continues to date. All global leaders & political parties are its victims and many even thrive on it. We see it play out everywhere, in all democracies, from the US to India. Not only do politicians mistrust each other but citizens have little trust in them, irrespective of their political affiliation. Despite continuous effort which politicians, governments, and leaders put in through propaganda and media, the gulf between them and the people is only widening. As far as governance is concerned, almost all institutions are under suspicion. Bureaucracy, police, tax

departments, municipalities, and even the judiciary are not trusted. Every action is sought to be enquired and even then, there is a constant demand for further probes. It's now one long winding roller coaster ride of distrust.

In the context of elections, the Election Commission's role goes much beyond conducting free & fair elections. The Election Commission is an interface between the people and the government. They are responsible for the trust people have in democracy and the government. It is important that the processes that the Election Commission adopts are transparent and allows checks and rechecks. Only then the Election Commission can be the bedrock of democracy. Only then do they generate trust in the results thrown up by the election. Only they can ensure that democracy is trusted.The election system should be simple enough to be understood & trusted by all eligible to vote. Too much technology is not understood by anyone &the voters are pushed by an authority to trust it.

All personal relationships, trade, and commerce, politics, society, everything are based on trust. Trust is the cornerstone of human civilization. Trust is vital to any transaction. Without trust, there can be no relationship, institution, or nation.

Trust is the core of all core values. It is important for nations, institutions, organizations, social groups, people, environment, systems, services & products. Without trust, there can be no synergy, no symbiotic dependable growth.
Trust has to be cultivated by being open to sceptics, by entertaining doubts, by consciously allowing checks and rechecks.

Trust should be at the core of all processes, plans, and designs. It should form the core of design, design for all, barrier-free design & Universal Design

Universal Design in Democracy

The focus of Universal Design till now has been towards the design of products & services operated by business entities. The objective was merely to facilitate usage by a diverse population. Universalization was limited in demographic reach. At best extending to a city. Universal Design has not ventured to address challenges like the universal franchise, universal education, universal health. These are design challenges that will help evolve Universal Design to a level that will justify its universality.

The principles articulated for Universal Design are

Equitable Use
Flexibility in Use
Simple and Intuitive Use
Perceptible Information
Tolerance for Error
Low Physical Effort
Size and Space for Approach and Use
All these factors are extremely important for addressing systems for universal franchise, universal education, universal health, and other services like public transport networks, revenue collection, tourism, and hotels. However, it is not enough. Long-term happy acceptance of the design solution requires that it evokes and supports trust.
We must add 'trust' as one of the Principles of Universal Design.

Designing Trust

We live within interdependent systems. Elements within the system, network and depend on each other. Reliability of interaction is essential for the functioning of the system. There are well-thought-out strategies to achieve reliability in non-living and living elements of the system.

Non-living systems can be made reliable by

Enhancing durability of components & connections

Enhancing the reliability of power source

Providing for redundancy

Providing backup

Transparency

Pro-actively searching for defects, hiring / rewarding ethical hackers

Living systems are made reliable by

Improving communication & understanding

Listening, valuing & appreciating users' complaints & suggestions

Responding, transparency

Allowing improvement

Being self-critical

Absence of fear, coercion & threat

Universal Design & Indian Elections

Indian election, often termed as a festival of democracy, was taken up as an exercise in Universal Design at the Department of Design at the Delhi Technological University, Delhi. (2)

The findings regarding trust deficit were astounding. Possibilities are immense. We will be sharing more details in subsequent issues.

Hope Universal Design researchers will venture into investigating similar challenges in their countries.

If Universal Design investigates government initiatives in health care, education, revenue collection, tourism then not only will Universal Design Principles & methodology evolve but also the world will be a better place.

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Guest Editor:

Assistant Professor Dr Antika Sawadsri

Chairperson, Council of Deans for Architecture School of Thailand – CDAST and Dean for School of Architecture, Art, and Design, KMITL - Assistant Professor Dr Antika Sawadsri has experience in academic research and design practice on Universal Design concept. Her PhD research at the Newcastle University, UK focused on interplay between disabled people and their accessibility in public space as a socio-political platform to understand social inclusion of Thailand society. Her academic research and service involve with 'user-centric design approach'.

Recently Antika and her team co-create mobile COVID19 swab testing units and distribute to many COVID19 infected cluster throughout Thailand. Those mobile units have been co-designed with other disciplines such as engineering, medical and healthcare staff at the frontline."

Guest Editor's note

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This part of the year in 2021 is another unusual situation during the pandemic. We have shared similar experiences that COVID19 affect us from our daily life to the future of how we live, we share our places, and how we maintain our life in safe and security. The concept of Design for All, Universal Design, or Inclusive Design have been recalledagain and again when different discipline foresees ournear future.

In this volume 'Design for All Institute of India, August 2021', the young academics gave many scenarios when space and facilities need to response to the needs of people with different abilities such as people with disabilities, students with depression, people who want to flourish their lives in public hot spring and so on.

We believe the concept of Universal Design or Inclusivity will prepare the world community to be ready for the so called 'VUCA'[1] world for our next generation. This design process and solutions help us to work with complexity and uncertainty of human's needs. These articles provide some concrete research-based design process

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[1] *'**VUCA** ' is an acronym (artificial word), first used in 1987 and based on the leadership theories of Warren Bennis and Burt Nanus, and stands for Volatility, Uncertainty, Complexity and Ambiguity. It was the response of the US Army War College to the collapse of the USSR in the early 1990s. Suddenly, there was no longer the only enemy, resulting in new ways of seeing and reacting. Source:* **https://www.vuca-world.org/**

to show how we include ranges of challenges transfer to better quality of life of population with some disadvantages.

Investigation and Evaluation of Rehabilitation Factors in Shipiao Hot Spring Health and Wellness Resort in Yunnan Province, China

Antika Sawadsri[1] and Gu Yongli[2]

(1.School of Architecture, Art, and Design, King Mongkut's Institute of Technology Ladkrabang,Bangkok,10520 Thailand.
2.College of Design, Yunnan Art University,Kunming,650500,China）

Abstract: Taking the Shipiao Hot Spring Resort in Yunnan Province as the research object, a comprehensive investigation on the rehabilitation factors of the Hot Spring Health and Wellness Resort is carried out through on-the-spot investigation and analysis and questionnaire survey. Subsequently, using GST grey statistical theory and Analytic hierarchy process (AHP), four rehabilitation landscape elements of natural environment, sensory experience, spatial perception and environmental facilities are selected as the main evaluation indexes of hot spring rehabilitation landscape, and the evaluation system of hot spring rehabilitation landscape is constructed. Then, the Yaahp AHP software is applied to process and analyze the survey data, and the current situation of Shipiao Hot Spring rehabilitation landscape is comprehensively evaluated. Finally, the optimization strategy of hot spring environment is put forward according to the scores of four rehabilitation factors.

Keywords: *Hot Spring Health and Wellness Resort; Investigation of Rehabilitation Factors; Evaluation of Rehabilitation; Shipiao Hot Spring; China*

Hot spring health and wellness resort is a health and wellness tourism holiday destination based on hot spring resources, and it is an important type of rehabilitation landscape, which contains excellent hot spring water resources, natural environment, rehabilitation facilities, spa products, health and wellness courses, etc. Rehabilitation factors are environmental factors that play a core role in people's physical and psychological recovery in the rehabilitation environment, including climate, topography, water system, plant levels and diversity in the rehabilitation environment, privacy, scale and function in the process of spatial perception, smell, touch, sound in the environment, etc., and the richness, culture and humanization of environmental service facilities.

As a kind of important resources, hot spring rehabilitation landscape has good physiological health care and psychological regulation to the human body. The hot spring health and wellness resort is attracting more and more people because it is based on colorful landscapes and comfortable and pleasant hot spring environment, supported by scientific health and wellness concepts, guided by different health and wellness needs, and backed by comprehensive health and wellness products. Exactly, the investigation and evaluation of hot spring health and wellness resources is the basis of hot spring environmental resources management and sustainable development. In other words, the investigation and evaluation based on adequate hot spring environmental health and wellness resources provide good conditions for the scientific layout, planning and construction of hot spring health and wellness resort.

In this study, the Shipiao Hot Spring Health and Wellness Resort in Yunnan Province is selected as the investigation and evaluation

object to study the rationality of the elements of the health and wellness hot spring landscape environment, which has important practical significance for exploring the construction of the hot spring health and wellness environment and the optimization of rehabilitation factors.

1. Selection of rehabilitation factors

In the study, we use the rehabilitation elements with high recognition at home and abroad for reference to evaluate the rehabilitation landscape environment, and determine the selection of rehabilitation factors for hot springs. Then, we judge the achievement degree of the core rehabilitation elements of the hot spring, which provides a basis for the future environmental management and rehabilitation environment optimization. In the selection of rehabilitation factors, drawing lessons from the supportive rehabilitation environment design theory put forward by Roger Ulrich, an American scholar, combined with the AHP proposed by American Professor Satie, Chinese Li Shuhua and Liu Boxin, the frequently used indicators are screened out, forming a set of primary indicators based on ecological environment, spatial perception, sensory experience and infrastructure (including 21 indicators). According to the grey statistical analysis method, the primary selection index set of health and wellness hot spring landscape is classified according to "high, medium and low", forming a three-level gray whitening segmentation function [1]. In addition, the grey statistical questionnaire is designed using the Likert scale, and the relevant experts in the field of health and wellness landscape and hot spring landscape are asked for their opinions on the importance of pre-selected evaluation indicators. A total of 20 expert questionnaires are sent out and 20 valid questionnaires are

collected. Among the 21 pre-selected indicators, the grey statistical importance of 16 pre-selected indicators is high. According to the grey statistical method, 16 evaluation indexes with "high" importance are selected as the constituent elements of the landscape environment of rehabilitation hot springs (see Table 1).

Table 1 Grey statistical analysis results of rehabilitation factors of rehabilitation hot spring landscape

Rehabilitation factors	Pre-selection indicators	η high	Decision vector η medium	η low	Importance	Whether to choose
	Climate comfort	15.12	4.88	0	High	Yes
	Water environment	10.35	9.17	0.48	High	Yes
	air quality	11.79	7.31	0.90	High	Yes
E ecological environment	Forest quality	11.92	8.08	0	High	Yes
	topography	11.64	6.17	2.19	Medium	No
	Community species diversity	1.39	8.24	10.37	Low	No
	Environmental cleanliness	1.57	10.33	8.10	Medium	No
	Venue functionality	12.00	8.00	0	High	Yes
Spatial per	Site privacy	11.34	8.16	0.50	High	Yes
	Venue	10.2	8.40	1.36	High	Yes

Rehabilitation factors	Pre-selection indicators	η high	Decision vector η medium	η low	Importance	Whether to choose
Sensory experience	Visual landscape	15.44	4.56	0	High	Yes
			8.03	0	High	Yes
	Acoustic landscape	11.97	6.66	1.86	High	Yes
			8.00		High	Yes
	Olfactory landscape	11.48	10.62	06.7	Medium	No
	Tactile landscape	12.00	7.11	1		Yes
			6.73		High	Yes
Infrastructure	Taste landscape	2.67	4.87	0.43	High	Yes
			7.63		High	Yes
			3.43	00	High	No
	Service Facilities	12.46		3.16	Low	
	Leisure facilities	13.27		9.34		
	Health and wellness facilities	15.13				
		9.21				
	Local cultural expression	7.23				
	Richness of surrounding attractions					

cep accessibilit tion y	4				
Site scale	11.2 3	7.34	1.43	High	Yes

Among the ecological environment elements, topography is the inherent landscape resource of the hot spring area, but it is not selected because it is difficult to develop, utilize and define; despite the community species diversity can reflect the ecological environment of the area, it is not selected, because too many community species will affect the landscape quality, and is not conducive to the development of health and wellness activities; environmental cleanliness belongs to the category of service facilities, so it is not listed separately. Among the elements of sensory experience, taste landscape is not selected because the correlation between taste and the quality of health and wellness hot spring landscape is not high. Among the infrastructure elements, the richness of the surrounding scenic spots is not selected because the purpose of the hot spring health and wellness activities is strong, and it has no real effect on the health and wellness activities.

2. Case investigation

Shipiao Hot Spring Health and Wellness Resort is located in Baoshan, Yunnan Province, China, with a total area of 31468.61 square meters. There are more than 10 natural outfalls in the area. The hot spring water quality is excellent, with the temperature of 50~80℃, and the daily flow of about 1894.3 cubic meters. The main hot spring water outlet has a boulder shaped like a scoop, so it is called Shipiao(Chinese pinyin of stone scoop). With people's understanding of the curative effect of Shipiao Hot Spring, more and more people gather spontaneously in the mountains and forests around the hot spring for recuperation. At its peak, there are as

many as 1,000 persons, forming a "sacred place for folk recuperation."

2.1. Investigation method

The investigation methods of this study are on-the-spot survey and questionnaire survey. The on-the-spot survey method investigates the data and characteristics of all kinds of resources in Shipiao Hot Spring area, and analyzes the advantages and disadvantages of Shipiao Hot Spring health and wellness resources. Investigate the environmental factors of hot spring area, such as water resources, climate environment, altitude, forest resources, landscape environment, hot spring products and so on. Questionnaire is used to investigate the use of Shipiao Hot Spring health and wellness environment and the satisfaction of health and wellness patients. The healers in Shipiao Hot Springs judge the current situation of Shipiao Hot Spring environment by judging the health and wellness resources, effect and comprehensive satisfaction of Shipiao Hot Springs, so as to find out the existing problems and deficiencies and put forward environmental optimization measures. In this study, 200 questionnaires are distributed in the field, 191 valid questionnaires are collected, with the questionnaire recovery rate of 95.50%.

2.2. Survey content

2.2.1 Ecological environment

1) Hot spring water resources. Shipiao Hot Spring Resort is rich in water resources, with a total of 15 water outlets, all of which are natural outlets, with an average effluent temperature of 50-80 ℃ and a daily flow of 1894.3 cubic meters. According to the water quality inspection report, Shipiao Hot Spring contains a large number of

beneficial to the human body of a variety of minerals and trace elements, the main components are potassium, sodium, calcium, magnesium, carbonic acid, metasilicic acid, the spring quality reaches the high-quality rare hot spring standard, is a rare drinking calcium magnesium hot spring. Bubble bath Shipiao Hot Spring water has a certain rehabilitation effect on rheumatism, skin diseases, trauma, burns, arteriosclerosis and other diseases. In addition, drinking Shipiao Hot Spring water in a planned way can improve diabetes, coronary heart disease, gout, and digestive diseases[3].

2) **Climate resources.** The investigation area is a subtropical climate, with dense forests, high mountains and deep valleys, and the hot spring area is located in the valley area on the hillside, with an annual average temperature of 21.10C, an annual precipitation of 1120.00mm, an average annual relative humidity of 76%, an average annual sunshine of 2335.5h, a temperature and humidity index of 68.22and a comfort rating of grade 0. it is the most comfortable for the human body and is of great help to reduce the heat load on the human body, and can be called an ideal place for summer shelter and warmth.

3) **Altitude resources.** The altitude that is most beneficial to human health is 1200m to 1500m. At this altitude, it has the most suitable air pressure, the densest negative oxygen ions and the most comfortable temperature. The altitude of Shipiao Hot Spring area is about 1145-1228m. The density and quality of negative oxygen ions in hot spring area are excellent.

4) **Forest resources.** The forest coverage rate of Shipiao Hot Spring area is 63.23%, the forest resources are rich, the natural vegetation rate is 75.62%, the artificial vegetation rate is only 24.38%, and the

effective green coverage area is 94.32%. Vegetation can effectively block strong ultraviolet rays at high altitude. the main vegetation distributed in this area are Phoenix tree, small leaf banyan, alpine banyan, jackfruit, Pinus elliottii, seven-leaf tree, Bauhinia, Magnolia officinalis and other naturally growing trees with large crown. Camphor, fragrant wood, soft-leaf sunflower, palm, Platycladus orientalis, Camellia oleifera, holly, plantain, star anise, leaf flower and other artificially planted landscape plants. The hot spring area is surrounded by green in summer and autumn, and the air is fresh, which is very suitable for mental cultivation, mood regulation, recreation and recuperation.

2.2.2 Spatial perception

Shipiao Hot Spring Resort is surrounded by mountains and water, and the visual richness and hierarchy of the landscape are good. In the public pool spring area, the encirclement degree is insufficient, and the privacy of the site is weak. The public color service area and the hot spring pool area have a good moving line, strong identification of regional features, smooth connection between space and space, and good accessibility.

2.2.3 Sensory experience

Natural hot spring bath: natural hot spring bath is the most important hot spring product of Shipiao Hot Spring Resort. There are 17 hot spring pools in Shipiao Hot Spring area, including 1 outdoor swimming pool with an area of 120 square meters, 5 outdoor bubble pools with an area of 9-12 square meters each, 2 indoor male's and female's naked hot spring pools with an area of about 60 square meters each, which is the main bath place for recuperators, and 8 hotel accommodation attached hot spring pools with an area of 4 square meters each.

Drinking therapy: in Shipiao Hot Spring, drinking therapy and bubble bath therapy are inseparable, there are three hot spring water drinking points, recuperators through daily drinking, tea, three meals of water and other ways to drink hot spring water for health and wellness.

Natural cave fumigation: natural cave fumigation is one of its famous hot spring health and wellness products. The temperature in the hot spring cave is kept at about 43 ℃ all the year round, and the recuperators enter it as if they had entered a natural sauna. In addition, there is head fumigation for head entry only, which plays a health and wellness effect on human face moisturizing and vision restoration.

2.2.4 Infrastructure

There are 1 hot spring accommodation, 3 rest pavilions, 1 comprehensive service area, 1 restaurant, and 1 garbage collection station.

3. Evaluation of rehabilitation factors

3.1. Evaluation method

Analytic hierarchy process (AHP) is a commonly used method for quantitative analysis of non-quantitative things. The reference of its combination of qualitative and quantitative, systematic and hierarchical characteristics in rehabilitation landscape research has been widely used and confirmed. In this study, the quality evaluation of health and wellness hot spring landscape is divided into three levels: target layer, criterion layer and index layer. According to the relative importance calibration, the relative importance values of 16 indexes are assigned by 20 experts engaged in landscape planning and design (5), rehabilitation landscape-related researchers (5) and graduate students (10), respectively,

and then imported into Yaahp10.1 software for batch processing, and finally obtained the weight results of each level of indicators (Table 2). As can be seen from Table 2, in the criterion layer, the order of weight from large to small is sensory experience (0.3873) > ecological environment (0.2748) > spatial perception (0.1981) > infrastructure (0.1398), indicating that the sensory experience brought about by landscape perception and the landscape environment of natural ecology are important factors affecting the evaluation of health and wellness hot spring landscape. Among the elements of ecological environment, the weight value of climate comfort is the highest, followed by forest quality, indicating that the natural climate of health and wellness hot spring landscape is more important. The comfort of the hot spring climate is the most important for the recuperators, and the good forest landscape environment is an important factor to improve the landscape quality, which can bring people physical and mental relaxation. Among the elements of spatial perception, the functional weight of the site is the highest, followed by the privacy of the site, indicating that it meets the diversified needs of the well-being and the privacy of sense of security, which determines whether the recuperators are willing to stay more in the landscape environment. Among the elements of sensory experience, the weight value of visual landscape is the highest, followed by tactile landscape. it shows that the visual perception of landscape color, ornamental characteristics, landscape artistic conception, touch texture and hot spring impact are more important in the construction of health and wellness hot spring landscape. Among the infrastructure elements, the weight value of leisure facilities is the highest, followed by recreation facilities, indicating that leisure space, resting space and recreation

platform are highly attractive to the well-being, and should be paid attention to in the infrastructure landscape elements.

The satisfaction score of each landscape evaluation index can be obtained through questionnaire survey, expert score and field measurement, and the comprehensive score of the index layer can be obtained by multiplying the satisfaction score of each index layer and the index weight value of the index layer. Then the comprehensive calculation model of health and wellness hot spring landscape quality, such as Eq. (1) to Eq. (5), A, B, C are the corresponding index items in Table 3.

$$A=B_1+B_2+B_3+B_4 \quad (1)$$

$$B_1=0.4843C_1+0.1172C_2+0.1678C_3+0.2307C_4 \quad (2)$$

$$B_2=0.3851C_5+0.2383C_6+0.1701C_7+0.2065C_8 \quad (3)$$

$$B_3=0.4536C_9+0.0837C_{10}+0.1539C_{11}+0.3088C_{12} \quad (4)$$

$$B_4=0.2189C_{13}+0.4198C_{14}+0.2783C_{15}+0.0830C_{16} \quad (5)$$

Table 3 Evaluation index weight results

Target Layer	Criterion Layer	Weight Of Criterion Layer	Index Layer	Weight Of Index Layer	Ranking	Total Weight	Total Ranking
			Climate Comfort C_1	0.484 3	1	0.133 1	2
			Water Quality C_2	0.117 2	4	0.032 2	14
	Ecological Environment B_1	0.274 8	Air Quality C_3	0.167 8	3	0.046 1	9
			Forest Quality	0.230 7	2	0.063 4	5

Health And Wellness Hot Spring Landscape Evaluation Model A			C$_4$				
			Venue Function C$_5$	0.385 1	1	0.076 3	4
			Venue Privacy C$_6$	0.238 3	2	0.047 2	8
	Spatial Perception B2	0.198 1	Venue Accessibility C$_7$	0.170 1	4	0.033 7	12
			Site Scale C$_8$	0.206 5	3	0.040 9	10
			Visual Landscape C$_9$	0.453 6	1	0.175 7	1
			Soundscape C$_{10}$	0.083 7	4	0.032 4	13
	Sensory Experience B3	0.387 3	Olfactory Landscape C$_{11}$	0.153 9	3	0.059 6	6
	Infrastructure B4	0.139 8	Tactile Landscape C$_{12}$	0.308 8	2	0.119 6	3
			Service Facilities C$_{13}$	0.218 9	3	0.030 6	15
			Leisure Facilities C$_{14}$	0.419 8	1	0.058 7	7
			Health And Wellness Facilities C$_{15}$	0.278 3	2	0.038 9	11
			Local Cultural Expression C$_{16}$	0.083 0	4	0.011 6	16

3.2. Comprehensive evaluation results of rehabilitation factors

Through the health and wellness hot spring landscape environment satisfaction questionnaire, the questionnaire refers to the design theory of supportive rehabilitation environment put forward by Roger Ulrich, an American scholar with high recognition in

rehabilitation landscape. An on-the-spot questionnaire survey is carried out from March to June in 2021. A total of 240 questionnaires are distributed and 226 valid questionnaires are filled out on the spot, with an effective rate of 94.17%. Among them, 62 persons are in need of recovery from illness, 78 persons are in need of health care, 57 persons are tourists, and 29 persons are on leisure and vacation; Gender: 117 females, 109 males; Age group: 12 persons younger than 18 years old, 92 persons 18-45 years old, 81 persons 46-69 years old, 41 persons older than 69 years old, reflecting the diversified characteristics of health care experience levels.

In order to display the evaluation results in a data format, the health and wellness hot spring landscape quality evaluation results are divided into 5 levels according to the 100-point system: Grade I (≤44 points), the landscape quality is extremely poor; Grade II (45-59 points), the landscape quality is poor; Grade III (60-74 points), the landscape quality is average; Grade IV (75-89 points), the landscape quality is good; Grade V (90-100 points), the quality of the landscape is very good. According to the comprehensive evaluation analysis (Table 4), the comprehensive evaluation score of Shipiao Hot Spring quality is 78.54 points, the landscape quality is Grade IV, and the landscape quality is relatively good. Among them, the quality of ecological environment (26.03 points) and the quality of sensory experience (28.21 points) are the dominant elements of Shipiao Hot Spring; while the spatial perception quality of the site is average, and infrastructure is a relatively lacking element in its construction.

Table 4 Comprehensive scores of the landscape quality of Shipiao Hot Spring

Criterion Layer	Weighted Score	Index Layer	Average Scored	Weighted Score	Criterion Layer	Weighted Score	Index Layer	Average Score	Weighted Score
Ecological Environment B_1	26.03	Climate Comfort C_1	100	48.43	Sensory Experience B_3	28.21	Visual Landscape C_9	78.6	35.65
		Water Quality C_2	76.1	8.92			Soundscape C_{10}	75.7	6.34
		Air Quality C_3	87.4	14.67			Olfactory Landscape C_{11}	57.4	8.83
		Forest Quality C_4	98.4	22.70			Tactile Landscape C_{12}	71.3	22.02
Spatial Perception B_2	14.65	Venue Function C_5	77.6	29.88	Infrastructure B_4	9.65	Service Facilities C_{13}	64.8	14.18
		Venue Privacy C_6	73.4	17.49			Leisure Facilities C_{14}	72.7	30.52
		Venue Accessibility C_7	68.5	11.65			Health And Wellness Facilities C_{15}	68.4	19.04
		Site Scale C_8	72.4	14.95			Local Cultural Expression C_{16}	63.4	5.26

In the comprehensive evaluation of eco-environmental quality, climate comfort C_1 and forest quality C_4 have higher scores. Shipiao Hot Spring area does little damage to the original ecological environment, preserving a large area of primitive forest and natural

forest, its valley topography is conducive to the maintenance of temperature and humidity, high-quality climatic conditions and forest environment provide good conditions for hot spring health and wellness. Because there are a large number of recuperators in Shipiao Hot Spring, the per capita health and wellness time is as long as 25 days, and the recuperators produce more domestic waste pollution, so the air quality C_3 and water quality C_2 are relatively low.

Site function C_5 has the highest score in the comprehensive evaluation of spatial experience quality. Shipiao Hot Spring function zone is clear, with special service and reception function area, hot spring health and wellness function area, health and wellness function area, health consultation function area, basically meet the diversified needs of all kinds of recuperators. There are 17 kinds of bubble pools in Shipiao Hot Spring, only some of them are equipped with certain plants or stones for private encirclement, while other rest places are open spaces, and the scale and proportion of landscape elements are generally dealt with, resulting in a slight deficiency in the quality of privacy C_6 and site scale C_8 of hot spring sites. The score of site accessibility C_7 is the lowest, the distance between the functional areas is far, the terrain is undulating, and the barrier-free design is not considered, so it is extremely inconvenient for recuperators to reach the destination in the site.

In the quality of sensory experience, the comprehensive scores of visual landscape C_9 and tactile landscape C_{12} are higher. Shipiao Hot Spring uses the setting of high and low bubble pools to form a more open view of the landscape, there are Phoenix wood, bauhinia, banyan, jackfruit and other plants with rich colors and high ornamental value, as well as other landscape sketches with various

colors. The hot spring area has a natural cave fumigation landscape, and at the same time uses the terrain to form a natural impact therapy, which not only has the visual sense of the waterfall, but also makes people get full tactile stimulation, in addition, in the pavement material, mosaics and pebbles with strong sense of concavity and convexity are selected for foot massage. The comprehensive scores of sound landscape C_{10} and olfactory landscape C_{11} are lower, mainly because there is no artificial sound scene in the hot spring area, and there is a lack of the use of aromatic plants.

In the infrastructure evaluation, the comprehensive score of leisure facility C_{14} is higher, mainly due to the relatively perfect construction of facilities such as pavilions, benches and leisure platforms in the hot spring area. Although the layout is still lacking, it accords with the principle of ergonomics and is comfortable to use. The scores of service facility C_{13}, health and wellness facility C_{15} and local culture C_{16} are lower, mainly because the service reception in hot spring area is better, but the lighting arrangement is unreasonable, the service radius of sanitary facilities is small, and there is a serious lack of publicity facilities; although there are fitness trails and health and wellness consultation platforms, the level of health and wellness consultation service is low, and there is a lack of well-equipped hot spring medical system. The hot spring area has only made a conceptual derivation of the form of "Shipiao". The number of scenic spots embodied in culture is relatively small, and a unique hot spring landscape cultural system has not been formed.

Conclusion

Based on grey statistical theory and Analytic hierarchy process (AHP), 16 evaluation indexes are selected from four aspects of

ecological environment, spatial perception, sensory experience and infrastructure to construct a comprehensive evaluation model of health and wellness hot spring landscape quality. Combined with the actual investigation, we have carried out a qualitative and quantitative landscape quality analysis of Shipiao Hot Springs, which enables the research scientific and objective, and provides a certain practical significance.

The results suggest that innate resources such as ecological environment and sensory experience are the advantages of Shipiao Hot Spring landscape, but there is a lack of spatial experience and infrastructure construction, that is, the shaping of humanized perceptual landscape still needs to be strengthened. Generally speaking, we should make rational use of idle space, refine functional zones, select landscape elements with appropriate scale and proportion, create a good private space, increase space functionality and interest, and improve internal traffic. We should make good use of plant elements, enhance color richness, and reasonably arrange health and wellness plants combined with hot spring water landscape, increase the utilization rate of health and wellness plants, and give full play to the maximum benefit of the combination of plants and smell. In addition, it is also a good measure to enhance the artificial music landscape design, which helps to make use of the pleasant sounds of nature, and introduce the audible, meltable, collectable and accessible sounds into the health and wellness environment. Finally, the service facility system should be improved, and local culture should be integrated into all aspects of the landscape. For example, we may introduce formal medical institutions, actively sum up the experience of private health care, distinguish the population, treat them according to

classification, and scientifically carry out hot spring health and wellness.

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Salad Greenhouse at Samart Farm Location: Association of the Physically Handicapped Pathumthani (APHP)

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Introduction

Since the Association of the Physically Handicapped Pathumthani(APHP) was established, one main mission of this organization is an income generation to the members. It encourages members to do vegetable farming by focusing on local products, such as morning glory and lettuce. However, with physical limitations, disabled people confront with many difficulties to take care of vegetables every day. Moreover, they cannot earn enough income to meet expenses because prices of local vegetables are relatively low, and they can only be sold in the community. The members' incentives to grow vegetables are decreased.

The School of Architecture, Bangkok University was asked by the APHP's president to find any solution to improve a quality of life of the disabled members. After intensive discussion with many the association's members, therefore, a project for constructing salad greenhouse and conducting workshops for growing vegetable were proposed. This project will lead tosustainable income for all members.

Within a year of conducting the project,accessible facilities were developed according to Universal Design principles. The existing vegetable plots were modified. The automation water system was attached. Furthermore, the greenhouse was constructed. Many salad vegetables are selected to grow because of

higher value. People with disabilities can access and take care of the vegetable plots easier than before. The building is lesser barriers and able to solve many physical limitations. This will lead to a more stable income.

Picture1: *the APHP's president is cutting the salad vegetable which is the first round production.*

Project's objectives

1. *Design and construction of salad greenhouses for increasing agricultural productivity within the Association of the Physically Handicapped Pathumthani (APHP)*

2. *Applying the Universal Design principles and assistive technology to facilitate the disabled people to access to the vegetable plots and salad greenhouse*

Design Concept

The salad greenhouse is design and built based on Universal Design principles. Assistive technologies are installed, such as automation watering system which is controlled by an application in

mobile phone. This greenhouse prototype can extend to other communities.

Process of working

Since the project aimed to decrease both financial and environmental barriers that the people with disability are confronted, participatory design is mentioned. This concept can help the design team to learn more about disability. Action research is also the vital idea to conduct this project. This methodology focuses on studying a real environments or situations in a community in order to understand the problem which leads to development of that community. This consist of four stages; plan, observation, action and evaluation.

1. Plan: survey the disabled people requirements

Picture2: the Bangkok University students are interviewing the APHP staffs.

The design team has created the process of data collection with the APHP's representatives. At the research stage, students from the school of Architecture, Bangkok University were asked to collaborate. They visited the project's site and arrange a focused group interview with association's members. All requirements were

collected. Issues of both occupational and environmental improvements were key information.

Many physical limitation and environmental barriers were raised during survey. Problems in vegetable quality control and distribution were also mentioned. Therefore, at this planning stage, experts from various disciplines were invited to give consults such as instructors from the School of Engineering, the School of Economics, and the School of Communication Arts.Ideas were exchanged among them and some of them were implemented. From participatory meetings among every stakeholder, salad vegetables are proposed to grow instead of local vegetables due to higher value. The salad greenhouse is also a solution.

2.Observation: physical and economic challenges

The significant problems that the people with disability encountered are physical obstructs in the environment. The design team therefore uses two methods to observe such barriers. Firstly, the team observes one wheelchair user's activities and behavior. He is the real staff of the APHP. Secondly, students in the design team simulated the use of space by spending half day on a wheelchair and do all farming activities to understand more on accessing the vegetable plots and its obstacles. These can help the team learn about the user's limitations.

Picture3: the Bangkok University students are experimentally doing farm activities on wheelchair in order to understand the wheelchair user.

2. Action by design

The accessible facilities within the greenhouse and vegetable table plots were designed according to the Universal Design principles and the accessible environment standard. To make sure that these designs can solve every physical need of disabled people especially a wheelchair user, staffs of APHP were invited to participate with every design stages. The table planting plot is an example idea deriving from this participation process. It was proposed to replace an on-ground plot by the wheelchair staffs,who want to take care of salad by themselves.
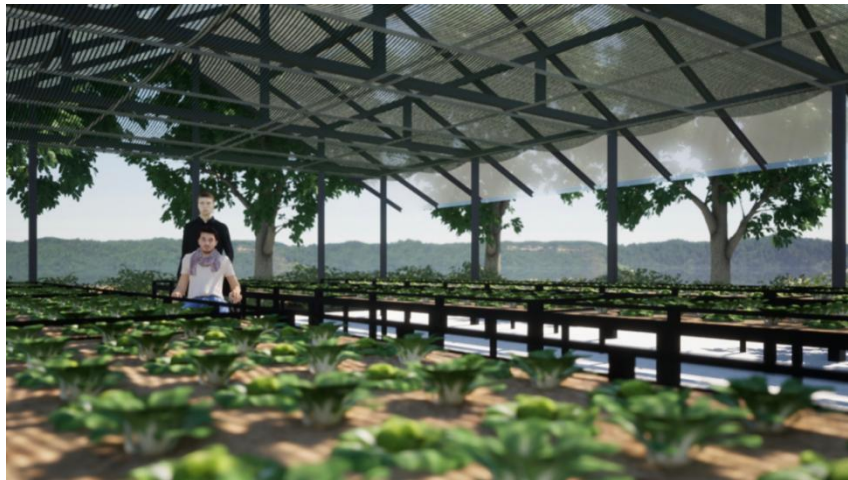
Picture4: the design of salad greenhouse

Apart from such physical concern, the design is also dealing with economic dimensions such as size of construction area, budget, and possible income from salad in each planting cycle. Form such issues, we summarized that 12 planting table plots were built. Each table plot can grow 100 salad vegetables which all 12 plots will lead to an initial income about 144,000 Thai baht per year. This project can increase annual income about 10 times.

4. Evaluation

Picture5: the salad greenhouse

After the design of the salad green house and planting table plots were completed and agreed, they were constructed. All these constructions were fully finished on December 2020 and the first fully income obtained on March 2021. An assessment focuses on evaluating many aspects both physical and financial challenges as following,

-The greenhouses can lead to certain productivity, which give rise to certain income.

-The greenhouses can be controlled and maintained by people with disabilities themselves.

-The use of technology is appropriate for the limitations of people with disabilities. The automation system of watering can

facilitate the maintenance of vegetables. However, trainings of such technology using must be arranged.

Picture 6: *the automation watering system controlled by mobile application*

When asking further the APHP's members, they suggest a future development as following,

-The APHP should increase productivity options, for example, other higher value vegetables or processed products derived from vegetables. These can expand new marketing channels.

-The APHP should create brand and packaging of this community product in order to add value to the production.

-The APHP should bring the products into digital marketing. Training of this issue could be arranged.

-Profits from the products should be used to build new greenhouses in order to providing product .

A study of the effects of receiving assistive devices using gold patents for the disabled T74 under the Rehabilitation Act of the Disabled B.E. 2534 and the Act on Promotion and Development of the Quality of Life of the Disabled B.E. Edit 2013)

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Background and importance of the problem

Nowadays, technology and facilities day by day is more important It is part of daily life. even the handicapped or the elderly The advancement of technology helps to improve rehabilitation to be able to live a life similar to normal people. Reduce the burden on society and people around Assistive devices are an integral part of rehabilitation and are essential in improving the quality of life for people with disabilities. There are various types of assistive devices for the disabled. Each type has a different purpose of use, method of use, and care. The procurement and selection of assistive devices requires consideration of the disability condition, use, environment, economy, status and preferences of people with disabilities. The development of a support system for assistive devices with disabilities aims to create an appropriate model of service provision of assistive devices to persons with disabilities. and meet the satisfaction of people with disabilities the most

The United Nations (1994) issued a standard rule. on creating equal opportunities for people with disabilities and defines the creation of equality of opportunity for people with disabilities as "the

process by which social systems and the environment such as services, activities, information It has been prepared for all citizens, especially people with disabilities. in which people with disabilities are members of society as well as other people and have the right to live in their own community or locality and should be supported based on existing needs. under the normal structure of society in education, public health, employment and social services."

For Thailand in the year 2534, the government has promulgated The Rehabilitation of Persons with Disabilities Act established. by focusing on people with disabilities to be self-reliant as a burden to society to a minimum. rights of persons with disabilities to have a better quality of life In order to be self-reliant, under section 30 paragraph 3, unfair discrimination against a person cannot be made on the ground of differences in origin, race, language, age, physical condition or health, status of the person. socioeconomic status Religious beliefs, education, or political opinions which are not contrary to the provisions of the Constitution, Section 55. Persons with disabilities or disabilities are entitled to access public facilities. and other state aid

At present, Thailand has revised the 2007 Disability Law, which is called the Promotion and Development of the Quality of Life of Persons with Disabilities Act 2007, focusing on the rehabilitation of the disabled. empowerment or the ability of people with disabilities to have better conditions or maintain the existing capacity or ability through medical, religious, educational, social, professional or any other procedures so that people with disabilities have the opportunity to work or live in society to their full potential and the promotion and development of quality of life Rehabilitation of people with disabilities welfare arrangement Promotion and protection of

rights Supporting people with disabilities to live independently have human dignity and equality with the general public Fully socially involved and effective under an environment that people with disabilities can access and used by the Sirindhorn National Institute for Medical Rehabilitation Received budget support from the National Health Security Office (NHSO) as a core for developing and supporting the demonstration center of assistive devices for the disabled. with a total of 11 pilot hospitals across the country for 3 years and began to provide services to Persons with disabilities since October 2006, which has been a demonstration center for assistive devices in collecting, recruiting, and providing assistive devices according to the rights of the Act and the health insurance system (Thor.74) (October 2004) in the budget amount. 2,000,000 baht, divided into the year 2006 and 2008, amounting to 500,000 baht in the subsidy category, and 2007 received a budget of 1,000,000 baht to purchase assistive devices for the disabled. Provide support services for assistive devices by providing people with disabilities to receive assistive devices suitable for their condition. by providing assistive devices for the disabled in addition to the standard equipment so that people with disabilities can choose to buy according to their needs and suitability with a target group are disabled and visually impaired with one of the following qualifications:

> 1) *being a new disabled person who registered with a disability by bringing a disabled person's card to show their intention to obtain assistive devices The doctor agreed that the need for assistive devices for the disabled.*

2) Being a new disabled person who is registered with a disability and receive assistive devices for the disabled It has been in use for at least 3-5 years.

3) A new handicapped person who holds a gold card T74 and the doctor decides that it is necessary to use assistive devices.

4) Persons with disabilities who hold gold card T74 and receive assistive devices It has been in use for at least 3-5 years.

Types of participating devices

1) **Wheelchairs for people with disabilities are divided into 3 types as follows:**

- *A wheelchair that is suitable for a standard disability.*
- *Wheelchairs for people with disabilities suitable for disabilities. self help*
- *Three sizes of adjustable anon-adjustable wheelchairs for cerebral palsy.*

2) *buoyancy aids For people with mobility disabilities:*

- *Single-axis umbrella cane*
- *Three-legged walking stick*
- *Armpit crutches*
- *Walker*
- *Anterior Wheel Walker*

3) **White cane for the visually impaired**

- *White staff (in case of receiving a white staff for the first time Use a method to send people with disabilities who have already been assessed. to train at Rajasuda College and the Blind Association of Thailand)in the development of people with disabilities at present still*

unclear and the overlap between the services of the Health Security Office Services of the Social Security Office and services received under the rights of persons with disabilities registration under the Rehabilitation of Persons with Disabilities Act B.E. 2534 which is about to be replaced. The Promotion and Development of the Quality of Life of Persons with Disabilities Act, B.E. 2550 (2007)

According to the results of a study by the Public Health Research Foundation. The Ministry of Public Health found that in Thailand, there are approximately 8.1 percent of the population with disabilities. which is lower than the results of the United Nations study. that have been estimated There are about 10% of the population with disabilities. In Thailand, there are more than 6 million people with disabilities who are required by the government to provide assistance services. If including the number of family members of persons with disabilities, approximately 2-3 people per family are affected by the burden of taking care of the disabled in the family. and need state aid services as well The State must provide assistance services related to persons with disabilities for the population of not less than 18-24 million people. He will be a burden on family, society and nation. on the contrary If people with disabilities are developed effectively and families of persons with disabilities receive appropriate assistance, they will be self-reliant "social costs" live independently and has dignity as well as being a human resource that creates benefits for society and the country is no less than the general public

From the above information The researcher therefore wanted to study and survey the satisfaction of people with disabilities who

received assistive devices of each type. that is appropriate and meet the needs and in accordance with the lifestyle of the service recipients or not by studying information about receiving services of service recipients from people with disabilities who receive assistive devices to take advantage used to improve the equipment to assist the disabled to be appropriate and have a good quality of life able to live in society happily for people with disabilities

1. Research objectives

1. *To know the satisfaction of service recipients About assistive devices for people with disabilities received*

2. *To study the needs About assistive devices for people with disabilities To be suitable for the way of life of people with disabilities in each area*

2.Scope of research

Research study on "Impacts from receiving assistive devices using the Golden Patent for Persons with Disabilities 74under the Rehabilitation Act of the Disabled B.E. and the Promotion and Development of the Quality of Life of the Disabled Act, B.E. Objectives for Analysis and Assessment Situation of the provision of services for receiving assistive devices that use gold patents for the disabled to identify problems in providing services that should has been developed and proposed guidelines for improving the health service system to be in line with Must receive assistive devices for the disabled using the golden patent for the disabled. The potential and quality of service as well as the organizational structure and processes. Organize service systems both inside and outside the hospital; linking the work between public and private hospitals. by

studying and analyzing information from documents or documentary research

3. Expected benefits

1) *To enable the agencies involved in the provision of assistive devices to know the satisfaction of the service recipients with the assistive devices allocated in each budget year.*

2) *To make the agencies involved in the provision of assistive devices aware of the need for the use of assistive devices that affect the way of life of people with disabilities*

3) *To enable agencies involved in the provision of assistive devices to be able to apply the knowledge gained, to improve, to change to be appropriate. in service Devices to assist the disabled in the future*

4.Methods of conducting the study

Review of research and situational information on the effects of receiving assistive devices that use gold patents for the disabled under the Rehabilitation Act of the Disabled, B.E. 2534and the Promotion and Development of the Quality of Life of the Disabled Act, B.E. 2007(revised 2013) at present from relevant domestic agencies such as the Institute of Geriatric Medicine Health Systems Research Institute National Research Council, NHSO and other related agencies by the study Study from academic papers, research results and related academic articles. Both various types of academic documents within the country and various types of academic documents. from abroad including information on Academics obtained from searching through electronic media or websites. which consists of information Academics which are important

5.The results of the study of satisfaction with medical rehabilitation services and assistive devices for the disabled

From the study "Review of the benefits package and access to assistive devices services for people with disabilities Benefit Pack Review Program and access to assistive devices services for people with disabilities Ministry of Public Health 2014" found that there were 244 persons with disabilities who provided satisfaction data that could be analyzed, with an average age of 48 years. Nearly 90 percent of them were disabled with mobility. On the day of the survey respondents traveled an average of 34 kilometers from home to hospital and spent an average of 2.4 hours at the hospital from arrival to completion of the service. Respondents rated their satisfaction across all dimensions. Representing an average score of 3.77 points out of a full score of 5, with the highest satisfaction with the service provider's manners and service results. (Each dimension has an average score of 4.14 points)

a. Service provider

Courtesy of staff was the highest score (4.25 points), followed by the care of staff providing rehabilitation services to people with disabilities (4.20 points). Service personnel's competency scored the highest (4.38 points) and service wait time scored only 3.10 points. (Only one question was asked, namely willingness to pay for rehabilitation services) was the dimension that received the lowest satisfaction score of 3.15, but neither dimension nor any point received an average satisfaction score of less than 3 points.

b. Quality of life and ability to live with people with disabilities

People with disabilities The respondents in the interview were 308 people who had access to devices and 295 people who did not have access to devices. Groups that do not have access to the device Slightly older than the device access group, both groups had incomes of themselves and their families before disability.

They are similar, but their incomes after disabilities are different. There were 85persons with disabilities who did not receive the device. The reasons for not receiving the device were lack of information and lack of assistance in coordination (36% and 31%, respectively). Persons with disabilities who receive equipment but did not use the equipment received by the device damaged/damaged (36%) and the equipment is not suitable for living conditions and daily activities (34%). device access group The overall quality of life was better than those who did not have access to the equipment. significantly The group that has access to the device They had better quality of life than other groups in three dimensions, namely physical, mental health and social relationships. (Except environmental dimensions) and also found that the group that accesses the device have the ability to live better than those who do not have access to equipment significant in all aspects, including movement Self-empowerment, finding a job/maintaining the current job and economic self-reliance The study showed that the factors affecting access to equipment were age, health insurance, Registration of people with disabilities, occupation and family care The important issues are as follows: (1) when people with disabilities get older, they have fewer opportunities to access equipment; (2) people with disabilities who use civil servants' medical benefits have

the greatest opportunity to have access to equipment, followed by Persons with disabilities who use the rights of the universal health insurance system and people with disabilities who use social security rights have the least chance of accessing the devices; More than people with disabilities who are not registered. (4) Persons with disabilities who are employees of contract companies and farmers have the opportunity to access equipment. than those with non-professional disabilities; and (5) the need for family care is more likely to have access to equipment.

c. Results from stakeholder group discussions

Group discussion of representatives of disabled people's organizations, service providers and policy makers. In this project, five key areas were covered. The data partially supported or aligned with findings from other sections of the study, such as differences in health insurance benefits between funds. obtaining the equipment that are not suitable for the environment and daily life There is no place to repair damaged equipment, while another piece of information helps to enhance understanding of the situation with people with disabilities in Thailand. including the recognition of rights service received and problems that arise affecting access to the equipment. The recommendations of the three stakeholder groups reflect problems that should be urgently addressed from the perspective of the participants. can be summarized as follows:

1) Persons with disabilities do not have the information necessary to access services provided by government agencies partly due to lack of information sharing links between agencies. In addition, each type of handicapped person and people with disabilities living in urban and rural areas Still need information that is transmitted through the media in different formats.

2) **Disparities in benefits, services and disbursement mechanisms for equipment of the public health insurance system It is an important factor in accessing rehabilitation services. obtaining the equipment and use the equipment received regularly Disadvantages from transferring/transferring rights between funds is one of the issues that people with disabilities and representatives of disability organizations focus on.**

3) **There are insufficient health personnel to support the need for rehabilitation services. and services related to the provision of equipment This is a major obstacle to accessing the device. and having a good quality of life for people with disabilities In this regard, local governments should NGOs and people with disabilities take part in providing services. Some of the group discussion participants suggested adjusting the service provider's attitude in order to provide quality service. non-discriminatory This will help reduce inequality.**

4) **The management of the whole system of equipment, from the national level down to the regional and local level, should be developed, for example, in the selection of the equipment list. Establishment of a procurement coordination center Exchange and return equipment as well as to manage maintenance efficiently Reduce redundancy and unnecessary waste of resources.**

6.Summary of study results

This study highlights the situation regarding access to devices. of people with disabilities in Thailand, including the lack of necessary information inaccessibility of rehabilitation services that people with disabilities who need equipment Many people with disabilities do not use the devices they receive, while some people with disabilities receive the devices. repeated from hospitals and

other departments both in the government and civil society sectors All of these problems are the result of policies and practices of many agencies such as the Ministry of Public Health. Ministry of Social Development and Human Security public health insurance system Hospitals, local administrative organizations, etc. are important issues that should be considered for improvement. The disparity of benefits under the health insurance system Providing rehabilitation services and equipment that cannot meet the needs in some areas (Partly due to the shortage of personnel in specific fields) Lack of cooperation and coordination between relevant departments and lack of equipment management system

7. Policy proposal

1. *Create mechanisms and links of work between different departments. both public and private including creating a database that can be shared among the relevant departments*

2 *Determine the direction of creating equality and equality in terms of benefits for people with disabilities in each health insurance system.*

3 *Improve the structure and duties of government agencies in terms of policy development and academics to be clear and strong.*

4 *Follow up and check the disbursement of equipment To prevent duplication and to be effective for both the public and private sectors*

5 *Develop innovations to increase awareness and access to information related to specific people with disabilities.*

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Study of the Physical Environment that Impacts Students' StressAccording to the Healing Environment Concept Case Study: Faculty of Architecture, KMITL

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Abstract

Information from the psychiatrist of the KMITL's institute found that students from the Faculty of Architecture, KMITL, were admitted to the treatment of stress mental health problems amounted to 100 people over a period of one year, where architecture and physical environment play an important role in increasing stress or avoiding the effects of stress (Chuengsatsongsap, 2017, p. 18).This study aimed to

1*) investigate factors of the physical environment that affect students' stress*, *2) present guidelines for improving theprimary physical environment impacting student stress.*

Therefore, the healing environment concept was used as a guideline for solving the problem, according to the interviews with students of the Faculty of Architecture, KMITL, to find guidelinesto improve the basic physical environment that help avoid the impact on stress.

This study was qualitative research collecting data by surveying the physical environment in the teaching area, rest area and activity area of the Faculty of Architecture, KMITL, and observingusagearea behaviour of students by taking notes, recording

pictures and focused-group interviews with students about the causes of stress, problems of physical environment factors and needs for improvingphysical environmentofstudents of Faculty of Architecture ,KMITL ,that has an impact on stress.The obtained data were analyzed for guideline to improve the basic physical environment.Results from a survey and interview with students of the faculty of Architecture, KMITL,about the physical environment factors that affect the stressincluding1) not enough light to used, 2 (colour inside the buildingis too white andthe old colour condition looks pale ,3)noise from neighbouring classrooms and noise from nearby boat traffic ,4) (non-ventilated air inside building and the odour that is unsatisfactory ,5) congestion of area and furniture layout and other factors such as thoroughfare,teaching and learning communication equipment, work area out of school time that affect usage and affect stress.

Keywords: *Healing Environment, Stress, Students of Faculty of Architecture*

1. Introduction

Stress is an emotional or emotional state when a person faces problems and feels uneasy. Worry, fear, anxiety, when people are aware of or evaluate these problems. Or cause harm to the body, resulting in physical and mental balance)Pornjirasilp, 2011.(Higher education is a period in which thought processes are developed. Adaptation to the school environment is an age with a change in lifestyle, greater responsibility, faced with pressures and worries about studying, exams, submitting projects due to rushing times and constraints. in various matters) WongThai ,2014, pp.4-5.(

Psychiatrists from the Faculty of Medicine ,KMITL, gave information that the students of the Faculty of Architecture were quite difficult to treat. Because the lack of rest makes the treatment with medication quite difficult and slow to work. may be at risk for depression. Faculty of Architecture There is a policy called Repair, Build, Determination of the Sustainable Budget System during 2018-2021 to improve the quality of the physical environment of the Faculty of Architecture. Because the physical environment is also associated with good quality of life. And in this policy, it addresses the mental health of students. to reduce the risk of depression caused by stress student pressure. Therefore, the researcher foresees the adoption of the concept of the healing environment as a guideline to improve the basic physical environment factors that reduce the factors affecting stress among students of the Faculty of Architecture, KMITL. It is a theory that guides the design or improvement of the physical environment to reduce the stress of the occupants of the facility.

2. Objective

1) *To study the factors of physical environment affecting student stress.*

2) *To suggest ways to renovate the basic physical environment that affects students' stress.*

3.Theory

Stress is an emotional or emotional state when a person faces problems and feels uneasy. Worry, fear, anxiety, when people are aware of or evaluate these problems. Or cause harm to the body, resulting in physical and mental balance.

Healing environment is an environmental design that contributes to treatment. Therefore, the environment affects the

positive role of human beings. Relax the environment, increase health, lower heart rate, lower breathing and lower blood pressure. Environmental factors can avoid the influence of stress.

1) Air quality affects human behavior that will change according to the weather. For example, hot weather results in a feeling of irritability. This also includes poor indoor air quality, foul odors, humidity, and ventilation. Indoors should be ventilated with door and window openings rather than circulating under air conditioners which may accumulate germs causing respiratory infections (Chakraphand,1999).

2) Noise affects health and spirit. Noise pollution is a very high frequency. Damage to the hearing system, leading to physiological changes, such as hypertension. In addition, there are risks to spirit and work efficiency (Chakraphand,1999).

3) Lighting is provided in the working environment, especially those working in the building will receive light. Light intensity, also known as light brightness, has a profound effect on the functioning of the eye muscles as well as the optic nervous system. or the intensity of light that is more or less than that specified by the standard called inappropriate lighting If given continuously for a long time, causing many problems such as eye pain, burning eyes, and indirect consequences are the destruction of the nervous system, causing stress) Siyangnok, 2013 ,p.2).

4) Color has a great relationship with emotional stimulation. Depression also affects their color choices. The colors of positive emotional reactions are usually cold, and the warm colors are orange, blue, orange and purple. Hot colors, such as red or yellow, stimulate emotions, but they tend to feel higher energy)Sevda Korkmaz, 2016, p 47). Colors have an influence on the soul. Notice

that colors give a beautiful, bright atmosphere, such as the golden glow of the sun, the color of the sea, often creating a feeling of warmth and happiness. Therefore, color has an influence on humans) **Thepnoo ,2018** ,pp15-16).

5) **Congestion is a psychological response. Or are negative feelings (negative feelings) that result from density. It is a feeling that arises from human perception. There are several factors that contribute to the feeling of congestion, such as the feeling of being crowded due to the crowd. cramped building Limited usable space Lack of personal space, etc., which affects stress**) **Harayangkoon et al.,2013 pp229-231.**

6(**The landscape, if viewed in a large way It is the design of the urban community ever. But if you look at it in a small form, it may be just landscaping. Healing Garden is another term that is heard more often. Landscaping, landscaping, to look beautiful, have the beauty of natural plants, small and large, with stones, ponds, streams, fountains. Waterfalls and natural sunlight combined**, **the healing garden could be a health garden. which is a natural way to heal the mind**) **Chuengsathiensap , 2010, p**.**31**(.

7 (**Social support environment refers to information and object. Spiritual support from individuals or group of people a result, the patient's behavior shows that the way they want is healthy here. Social support may come from family members, such as parents, siblings, colleagues, students and teachers. The impact of social support on mental and physical health. Social support can improve people's ability to deal with life problems. It also helps to reduce stress and improve personal resistance (Chuengsathiensap ,2010, pp44-48).**

Related research

Researcher/ ResearchName	Research Type	Research Results
WongThai, P. 2014 STRESS IN UNDERGRADUATE STUDENTS OF FACULTY OF ARCHITECTURE CHULALONGKORN UNIVERSITY	Quantitative Research	Most students are in moderate stress. The factors associated with stress are: too much amount of schoolwork, infrequent meeting between teacher and student about project designs and students' increasing age.
Boonpume, N. 2010 STRESS AND COPING OF THAI TRADITIONAL MEDICINE STUDENTS OF RAJAMANGALA UNIVERCITY OF TECHNOLOGY THANYABURI	Quantitative Research	Most students manage stress in a positive way is to accept the truth. And a number of students managed negative stress by venting emotions such as breaking things, shouting loudly, but not often.
Researcher/ ResearchName	Research Type	Research Results
Pongyen, N, and Waroonkun, T. 2014 DESIGN GUIDELINES FOR IMPROVING OUTPATIENT BUILDING OF A COMMUNITY HOSPITAL IN ORDER TO INCREASE SATISFACTION	Mixed Research	Building users focus on factors that affect negative feelings by first focusing on sensory factors such as lighting. Odor, second to indoor use factors Environmental beauty factors and treatment process factors
Juthamas, M. 2017 A STUDY OF PROBLEMS AND SOLUTION GUIDELINES FOR ARCHITECTURAL CLASSROOM BUILDING IN BANGKOK UNIVERSITY	Qualitative Research	The most problematic part is the school building, the classroom has insufficient space for students' use, and the limited equipment and equipment are not enough to meet the students' needs.

4. Research Methodology

This study was aimed at exploring physical environments that impact mental health among students from the Faculty of Architecture, KMITL, in order to recommend guidelines for improvement by using the healing environment concept. This qualitative research used surveys, observations and focus groups.

4.1 Area Scope and Key Informants

The scope of the area included areas used for education, relaxation and other activities of the Faculty of Architecture. The key informants were 30 students from the Faculty of Architecture who were informants in focus groups on 28 October 2020 and 6, 12, 15 November 2020.

4.2 Research Instruments

The instruments used in this study were in two categories, namely, recording instruments for physical environment surveys and focus groups as follows:

4.2.1 Physical environment survey and behavioral observation recording instruments were a camera and a notebook. The researcher walked, surveyed and recorded data in areas used for education, relaxation, other activities and observed student behavior.

4.2.2 The focus group recording form was developed from analysis of data from field surveys of physical environments that impact stress and observation of behaviors among students from the Faulty of Architecture, KMITL. The focus group recording form used by the researcher in in-depth interviews contained content regarding utilization behaviors, causes of stress, physical environments and recommendations on modification of physical environments that impact stress among students from the Faculty of Architecture.

4.3 Data Collection Methods

4.3.1 **The researcher entered the area to survey physical environments in the lecture room (Lecture Hall), the library (Lecture Hall), the laboratory (Lecture Hall), the cafeteria, hallways in education buildings (Lecture Hall, Integrated Building and the Department of Fine Arts Building), the computer laboratory (Integrated Building) and the surroundings of the Faculty of Architecture. The researcher observed the behaviors of students in the Faculty of Architecture by taking photographs and taking unstructured field notes for the first time on 11 November 2019 between 9:00 am – 2:00 pm for four hours. In addition, the researcher entered the area to survey the physical environments that impact stress and observed utilization behaviors of students from the Faculty of Architecture for the second time on 26 October 2020 to find guidelines for improvement and develop focus group instruments.**

4.3.2 **The researcher held focus group discussions with students from the Faculty of Architecture and collected in-depth data regarding problematic physical environments and behaviors of students from the Faculty of Architecture. The researcher entered the area to conduct in-depth interviews and observe the behaviors of 30 students from the Faculty of Architecture, KMITL, on 28 October 2020 and on 6, 12 and 15 November 2020. The interviews covered content concerned with utilization behaviors, causes of stress, physical environments and recommendations for modification of physical environments at the Faculty of Architecture that impacts students' stress.**

5. Research Findings
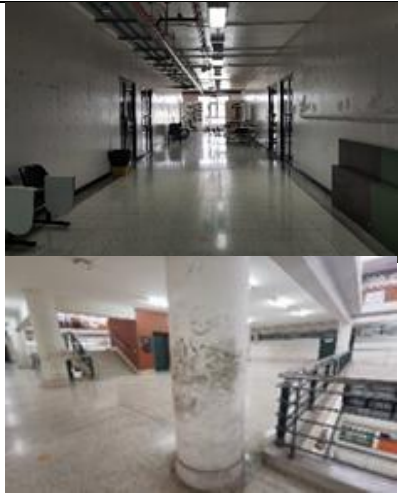
5.1 Area Survey of the Faculty of Architecture, KMITL

The data were obtained from surveying the lecture room (Lecture Hall), the library (Lecture Hall), the laboratory (Lecture Hall), the cafeteria, hallways in education buildings (Lecture Hall, Integrated Building and the Department of Fine Arts Building), the computer laboratory (Integrated Building) and the surroundings of the Faculty of Architecture. The researcher analyzed physical environments that impact stress consisting of lights, colors, sounds, air quality and overcrowding. These five factors were obtained from the literature review and the factors can impact stress if the factors cause negative feelings and have no response from use. From the survey of the area, the researcher found the following problems.

Table 1 – Data from Area Survey

Images from the Survey	Survey Data
	Lecture Rooms (Lecture Hall) - **Some rooms do not have full lighting.** - **Room paint is old white paint with stains on the walls.** - **Unused items and furniture are placed at the sides, which may cause feelings of clutter and narrow space.** - **Some room walls do not hold sound, causing sounds from nearby rooms to be heard.**
Images from the Survey	**Survey Data**
	Laboratory (Lecture Hall) - **Lights are not spread, which may cause lights to be**

	insufficient for drawing designs. - **Room paint is old and does not motivate work.** - **Some pieces of furniture are damaged.** - **Unused items are placed at the sides, which may cause feelings of clutter and narrow space**
  	Library (Lecture Hall) - **Poor lighting between bookshelves cause bookshelves to feel narrower.** - **The paint, the floor, the walls, the ceiling and the furniture look official, not relaxing and does not encourage reading.** - **Official-looking furniture models may not be comfortable and relaxing.** **The furniture arrangement appears crowded. Reading tables and chairs are too closely placed**
	Cafeteria **- There are few vendors, causing the lunch break to be crowded. In addition, vendors are available only**

	at one side of the cafeteria, causing people to choose to sit at the side with the cafeteria rather than the other side of the cafeteria.
	Computer Laboratory (Integrated Building) - **The paint on the floor, walls, ceiling and the furniture is white, causing the laboratory to look like a science laboratory. This does not encourage creativity.** **Lights at the front of the room should be capable of dimming to clearly see projector images.**
	Hallways (Lecture Hall, Integrated Building, Department of Fine Arts Building) - **Lighting is dark and does not cover every point. Hallways have insufficient natural light, causing hallways to look dark and do not boost awareness.**

Images from the Survey	Survey Data
	Hallways (Lecture Hall, Integrated Building, Department of Fine Arts Building) **- Most of the paint is old white paint with stains on the wall. When combined with green doors, this causes the building to feel more like a hospital than a school building.** **- Some of the hallways, such as those in the Lecture Hall, do not have many openings, causing hallways to lack ventilation and have a damp odor.**
	Surroundings of the Faculty of Architecture, KMITL **- The Faculty of Architecture, KMITL, has an advantage from having many trees and ponds, causing the area to feel cool, shady and relaxing. Students came to sit and rest at various points with seats. If made to be more attractive, students may show interest in the area as a place**

for relaxing. However, this may have effects at night because heavy tree cover causes the area to be dark and have a frightening atmosphere.

Source: The Researcher (2020)

5.2 Focused-group interviews Data

According to data from a focus group discussion with 30 students who provided data concerning physical environments, which consisted of five factors, namely, lights, colors, sounds, air quality, overcrowding and other recommendations, issues, problems and solutions with the following details were summarized in Table 2:

5.2.1 General Data of Key Informants

1. Causes of stress were from students' personal factors, heavy workloads when studying, lack of sleep, inability to keep up with work, personal pressure and lack of progress at work.

2. Regularly used areas in the Faculty were the Lecture Hall, shared workspaces, the cafeteria, the basement of the 4-story building, studios of the Department of Architecture and the Department of Interior Architecture, the Integrated Building, the Department of Fine Arts Building and the library.

Table 2 – Focused-group interviews Data

Studied	Problem	Recommendations from

Variable		Interviewees
1. Light	**Lecture Rooms (Lecture Hall)** - **Room lights cause students to feel drowsy and sleepy. The center of the room does not have as much light as the sides.** **Library (Lecture Hall)** - **The lighting between bookshelves is inadequate. When looking for a book, students have to squint. The narrow distance causes students to feel that bookshelves are dead ends.** **Laboratory (Lecture Hall)** - **Design Drawing Laboratory** **Lights are not evenly dispersed, causing drawing work to be unclear. Students have to squint to focus. This causes pain after a long time.** **Hallways (Lecture Hall, Integrated Building, Department of Fine Arts Building)** - **Hallways are not well-lit, causing students to feel depressed and unmotivated before entering class. Hallway atmospheres are similar to an abandoned building, causing the**	**Lecture Rooms (Lecture Hall)** - **Rooms should have lights at the center to provide even lighting in the sitting area.** **Library (Lecture Hall)** - **Lights should be dispersed throughout the library or the furniture arrangement should be changed to be consistent with old light positions to allow light access.** **Laboratory (Lecture Hall)** - **Lights should be arranged evenly throughout the room and furniture arrangements should be modified to be consistent with light positions to prevent overhead shadows when sitting and drawing.** - **The drawing room on the 4th floor of the Lecture Hall should have more lights or shafts to allow natural light in.** **Hallways (Lecture Hall, Integrated Building, Department of Fine Arts Building)** - **More lights should be added to hallways in the building or warm white lights should be added to walls to create a livelier atmosphere.** **Paths Outside the Building (At Night)** **Lights should be added to every**

	building to appear narrow and unsafe, particularly in the evening. **Paths Outside the Building (At Night)** The Faculty's paths are lit at only certain points at night, causing students to feel afraid and concerned about danger.	point on paths outside buildings at night and not only at certain points.
Studied Variable	**Problem**	**Recommendations from Interviewees**
2. Color	**Lecture Rooms (Lecture Hall)** - There is too much white (all-white), which does not create motivation and causes a sleepy atmosphere when studying. **Library (Lecture Hall)** - The colors of the floor, walls and the furniture are not relaxing; rather they are boring and more stressful. Color shades look old without any identity. - Tabletops should be in a bright color such as white, which is more comfortable for the eyes than dark brown wooden tables. **Hallways (Lecture Hall, Integrated Building, Department of Fine Arts Building)** - Indoor colors are all white, causing hallways to feel like	**Lecture Rooms (Lecture Hall)** - Colors related to the Faculty or material colors should be included in building components and details without overusing in order to create more awareness. **Library (Lecture Hall)** - Color tones and material colors should be changed to be more modern, stimulating for reading, relaxing and attractive for use. - The Lecture Hall's interior should be repainted to look clean. Colors should be added according to building components and specifications. Posts should be changed from having a white color to having the Faculty's sepia-and-white color to feel lighter or a color that boosts awareness with

	hospital hallways: comfortable but not lively (Lecture Hall) Colors are not improved, causing hallways to appear old and depressing.	possible graphic images related to designing work and philosophical words to inspire students.
3. Sound	- Chatter from outside classrooms or sounds from people speaking into microphones in nearby rooms disturbs students when studying, causing students to lose concentration and feel irritated. - Sounds from deficient air conditioners in classrooms are disturbing.	- Walls should be made to be thicker or use soundproof materials with covers for wall power sockets to prevent sound from escaping. - Air conditions may need to be checked to solve the problem.
4. Over crowding	- Close furniture arrangements in the library caused the library to feel crowded and narrow. When standing up, students have to pay attention to people around them. - The cafeteria at lunch has many people, few vendors and seats. Students have to stand and wait to buy food for a long time, causing students to feel crowded and busy.	- Furniture arrangements in the library should be spaced to allow for good function with many choices in arrangements for individuals or groups. - Vendors should be increased and dispersed to both sides of the cafeteria to disperse seating choices.

Studied Variable	Problem	Recommendations from Interviewees
4. Over crowding	Students have to be concerned about time needed to go to afternoon classes. - Fine arts students have insufficient exhibition and drawing space, causing concerns about separating space when there is activity.	- Exhibition and drawing areas for fine arts students should be added or expanded.
5. Air Quality	- Shafts in classrooms are usually not opened and the Lecture Hall does not have many opening shafts, causing damp odors. - Dust gathered at window sills, curtains and unused items causes effects on the eyes. In particular, when working in front of a computer screen, this causes students to have sties or eye irritation. - Cigarette smoke in the building area causes odors and uncomfortable breathing. - Unventilated odors from paint and used chemicals cause health impacts. - Odors from the canal next to the cafeteria cause students to lose appetite.	- When classrooms are not used, doors and windows may be opened to vent air outside. - Window sills and curtains should be cleaned. Unused items should be removed from the building or placed in a storage area. - Smoking areas should be placed far from the Lecture Hall. - Ventilation should be provided for work that requires use of chemicals or openings should be added to buildings. - Fragrant trees should be planted on the banks of the canal next to the cafeteria and dish positions should be changed to a more enclosed area.
6. Other Factors	- Lack of supporting space for work outside class hours causes	- Areas should support 24-hour work by students with

	significant anxiety. Most work is group work. Separation causes inconvenient communication about work and, for large scale work, dormitory space is not sufficient; creates inconvenience for students. - Damaged and fallen tiles from indoor passages for students to be careful for safety and concerned about more damage when walking.	diverse work area models to allow discussion with fellow students or allow students to work alone while facilitating simple access and use. Air conditioners may not be necessary and work areas may be open air with sufficient lights at night. - Damaged floor tiles should be repaired or re-laid if fallen off for safety.
Studied Variable	**Problem**	**Recommendations from Interviewees**
	- Footpaths cannot be used. This forces students to share the road with cars, do students do not feel safe. Furthermore, damage to traffic surfaces on the sidewalks makes students worried about tripping and falling when walking, particularly when hurrying to deliver work. 	- Damaged traffic surfaces on footpaths should be made smooth with a rough surface to prevent falling. Overgrown areas should be cleaned to be attractive for walking and sidewalks should be expanded to be functional with clear division of traffic modes. - Education equipment such as computer projectors should be modified to be convenient for use when teaching and when students present work.

	- **The quality of education equipment such as computer projectors used in classroom presentations makes equipment difficult to use. Equipment has problems, causing students to feel irritated when turning equipment on to use, so students feel that learning is not smooth. Screens have deviant and unclear colors, which forces students to focus eyesight.**	
7. Other Recommendations	**- Most stress is caused by work. Students mostly relax from stress by talking with friends. With areas that support sitting and talking in a good environment, students should have less stress.** **- New areas should be created for sports, music and singing practice rooms and space for watching movies.** **- Resting areas under trees should be added for involvement with nature because the atmosphere in the Faculty of Architecture, KMITL, is shady and comfortable due to tree colors.**	

Source: The Researcher (2020)

6. Discussion of the Findings, Conclusion and Recommendations

6.1 Discussion of the Findings

In studying environmental factors that impact stress among students at the Faculty of Architecture, the following information was found:

6.1.1 Insufficient lights at the center of lecture rooms (Lecture Hall), the library (Lecture Hall), space between bookshelves, the laboratory (Lecture Hall), hallways (Lecture Hall, Integrated Building and Department of Fine Arts Building) and outdoor paths (at night). The aforementioned areas had effects on eyesight, causing fatigue and aches from focusing in addition to causing fear and anxiety. This is consistent with the theory in that prolonged exposure to excessive or insufficient lighting or inappropriate lighting causes many problems such as pain and eye irritation, including side-effects such as damage to the nervous system resulting in stress (Siyangnok, 2012, p. 2).

6.1.2 The all-white color of the lecture rooms (Lecture Hall), the library (Lecture Hall) and hallways (Lecture Hall, Integrated Building and Department of Fine Arts Building) make the buildings feel like a hospital, meaning the buildings are comfortable, but not lively or motivating. Old and faded paint does not have a fresh feeling attractive for use. According to interviews with students, the students would like more stimulating colors than calming colors. This finding differs from cited researches. One theory states that colors were significantly correlated with emotional stimulation. Furthermore, personal anxiety levels and depression have effects on selections of colors used to trigger positive emotional responses. In general, the colors are cool or warm colors such as orange, blue, grey and purple. Hot colors such as red or yellow trigger emotion.

However, these colors were likely to energize people more (Korkmaz, S., 2016, p, 47).

6.1.3 Noise disturbance from chatter outside classrooms, boats in the river, construction at the sides of the Fine Arts building and deficient air conditioners in class rooms disturb concentration, causing students to feel irritated when studying and when working. This is consistent with the theory stating that sound affects physical and mental health. Noise pollution, such as high frequency rhythms, causes danger for hearing and physiological changes such as high blood pressure, gastrointestinal abnormalities and arrhythmia, etc. Furthermore, noise disturbance is harmful to mental health. Loud noises affects work efficiency (Chakrapan, 1999, Paragraph 16).

6.1.4 In the area of air quality, problems were found due to few openings in the building, poor ventilation, damp odors in classrooms and restrooms. Odors from chemicals and cigarettes in the building cause health problems and difficult breathing. Unpleasant odors from the canal beside the cafeteria and the position for placing dishes after eating cause students to lose appetite. In addition, outdoor areas have no roofs over paths connected to other buildings, faculties and the parking area, causing students to feel hot or wet when it rains. This is consistent with the theory of how air quality affects human behavior based on weather changes. For example, hot weather causes students to feel irritated. When air in the building has poor quality, odors and dampness, the effects are the same. Building interiors should be ventilated with openings, doors and windows rather than air circulation by air conditioners, which may accumulate germs and cause respiratory infections (Chakrapan, 1999, Paragraph 10).

6.1.5 The library is crowded due to close placement of furniture. The cafeteria is crowded with many people at lunch, but there are few vendors and seats, causing students to feel the areas to be narrow and insufficient for use. Unused furniture and items are placed in classrooms and hallways in the buildings, which blocks paths and creates clutter. Exhibition and drawing areas for fine arts students are not sufficient, causing students to have concerns when performing activities. This is consistent with a theory stating that overcrowding is a psychological response or a negative feeling resulting from density and a feeling caused by human perception. Many factors caused feelings of overcrowding such as overcrowding from population density, narrow buildings and facilities, limited space, lack of privacy, etc., which affects stress (Harayangkoon et al., 2013, pp. 229-231).

Physical environments such as lights, colors, sounds, air quality and overcrowding have effects on stress among students from the Faculty of Architecture, KMITL, and other factors such as lack of space to support work outside studying hours. Tiles in the building are damaged. Outdoor passages, foot paths and roads have damaged surfaces. Path size is not functional and educational equipment quality causes negative feelings with effects on students' stress. Furthermore, student stress is caused by personal factors such as heavy workloads, lack of sleep, inability to keep up with work, personal pressure and lack of progress.

6.2 Preliminary Recommendations for Implementation of the Findings

The preliminary recommendations for modification of physical environments of the Faculty of Architecture, KMITL, to reduce factors with impacts on students' stress are as follows:

6.2.1 The center of lecture rooms (Lecture Hall), the space between library bookshelves (Lecture Hall), the laboratory (Lecture Hall), hallways (Lecture Hall, Integrated Building and Department of Fine Arts Building) and outdoor paths (at night) should have sufficient lighting to cover the area, and lights should be properly positioned. Appropriate lighting for education buildings is as follows: 300 lux for classrooms, 100 lux for hallways, 750 lux for drawing rooms, 200 lux for bookshelves and 21 lux for outdoor paths (Illuminating Engineering Association of Thailand, 2019, pp. 45-46).

6.2.2 The colors of walls and furniture of lecture rooms (Lecture Hall) and the library (Lecture Hall) should be changed according to building components with specifications to be colorful, new and lively. Hallways (Lecture Hall, Integrated Building and the Department of Fine Arts Building) should be repainted to be clean by changing indoor colors from all-white to the lighter sepia-and-white color of the Faculty or a stimulating color tone. Building components, specifications and posts should be added to have colors or graphics images related to design in addition to having philosophical words to create inspiration and drive. According to a theory, color has spiritual effects. When observing attractive and bright colors such as the sun's golden light or the color of seawater, humans usually have warm and happy feelings. Therefore, color has effects on humans (Tepnu Tanita, 2018, p. 15-16). Images, artworks and decorations with psychological value and objects of faith with psychological effects are a specific form of physical, psychological and spiritual drive (Jeungsatiansap, 2010, p. 53.(

6.2.3 Disturbing sounds from activities that affect classroom learning, workspaces or indoor activities should be minimized. In a theory on development of systems for absorbing indoor noise such as wall, floor or ceiling systems, sound buffering materials such as curtains, carpets, rubber tiles and scientific vinyl rolls or sound-absorbing pads appropriate for buildings should be used. According to the findings of a research, floors and carpets can block more than 70 percent of noise disturbance and light music in a building (Jeungsatiansap , 2010, p. 74).

6.2.4 In the area of air quality, areas inside the Lecture Hall should have air conditioning products in classrooms, restrooms and workspaces to suppress unpleasant odors and air quality in buildings should be improved with fresh air machines or fans. Areas outside the Lecture Hall should be planted with fragrant trees such as herbs. When classrooms are not used, doors and windows should be opened to ventilate air. Improving air quality with fragrance from herbs that have healing properties or aromatherapy can calm emotions after improving air quality (Jeungsatiansap, 2010, p. 42).

6.2.5 To reduce overcrowding in the Faculty of Architecture, KMITL, library furniture should be arranged for convenient spacing and use with seating arrangements that allow a variety of choices ranging from individual seats to group seats. The cafeteria should have more vendors dispersed on both sides of the cafeteria to prevent students from clustering at one point. Exhibition and drawing areas for fine arts students should be sufficient for the number of students. According to a theory on preventing overcrowding, overcrowding can be solved by area management to increase use, modification of areas to have more privacy and furniture arrangements with spacing for convenient use. Furniture

models should be changed to have sizes that conserve space in addition to being furniture that can be hidden, folded and stacked. Seats should be arranged to allow individual or group seating choices (Horayangkoon et al., 2013. p. 229-231).

6.2.6 The landscape should be modified to be attractive by using natural plants with rocks, ponds, streams, fountains, waterfalls and natural sunlight. Healing gardens that use natural healing should be created (Jeungsatiansap, 2010, p.31). The Faculty of Architecture should modify the landscape to be attractive and increase seats under trees or improve the scenery to allow students to relax in a natural setting.

6.2.7 The Faculty of Architecture should have recreational areas such as sporting areas, music and signing practice rooms, movie viewing space and areas that support students to sit, talk and exchange opinions in addition to allowing students to perform activities together. Social support, information support, material support or mental support from individuals or groups can help the recipient perform or express desirable behaviors, which means good health in this situation. Social support may come from family members such as parents, siblings or colleagues.

Modification of physical environments at the Faculty of Architecture, KMITL, will reduce stressful factors for students. This is consistent with a theory by Jeungsatiansap (2010, p. 56) who stated that stress is a major factor given consideration in medical treatments. Therefore, creating relaxing environments is key to improving health recovery and creating more attractive workplaces.

Remarks: The researcher will use the preliminary recommendations for modification of physical environments that

impact stress among students from the Faculty of Architecture in further designs and questions to users.

6.3 Recommendations for Future Studies

In this study, the researcher studied only physical environments that impact stress among students from the Faculty of Architecture, KMITL. According to the findings, physical environments that impact stress were caused by lack of safety, which caused fear and anxiety. Therefore, in future studies, the researcher recommends using physical environment safety theories to study the physical environments of the Faculty of Architecture, KMITL.

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A Study of Way-finding According to Universal Design Concept: Case Study of Faculty of Architecture, King Mongkut's Institute of Technology Ladkrabang

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Abstract

Nowadays, Way-finding is the most important system in highly complex environments. The purpose of the research is to study Way-finding of Faculty of Architecture, King Mongkut's Institute of Technology Ladkrabang (KMITL.). This study aims to 1) Study the behavior and requirements of the Way-finding system of users in the Faculty of Architecture, KMITL. 2) Study the guideline concept of Way-finding for universal design. 3) Suggest the suitable guideline concept of Way-finding for the Faculty of Architecture, KMITL.

The design of the Way-finding system should be considered in all groups of users. Accordingly, to find the suitable concept of Way-finding of the faculty of Architecture, KMITL. This research uses the concept of universal design concept (Steinfeld and Maisel, 2012, para. 2). The concept affects the behavior and demand of all groups of users, students, including internal users, outsiders and 3 groups of persons with disability.

This study is qualitative research by taking the experiences of research participants. It leads to the benefit for the development of a Way-finding system in the faculty, KMITL. Moreover, the result of the study of Way-finding for universal design concept, a case study

of the Faculty of Architecture, KMITL., found that five groups of research participants have similar problems in the Way-finding system of the faculty. However, wheelchair users and people with visual disabilities suggest that the faculty should improve access and use of facilities for the disabled person rather than develop a Way-finding system. Moreover, the result shows that 6 groups of research participants mention the problem of the signal system except for people with visual disabilities who solely use other facilities such as Braille blocks, curb stone, speed bump, and bridge.

Keyword: *Way-finding, Signage, Physical Environment, Universal Design*

1.   Introduction

Because architectural environments are more complicated, people need to have maps or symbols to guide people to destinations. In these stressful environments, effective way-finding systems will help to create feelings of safety. According to the literature review, floor-plan configurations and signage/way-finding aids from Weisman's theory (Phaholthep, 2017, p. 81) were physical environments with significant influence in way-finding. Therefore, physical environments were the main factors used in this study.

Currently, the Faculty of Architecture, KMITL, found problems in accessing buildings caused by insufficient signage or way-finding aids, causing users to be confused and causing user needs to not be meet, particularly the needs of disabled persons such as students who use wheelchairs. Boonvong and Niamsap (2000, p. 19) stated three types of disabilities had direct effects on public building designs consisting of physical and mobility disabilities, hearing or interpretation disabilities and visual disabilities. In addition,

according to the findings from a survey conducted by the National Statistical Office in 1996 found people with these three types of disabilities combined to make up 73.2 percent of all persons with disabilities. Therefore, the researcher has a concept to improve the Faculty of Architecture, KMITL, to facilitate access by three types of disabled persons and universal design needed to be used as a guideline for designing the way-finding system in this study.

2. Objectives

1.*Study the behavior and requirements of the Way-finding system of users in the Faculty of Architecture, KMITL.*

2. *Study the guideline concept of Way-finding for universal design.*

3. *Suggest the suitable guideline concept of Way-finding for the Faculty of Architecture, KMITL.*

3.Theories and Literature

3.1 Physical Environment Affecting to Way-finding

Phaholthep₎ 2017, p. 81 ₍mention Weisman's theory that there are 4factors of physical environment affecting to way-finding are: 1) Floor-Plan Configuration2) Visual Access 3) Signage/Way-finding Aids 4)Space Differentiation.

3.2 Physical Environment

The one thing that humans learn and remember from the physical environment has a relationship with each other as a system called Conceptual System that occurs within the mind instead of what appears outside. Because the conceptual system in the human mind is complex. Therefore, the approach to the conceptual study of the physical environment was discussed. Then analyze the important parts of the structure of the conceptual system into 3parts as

follows: 1) Imaginary is the perceived mentally from the physical environment perceived through vision. 2) Distance and boundary are the relationship of the position of the imaginary elements with emphasis on distance and boundaries. 3) Meaning is the part that helps to understand what is present in the image. how to use and causing any feelings or attitudes. Therefore, meaning in here including the functional meaning and the emotional meaning.In which distances or boundaries and meanings are hidden in the imagination, these 3 important parts are related to each other. May create a clearer conceptual system.)Horayangkul,Setvorakitand Klinmalai,2013, p. 92)

In Kevin Lynch's study, there are three key components of a city's conception, known as the "Image": 1) Identity means the things that make up a city and have unity 2) Instruction means the physical relationship of things to each other. 3) Meaning is important for understanding the meaning of things. It can be a functional meaning or it could be an emotional meaning.)Horayangkul,Setvorakitand Klinmalai,2013, p. 94)

Horayangkul,Setvorakitand Klinmalai)2013, p.94-96)mention Kevin Lynch's theory that Kevin Lynch emphasizes the importance of organization in the physical environment. in order to understand and be able to cause "Imageability". Anything that produces a clear imagery must have unique and structural qualities.There are 5 components of urban imagery: 1) Paths 2) Edges 3) Districts 4) Nodes5) Landmark. Therefore " 5components of urban imagery" became an important part of the study of the shape of the city. It is something to consider in urban planning. And had a great influence on the subsequent study of the city's mentality.

3.3 Way-finding

Way-finding is human perception and familiarity with the built environment. There are 7important things to consider about navigation: 1) "Visual Guidance System" uses visual navigation systems such as colors, badges, to ensure that users can use those interior spaces. 2) "Architecture Element and Interior" such as using floor tiles, changing wall colors to help find paths. and creating space differences by alternating certain elements, such as choice of color or placement. Counter/waiting seat It will help the seeker to guess the area 3) Signposts should be installed in areas where the user can decide, such as entrances, lobby, elevators, corridors, intersection corridors, etc. 4) Choose a vision symbol that is suitable for a large group of people, such as children, the elderly and people with vision problems. (Universal Design concept.)5) "Legibility" The graphics used must be able to communicate. It is aimed at the desired point and visible at a reasonable distance. 6) Graphic design must be designed and placed in a consistent place along the way. (Directional signs of the road traffic system, signs on the superhighway giving clear directions, given at regular intervals) 7) Avoid overuse of the vision system. Be specific and show only the essential information. Also, the sign should not be installed too much before the location where the user will make the decision of the route. Because if the label is in the previous position too much or filled with too many signposts It will make it uninteresting to read and meaningless.)Phaholthep, 2017, p.81-82(

Differences in style translate into differences in strategy. Since more men than women fall into the map navigator style, they often rely on global reference points that assist them in building conceptual models of built environments. Women tend to strongly

rely on cues from the immediate built environment, such as landmarks or information given to them about which routes to take. Think traditional cardinal directions (North, South, East, West) as opposed to "over by the fountain with the ducks" — both points of reference can get you where you want to go, but men and women choose one over the other. Along the same vein, studies show that women are better able to recall specific landmarks in their environment than are men. For a deeper understanding of wayfinding and how architectural signage can improve communication, check out this whitepaper titled Pathways to Success with Wayfinding Signage.) **Liz Kelly** , **2012, para** . **3** (

When it comes to what's known as the sense of direction, studies have suggested differences in confidence levels between the genders. Confidence level directly correlates into how much anxiety a person experiences in navigating complex structures and campuses. On the whole, men report feeling more confident than women about their sense of direction, which strongly comes into play when they're faced with having to find their way around an environment that's new to them.) **Liz Kelly** , **2012, para.4** (

3.5 Signage

Signage is part of the way-finding system or graphic directional system to enable the masses travel to places as needed. In the preparation of tools to reach the destination. The environmental graphic designers have narrowed down the meaning. It creates tools to give directions, identify locations and give instructions, providing organized and concrete information, which provide information in orderly and concrete that consider of the use follow a standard called the Signage System. A good signage system

must consider the environment to make it effective in use.)Julmatcha, 2004, p.10)

The main functions of the badge are divided into 4 types according to their use as follows:

1) Directional is a basic type of sign, from map signs to road signs.

2) Identifying is a sign indicating the name and location of a place or thing, such as a city sign, a room sign, and a fire extinguisher sign.

3).Informational is a sign to tell information about giving details. It is considered as a decorative part of the venue, including exhibition information boards and announcements.

4) Restrictive or Prohibitive is a sign to tell restrictions, prohibitions, such as rules, regulations, no smoking signs. until the restricted area sign.) Kobsuknirun, 2015, p. 19(

3..6 Universal Design

The 7 Principles of Universal Design are well known in the universal design world. They've been used as a guide for many years by design professionals. The IDeA Center at the University at Buffalo has taken these principles and made them more practical. The 8 Goals of Universal Design help practitioners apply UD and measure outcomes. They cover functional, social and emotional dimensions. Briefly, the 8 Goals are:1) Body fit 2) Comfort 3) Awareness4) Understanding 5) Wellness6) Social integration 7) Personalization 8) Cultural Appropriateness)Steinfeld and Maisel, 2012, para. 2(

3.7 Literature Review

The literature review, it was found that Thai literature such as "The Creative Enviromental Graphic Designfor Yannawa Riverfront"byImsamang and Disakul Na Ayudhya)2019(, interested in studying and researching signs that are part of the Wayfinding

system over the direct way search system. And "The Design Guidelines for Floor-Plan Conguration to Increase Waynding PerformanceIn National Museums" by Moorapun (2013) focuses on floor planning. which the literature related to the design of the search system in accordance with the principles of Universal Design will be found in foreign literature more than Thai literature such as"Gender Differences in Wayfinding Strategies and Anxiety About Wayfinding: A Cross-Cultural Comparison" byCarol A. Lawton and Janos Kallai) 2002)and"Gender and Age Differences in Using Indoor Maps for Wayfinding in Real Environments"byChengshun Wang, Yufen Chen,Shulei Zheng and Hua Liao)2019(, a study of gender and age affecting path-finding ability. In addition, the research "Wayfinding in University Settings: A Case Study of the Wayfinding Design Process at Carleton University" by Kehinde Oyelola (2014) is the literature most relevant to this research. Research is qualitative research and uses different data collection methods. In particular, the study explores the approach to university campuses by examining and analyzing different perspectives of real users. Carleton University in Ottawa a place to explore. This place consists of a complex spatial structure. Multicultural End Users and the strategic goal of being an accessible and inclusive institution.

Therefore, Floor-Plan Configurationand Signage/Way-finding Aids from Weisman' theory)2017, p. 81(are interesting factors to study. Kevin Lynch mentions a well-organized environment to create a clear image. In this research, the five components of urban imagery by Kevin Lynch (Horayangkul, Setvorakit and Klinmalai, 2013, p. 94-96) were used in the analysis of "Floor-Plan Configuration". and using the principle of classification of symbols

according to their uses, 4 types (Kobsuknirun, 2015, p. 19) were used in the analysis of "Signage/Way-finding Aids".

4. Research Methodology

The research was a systematic research on the way-finding system of the Faculty of Architecture, KMITL, with the aim of producing recommendations on design improvement methods according to the concept of universal design. Qualitative research methods were employed through surveys and observation of the behaviors and needs of the users of the internal search system of the Faculty of Architecture of KMITL in addition to data collection from focused-group discussions involving research participants and actual user experience, followed by analysis and processing for the development of design guidelines.

4.1 Location of Study

The Faculty of Architecture, King Mongkut's Institute of Technology Ladkrabang

4.2 Key Informants

For the sample groups in this study, the sample receiving open-ended interview forms consisted of 31 subjects consisting of 8 outside people, 19 students, and 4 internal staff members, while the for the qualitative portion of the research through focused-group discussions consisted of 28 research participants consisting of 17 outside people, 7 students, and 4 internal staff members. The key informants were divided into two groups as follows:

1. Outside People – These consisted of the primary users of the way-finding system of the Faculty of Architecture of KMITL at first use, namely users of footpaths, users of vehicles, and three categories of disabled persons, namely persons with physical and movement impairments, people with visual impairments, and people

with hearing or communication impairments; they consisted of users of wheelchairs, blind persons and persons with blurred vision, and deaf persons.

2. Students-internal staff members of the Faculty of Architecture of KMITL – These consisted of the secondary users of the way-finding system of the Faculty of Architecture of KMITL, namely students, professors, staff, and a person with physical and movement impairments, namely one wheelchair-bound student.

4.3 Research Instrumentation

1. The instruments for recording the survey of the physical environment and user behaviors:

- Survey equipment consisted of GoPro cameras, photo cameras, and notebooks.

- Equipment used to demonstrate hypothetical roles consisted of wheelchairs, tinted glasses,fully-opaque glasses, white walking sticks, and ear plugs.

2. An open-ended interview form was used to conduct interviews online.

3. A focused-group interviews were recorded by a form with supplementation by an audio recorder.

4.4 Data Collection Procedures

1. A preliminary survey of the area was surveyed, followed by the photographing of the various physical environment of the Faculty of Architecture of KMITL for a thorough and systematic study. The researcher spent two days to conduct the preliminary survey, namely 11 December 2019 and 1 November 2020 from 1:00 to 4:00 pm, for a total of 6 hours (3 hours per day).

2. The open-ended interview form was distributed online to students, internal staff members, and outside people to obtain

information about the problems on the first use of the way-finding systems of the Faculty of Architecture of KMITL and information about user behaviors. The purpose was to seek preliminary guidelines on the improvements and development of tools for focused-group discussions on 8-11 May 2020. In total, 31 people returned their forms, namely 19 students, 4 internal staff members, and 8 outside people.

3. A survey of the area was conducted by the researcher, by which the researcher created hypothetical roles for the research participants by dividing them into 7 groups consisting of students, internal staff members, outside people on footpaths, vehicle users, and 3 groups of disabled persons consisting of wheelchair users, blind persons and persons with visual impairment, and deaf persons. Simultaneously, the researcher prepared the instrument for recording the survey of physical environment and user behaviors to develop understanding about the problems encountered and to select the best paths for all 7 groups participating in the research, with the actual survey conducted at a later stage. One day was spent for making records of the area and hypothetical roles of the research participants, namely 22 July 2020 from 1:00 to 4:00 pm, or 3 hours total.

4. The behaviors of the research participants who used the way-finding system of the Faculty of Architecture of KMITL were observed with the instruments for recording the survey of physical environment and user behaviors, and focused-group discussions were held and recorded to collect in-depth data from actual users and to reflect upon the different problems and needs of the 7 groups of research participants consisting of 28 people, namely 7 students, 4 internal staff members, 3 outside people on footpaths, 3 outside

people in vehicles, and disabled persons from 3 categories, namely 5 wheelchair users, 3 blind-visually impaired persons, and 3 deaf persons. This stage took 7 days on 26-28 October 2020 and on 6, 16, 18, and 25 November 2020.

5. Research Findings

5.1 Data from the Study into the Physical Environment of the Faculty of Architecture of KMITL

The researcher conducted the preliminary survey and took photographs of the different parts of the physical environment of the Faculty of Architecture of KMITL and subjected floor-plan configuration factors and signage/way-finding aids that influenced way-finding to analysis of the way-finding system as shown in Table 1 below.

Table 1 – Data from Area Survey by Analysis of Floor-Plan Configuration and Signage/Way-Finding Aids

Survey Data	Survey Photographs
1. Floor-Plan Configuration **1.1 Paths** **1) Footpaths and some intersections are small and narrow.** **2) Footpaths have rough surfaces with different levels, which create risk for falls.** **3) Footpaths have obstructions at intervals and trees that block traffic visibility.** **4) Footpaths are unsafe and deserted as there are no users in the evening hours.** **5) It is unknown whether the roads of the Faculty of Architecture of**	 **Figure for Item1 Figure for Item 2** **Figure for Item 3**

KMITL are one-way or two-way roads, as there are no arrows or signage to indicate directions on the roads, thus hindering decision-making. **6) The traffic pathways still do not comply with the principle of universal design.**	**Figure for Item 4 Figure for Item 5** **Figure for Item 6**
1.2 (Edges) **1) Footpaths and roads are clearly designated by lines, but lanes are not marked at entrances and exits for vehicles at the Faculty of Architecture of KMITL.** **2) The edges are old and deteriorated.** **3) Edges are missing or disconnected.** **4) Edges still do not conform to the principle of universal design.**	 **Figure for Item 1 Figure for Item 2** **Figure for Item 3**

Table 1 (Continued)

ข้อมูลจากการสำรวจ	ภาพจากการสำรวจ
1.3 Zones **1) There are no clear zoning practices. Buildings were only constructed in succession without consideration to their functions. Although zones became clearly established after 1 November 2020, it is impossible to identify which zone someone is located in on the pathways.** **2) The zones or unique usage characteristics of each building do**	 **Figure for Item 1**

not appear distinct, or it is unclear which building is used for what purpose. 3) It is impossible to spot facilities ahead from a distance. 4) Although parking zones are more organized, motorcycles are not parked in an orderly fashion. Moreover, there are very few handicap parking spaces.	 **Figure for Item 2** **Figure for Item 3** **Figure for Item 4**
1.4 Nodes 1) The intersections inside the Faculty of Architecture of KMITL is chaotic and hazardous for users. In particular, there are not enough concave mirrors, warning lights, and zebra crossings for disabled persons. 2) The footpath intersections inside the Faculty of Architecture of KMITL lack adequate signage, thus making it inconvenient to access and utilize areas. 3) Intersections still do not conform to the principle of universal design.	 **Figure for Item 1** **Figure for Item 1** **Figure for Item 2** **Figure for Item 2** **Figure for Item 3** **Figure for Item 3**
1.5 Landmarks 1) There are not as many architectural structures as previously believed. In addition, some architectural structures are old and dilapidated. 2) The appearance of the buildings inside the Faculty of Architecture of KMITL is poor and buildings are not easy to access by paths. For example, trees obstruct buildings, so they are	 **Figure for Item 1** **Figure for Item 2** **Figure for Item 3**
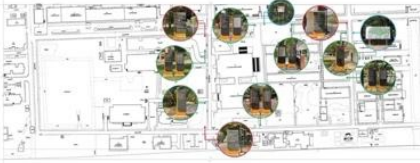
difficult to see from afar. **3) There are clear landmarks such as the "flying saucer" building.**	
2. Signage/Way-Finding Aids such as Directional Signs, Identifying Signs, Informational Signs, and Restrictive or Prohibitive Signs **1) Signs are inadequate for use in every type, especially at interactions.**	 **Figure for Item 1** **Figure for Item 2**

Table 1 (Continued)

ข้อมูลจากการสำรวจ	ภาพจากการสำรวจ
2) The visibility of signs is poor for every type, and signs are inappropriately positioned. **3) Directional signs are deteriorated and were not properly designed. In addition, information shown on the signs are unclear and cannot provide information on where someone is located within the Faculty of Architecture of KMITL. Moreover, they are provided only for vehicle paths and not for footpaths, thus causing users to require a significant of time to develop understanding.** **4) Some directional signs are small and lack proper design. Although after 1 November 2020 signs were**	 **Figure for Item 2 Figure for Item 3** **Figure for Item 3** **Figure for Item 4 Figure for Item 4**

designed, modified, and added for each intersection to appear more attractive and distinctive and to clearly identify locations or facilities, the material (steel) chosen for use in displaying information about the faculty is inadequate, as the texts are too small, and the information is placed too closely together. 5) Identifying signs clearly identify building names, but the signs are small and not distinctive.	**Figure for Item 5**

Source: Researcher (2020).

The above survey data show that the floor plan configuration of the Faculty of Architecture of KMITL consists of a horizontal distribution and buildings and layout, thereby presenting physical environment problems in all 5 categories, namely paths, edges, zones, nodes, and landmarks, which hinder way-finding. In particular, signage/way-finding aids are not available in sufficient numbers to adequately meet usage requirements, and the way-finding system of the Faculty of Architecture of KMITL still do not conform to the principle of universal design.

5.2   Data from the Study of the Physical Environment of the Faculty of Architecture of KMITL by Using Hypothetical Roles

The researcher surveyed the area by utilizing hypothetical roles with the 7 groups of research participants to develop understanding about the problems encountered and to select the most convenient paths for the research participants. Paths were selected based on open-ended interviews of students and internal staff members, which provided the information that the areas inside the Faculty of Architecture of KMITL which are frequently used are the central learning building, the cafeteria, area under the 4-story

building, and the dean's building. Thus, this research selected the main facility as the library located around the 1st floor of the central learning building and for the destinations for each group to be locations to be visited for the first time by the research participants. The paths used differed as appropriate, and the details are shown in

Table 2 as follows:

Table 2 – Data from Area Survey Using Hypothetical Roles was the 7Groups of Research Participants

Group	Type of User	Start Point	Goal	Nearest Distance)Metre(		Walking Time)Min(	
1	Student	Library	Operation Building(Research and Interior Design)	230		3	
2	internal staff member	Library	Operation Building 1 (Communication Design)	265		3	
3	Users of footpath	front of faculty	Library	355		4	
4	Users of vehicle	front of faculty	Library	600)Front of Faculty to Car Park(	150)Car Park to Library(	2.00)Front of Faculty to Car Park(	2.20)Car Park to Library(
5	Users of wheelchair	Building in the middle	Library	220		5.00	

		of water			
6	Blindperson	Building in the middle of water	Library	220	10.00
7	Deafperson	Building in the middle of water	Library	220	2.40

Source: Researcher (2020).

5.3 Data from the Observation of the Behaviors of the Research Participants

The researcher surveyed the area by observing the behaviors of the research participants who used the way-finding system of the Faculty of Architecture of KMITL across all 7 groups at the paths designated for them from the utilization of the hypothetical roles for the research participants. It was found that, 3 wheelchair users out of 5 and all 3 blind or visually-impaired were unable to personally explore the area. Thus, the researcher provided guidance, since the environment of the faculty was not facilitative of way-finding. To summarize the mean travel time in surveying areas through observation of the behaviors of the research participants who used the way-finding system of the Faculty of Architecture of KMITL, 22 out of 28 people visited the areas and searched for their designated buildings without the researcher's guidance, of whom 11 were females, with mean time required at 5.45 minutes, and 11 were males with mean time required at 5.22 minutes. Furthermore, a total of 14 out of 22 research participants asked other students

and staff members for directions; of these participants, 8 were females, while 6 were males. Thus, it was learned that men were more confident about way-finding than women. However, due to the small number of research participants, it was not possible to calculate a precise mean time value. Nevertheless, the results from the observation of the behaviors of the research participants are shown in Table 3 as follows:

Table 3 – Data from the Mean Time of the 6 Research Participants who Visited the Building Search Site

Group	Type of User	Length of Time The Researcher Surveyed	Female		Male	
			Total Number of People	Average Time)Min(	Total Number of People	Average Time)Min(
1	Student	3.00	4	6.16	3	4.28
2	internal staff member	3.00	2	3.13	2	3.35
3	Users of footpath	4.00	1	4.30	2	5.5
4	Users of vehicle	4.20	1	9.00	2	8.8
5	Users of wheelchair	5.00	1	4.00	1	3.30
6	Deafperson	2.40	2	7.10	1	7.00

Source: Researcher (2020).

5.4 Data from Focused-Group Discussions with the Research Participants

After the observation of the behaviors of the research participants in all 7 groups, the researcher turned the floor-plan configuration and signage/way-finding aid factors influencing way-finding into topics for focused-group discussions with the 7 groups

of research participants concerning the problems and solutions for the way-finding system of the Faculty of Architecture of KMITL as shown in Table 4 as follows:

Table 4 – Data from Focused-Group Discussions with the 7 Groups of Research Participants

Group	Problems Encountered	Recommendations from Participants
1-7	1. Floor-plan Configuration 1.1 Paths - Missing footpaths. - Diverse/disconnected footpaths.	- Design footpaths to be more accessible and abundant with signage or colors that are consistent with the characteristics of the Faculty of Architecture by creating long footpaths to reach destinations, painting along footpaths, creating clear footprints/wave/cartoon markings on foot paths for directional guidance or attaching stickers in the shape of footprints along footpaths.
3, 5 and 7	- Footpaths are deserted and not safe in the evenings.	- Install lights along paths similarly to what is done at airports to enhance safety during evening hours.
4	- Absence of road or lane names.	- Install signs bearing the names of roads or lanes at the entrances of each lane.

Group	Problems Encountered	Recommendations from Participants
4	- Unable to identify whether roads are one-way or two-way due to absence of directional signage on roads.	- Vehicle roads should be made to be one-way roads. - Arrows should be affixed to road surfaces to enhance driver understanding and safety.
1-7	- Paths still do not conform to the principle of universal design.	- Systematically and clearly design traffic paths by dividing paths into primary and secondary paths.

		- Construct correct braille blocks for blind persons. Moreover, blind persons can identify locations based on contact with rock surfaces and counting speedbumps/bridges. - Design patterns and paint coatings to be suitable for persons with visual impairments.
1, 2, 3, 5, 6 and 7	- Footpaths have rough and uneven surfaces.	- Replace footpath materials to make them uniform and connect paths to each other. Concrete materials are superior to metals, due to the greater slipperiness of metals.
3, 5, 7	- Some footpaths and intersections are small and narrow.	- Broaden footpaths (reduce road width and expand footpaths).
1, 2, 5and 6	- Footpaths are hot and not covered by awnings. - Footpaths have obstructions such as trees and electrical posts.	- Construct roofs to permit visibility of footpaths from afar and to provide protection from the sun and rain.
5	- Footpaths are not conducive to access and use of various facilities.	- Construct paths, slopes, and parking paths for wheelchair users. Additionally, existing sloops for wheelchair users that should be renovated include the integrated building, the building surrounded by water, and the cafeteria.
1, 2, 3, 4 and 7	**1.2 Edges** - Clearly separate footpaths and roads with edges, although the research participants were uninterested in this. - Edges are missing and deteriorated.	- Separate footpaths and vehicle roads by using paints that provide greater visibility (white-red/yellow) or plant trees to separate each area to ensure safety. - Design edges to be consistent with safety practices by increasing the height of footpath edges to allow blind persons

Group	Problems Encountered	Recommendations from Participants
		to touch them by hand, increasing clear fencing in hazardous areas (around the fish pond in front of the dean's building) and installing posts to prevent motorcycles from entering footpaths (open ground in front of the central learning building).
5,6 and 7	- Edges still do not conform to the principle of universal design.	- Construct railings for disabled and elderly persons. - Design railings for blind persons by providing directions by braille on the railings.
Group	**Problems Encountered**	**Recommendations from Participants**
1-7	**1.3 Zones** - The zones or usage characteristics of each building are non-distinct.	- Construct signs or symbols that can be understood by outsiders by paining buildings to match the map signs or create directional signs that divide zones from north to south or left to right wings with 2 zones, namely, Zone A and Zone B.
4, 5 and 7	- Facilities ahead cannot be spotted from a distance.	- Design large zone signage to permit visibility from afar.
5	- There are few parking zones for disabled persons.	- Add parking zones for wheelchair users.
1, 2, 3, 4, 5 and 7	- There are no clear zoning practices, as new buildings are constructed in succession without consideration to usage, thus a long time is required to search for paths.	- Divide zones by using various symbols or by dividing buildings by color by cultivating a variety of colorful flowers or providing bright and colorful signage as appropriate. - Create boundaries/atmospheres for zones such as by installing ATMs at the commercial area. - Design the environment in a manner that allows blind persons to understand and be communicated with such as by

		installing speedbumps on the ground and bridges crossing over zones.
4, 5and 6	**1.4 Nodes** - Roads are not safe for pedestrians to cross. - Intersections are busy and dangerous for users.	- Warning signs should be clearly added to danger areas such as unfenced fishponds. Furthermore, intersections should have mirrors or light/audio warning signals.
2	- No landmarks are found at intersections that can be used in communications with others.	- Nodes or intersections should be connected to landmarks. - Intersections should have landmarks designed as artwork that can be used as references or boost the identity of the Faculty of Architecture, KMITL. - Intersections should have clearly identifying symbols, colors or objects.
1, 2and 4	- Insufficient resting places	- Add seats at intersections to let people know these are meeting places.
5, 6 and 7	- Intersections do not have universal design	- Directional signs or posts should be designed to have directional arrow buttons to provide audio directions for the blind. - Braille blocks should be built at crosswalks.
1, 2, 4, 5, 6 and 7	**1.5 Landmarks** - No landmarks are found at major sites to identify intersections. - Landmark access paths are difficult. - Buildings have poor visibility.	- Select landmark points that are clearly visible. - Design buildings or existing sculptures to be more attractive by using different colors and materials.

Group	Problems Encountered	Recommendations from Participants
3, 4,	- Landmarks are unknown.	- Select landmark points that are clearly

5, 6 and 7		visible.
1, 2 ,3 and 4	- Fewer architectural works were found than expected.	- Landmark designs are an artistic work that can be used as a reference or to promote identity of the Faculty of Architecture, KMITL, by creating large colorful sculptures of animals or the faculty symbol (beehive).
7	- Landmark areas are dangerous for the blind because most of the landmarks are at the feet of stairs, bridges and fountains.	- Landmark design should give consideration to safety because this area supports every type of person. In particular, the area at the feet of stairs, bridges and fountains may be dangerous for the blind or people walking with a cane may fall from bridges.
1-6	2. Signage/Way-finding Aids Such as Directional Signs, Identifying Signs, Informative Signs and Restrictive or Prohibitive Signs - Every type of sign is sufficient for use. - Visibility of every sign type is poor and signs are placed inappropriate positions with difficult access in some cases. - Directional signs lack clear design and information with only vehicle routes. No information on footpaths can be found. - Some directional signs are small and deficient in design. Directional sign materials are	- The number of signs should be increased to be sufficient for use, particularly at intersections. - Signs should be clearly placed at paths, zones or important points with visual access and visibility on main paths. - Directional and information signs should be enlarged to stand out more. - Signs should be designed to be attractive, have the same identity and simple to understand. For example, vehicle directional signs should have clear directions. Sign colors should be painted to be connected to buildings, symbol designs and building colors. - Directional signs should be placed to show a layout of the Faculty of Architecture, KMITL, at the first point of entry to the Faculty, paths, zones and intersections.

	inappropriate and have small letters with too much information packed together. - Information signs are small and do not stand out.	- Information on directional signs should be more detailed and clear. More information on footpaths, building characteristics and current location should be provided, particularly at intersections. - Technology should be used to design touch screen systems for directional signs. - Building names should be designated to create a universal signage system such as systems for Buildings A, B and C or Buildings 1, 2 and 3.
กลุ่มที่ **1-7**	**Additional Recommendations Concerning Universal Design** - Signs do not cover universal design. - Signs are important for the deaf, particularly at intersections.	- Signs should be designed with visual access for wheelchair users. - Warning lights should be used for the deaf rather than audio signals.

Group	Problems Encountered	Recommendations from Participants
	- The blind and visually-impaired do not use signage systems.	- Raised maps and Braille characters should be added to directional signs. - Directional signs or posts should be designed to have buttons with audio directions for the blind. - Information on signs should be in two languages consisting of the English and Thai languages. - A universal way-finding system application for the Faculty of Architecture, KMITL, should be designed such as the CREW App for the blind. - Brochures should be designed and

		handed out at the front entrance. Brochures should contain information about paths in the Faculty of Architecture, KMITL. - Users should participate in every step of design.

Source: Researcher (2020).

6. Discussion of the Findings, Conclusion and Recommendations

6.1 Discussion of the Findings

Based on the study of the way-finding system of the Faculty of Architecture, KMITL, and the concept of universal design, the researcher discusses the findings based on research objectives on the following three topics:

6.1.1 Behaviors and Needs of Users of the Way-finding System in the Faculty of Architecture, KMITL   According to field observations of the participants' behaviors when using the way-finding system of the Faculty of Architecture, KMITL, to search for designated buildings, women spend more time looking for paths than men on average (Table 4.7) and women are more likely to ask for directions from students and internal staff than men. Thus, men are more confident about finding paths than women. This is consistent with the theory of Liz Kelly (2012, Paragraph 4), which states that women are more anxious about finding paths than men because the gender difference affects confidence when walking in a new environment. Furthermore, three out of five wheelchair users and all of the blind and visually-impaired were found to be unable to enter the survey area in person and had to be guided by the researcher, because the environment in the Faculty does not facilitate way-finding and does not have a universal design. The

behaviors and needs of users of the way-finding system in the Faculty of Architecture, KMITL are as follows:

- In the area of floor-plan configurations, the participants in five groups consisting of students, internal staff, outside pedestrians, outside drivers and the deaf were found to have similar problems in using the area. However, two other groups of participants consisting of wheelchair users and the blind and visually-impaired stated that building access should be improved and amenities for disabled persons should be used rather than developing way-finding aids because disabled persons cannot access and use an area if way-finding aids are good and environments do not facilitate access.

- Signage/way-finding aids were a factor with significant mentions of problems from six groups of participants consisting of students, internal staff, outside pedestrians, outside drivers, wheelchair users and the deaf, in particular, because signage is the core of path recognition. Signage should be placed at intersections. The deaf use sign language to communicate, causing barriers in way-finding. This differs from the blind and visually-impaired, who do not use signage, but use other way-finding aids such as Braille blocks, curb stones, speed bumps or bridges.

6.1.2 Guidelines for Designing a Way-finding System Consistent with the Universal Design Principle

According to the study, the 7 way-finding system design principles of Jarunya Pahontep (2017, Page 81-82) on "Key Considerations About Way-finding Systems" were consistent with the 8 universal design principles of Steinfeld and Maisel (2012, Paragraph 2) according to the following details in Table 5:

Table 5 – Data from Guidelines for Designing a Way-finding System Consistent with the Universal Design Principle

Way-finding)Phaholthep, 2017(	Universal Design)Steinfeld and Maisel, 2012(							
	BodyFit	Comfort	Awareness	Understanding	Wellness	Social Integration	Personalization	Cultural Appropriateness
1.Visual Navigation	☐	☐		☐				
2. Create Different Area from Architecture and Interior Design Elements	☐	☐	☐		☐		☐	
3. Guide signs should be installed in the area where the user decides	☐	☐	☐					

4. Choose a visual mark that is appropriate for a large group of people		☐	☐				☐	
5. Graphics must be able to communicate directly at the desired point and visible at a reasonable distance		☐	☐				☐	
6. Graphic design must be designed and installed		☐	☐		☐			

consiste ntly along the way							
7. Avoid using too many vision systems	☐			☐			

Source: Researcher (2021).

6.1.3 Guidelines on Designing a Way-finding System in a Case Study of the Faculty of Architecture, KMITL

According to data from preliminary area surveys, the Faculty of Architecture, KMITL, has dispersed buildings and horizontal building floor plans. Furthermore, in focus groups with the participants regarding problems and problem-solving guidelines for the way-finding system in the Faculty of Architecture, KMITL, floor-plan configurations and signage/way-finding aids were analyzed as physical environments with effects on way-finding in Weisman's theory (Jarunya Pahontep, 2017, Page 81) (Table 4). By using the 7 way-finding system designing principles of Jarunya Pahontep (2017, Page 81-82) to accompany consideration of recommendations from the participants and the 8 universal design concepts of Steinfeld and Maisel (2012, Paragraph 2) to solve problems of way-finding systems in order to meet the behaviors and needs of every user group, the researcher was able to summarize details of way-finding system designing guidelines in a case study of the Faculty of Architecture, KMITL, in Table 6 as follows:

Table 6 – Data from Guidelines on Designing a Way-finding System in a Case Study

of the Faculty of Architecture, KMITL

Solution	Design Principles of 7 Way-finding							Universal Design
	1	2	3	4	5	6	7	
1. Floor Plan Configuration **1.1 Paths** **- Path materials should be changed to be smooth and not slippery or rough.**	☐	☐						**Comfort, Awareness and Wellness**
- Footpaths should be modified to cover universal design by modifying and building slopes for wheelchair users along with creating Braille block paths for the blind.	☐	☐						**Body Fit, Comfort, Awareness and Wellness**
- Footpaths should be created through education buildings to connect with the Prof. PrasomRangsiroj Auditorium.		☐						**Body Fit, Comfort, Awareness and Wellness**
- Footpaths at sidewalks in front of the Faculty of Architecture, KMITL, should be modified and roofs should be built.	☐	☐						**Body Fit, Comfort, Awareness and Wellness**
- Lights should be installed at footpaths in Zones B and C.	☐							**Comfort,Awareness and Wellness**
- Directional symbols should be designed on footpaths in the shape of symbols or colors consistent with the Faculty of Architecture, KMITL.	☐		☐	☐	☐	☐		**Comfort, Awareness, Understandingand Personalization**

Table 6 (Continued)

Solution	Design Principles of 7 Way-finding							Universal Design
	1	2	3	4	5	6	7	
- Roads should be divided and directional arrows should be painted on road surfaces/vehicle traffic routes.	☐		☐	☐	☐	☐		Body Fit, Comfort, Awareness, Understanding and Wellness
1.2 Edges - Curb stones should be used as the main directional symbol and Braille blocks should be used as the secondary directional symbol for the blind and the visually-impaired.	☐	☐						Body Fit, Comfort, Awarenessand Wellness
- More stainless steel posts for motorcycles should be installed at missing points.	☐	☐						Comfort, Awareness and Wellness
- Guardrails should be built in dangerous areas using signage models consistent with the Faculty of Architecture, KMITL.	☐	☐						Body Fit, Comfort, Awareness, Wellness and Personalization,
- Braille characters should be used to identify routes on rails before reaching danger points.	☐	☐	☐		☐			Comfort, Awareness, Understanding and Wellness
- Sidewalks should be clearly painted and sidewalk materials should be changed to be different from roads.	☐	☐						Awareness, Understanding and Wellness
1.3 Zones - Zones in the Faculty of Architecture, KMITL, should be divided by painting and designing wall graphics in each	☐	☐			☐			Awareness, Understanding and Personalization

Solution	1	2	3	4	5	6	7	Universal Design
zone to be consistent with the Faculty of Architecture, KMITL.								
1.4 Nodes - Tables-chairs to be added at intersections and tables-chairs should have modular design (footpaths).	☐	☐						Body Fit, Comfort, Awareness, Social Integration and Cultural Appropriateness
- Warning signs should be added clearly in danger areas (vehicle traffic routes).(	☐		☐	☐				Comfort, Awareness, Understanding and Wellness
1.5 Landmarks - Landmarks should be installed in Zones A-D at 1-2 points per zone.	☐	☐	☐		☐			Comfort and Awareness
- Buildings or existing furniture should be painted or decorated to be consistent with the Faculty of Architecture, KMITL.	☐	☐			☐			Awareness and Personalization

Table 6 (Continued)

Solution	Design Principles of 7 Way-finding							Universal Design
	1	2	3	4	5	6	7	
- Sculptures should be created to identify zones and give character to the Faculty and existing sculptures created by fine arts students should be placed as landmarks.	☐	☐			☐			Awareness, Personalization and Cultural Appropriateness
2. Signage/Way-finding Aids - Signage should have the same identity and should be designed to be consistent with the institution overall	☐			☐	☐			Awareness and Personalization

and applicable to every faculty.								
- Every sign type should have visual access and size accessible to every type of user.	☐			☐	☐			**Body Fit, Comfort and Awareness**
- Every sign type should be increased to be sufficient for use.	☐		☐		☐	☐		**Comfort, Awareness and Wellness**
- Every sign type should be positioned to be clearly visible on main paths.	☐		☐		☐	☐		**Body Fit, Comfort, Awareness and Wellness**
- Signage materials should not be reflective metal materials.		☐		☐				**Comfort**
- Signage should provide clear directional information.	☐				☐		☐	**Comfort, Awareness and Understanding**
- Letters on signs should be complete characters and contrast between color pairs of letters and base colors should be effective.				☐				**Comfort and Awareness**
- The first information shown on way-find signs should be information showing where the reader is in the Faculty.					☐		☐	**Comfort, Awareness and Understanding**
- Information on way-finding signs shown on charts of the Faculty of Architecture, KMITL, should have information identifying footpaths, building characteristics and current location.					☐		☐	**Comfort, Awareness and Understanding**
- Buttons with audio directional information should be designed for blind persons in addition to raised maps, Braille characters. Furthermore, QR codes should be added and linked					☐	☐		**Comfort, Awareness and Understanding**

to maps on the website of the Faculty of Architecture, KMITL.								

Source: Researcher (2021).

And the researcher has seven recommendations outside designing principles and guidelines for the way-finding system consistent with the principle of universal design with consideration given to people of every group as shown in the details in Table 7 as follows:

Table 7 – Data from the Recommendations Outside Designing Principles

Solution	Universal Design
1. Footpaths in the Faculty of Architecture, KMITL, should be modified to avoid routes blocked by trees.	Body Fit, Comfort and Wellness
2. Vehicle traffic routes in front of Studio 1 and the cafeteria should be converted into footpaths.	Body Fit, Comfort and Wellness
3. Zones should be divided by vehicle traffic roiutes by adding Zone D in the lower area of the chart.	Comfort, Awareness and Understanding
4. Building names in each zone should be changed to be universal.	Comfort, Awareness, Understanding and Personalization

Source: Researcher (2021).

6.2 Recommendations for Implementation of the Findings

This study was aimed at investigating modification of the way-finding system of the Faculty of Architecture, KMITL, based on the concept of universal design to support diverse users including students, internal staff, outside pedestrians, outside drivers and three types of disabled persons consisting of wheelchair users, blind or visually impaired and persons with hearing impairments. The findings were obtained from real users. Guidelines from designing the way-finding system in a case study of the Faculty of

Architecture, KMITL (Item 6.1.3) will provide baseline data that can be applied as guidelines in designing way-finding systems in universities or education facilities with similar contexts to enable equal user access to buildings.

6.3 Recommendations for Future Studies

A part from considering the abovementioned models, this study explored only floor-plan configurations and signage/way-finding aids with effects on way-finding. According to the study, visual access and space differentiation should be considered in designing the way-finding system. Any person who will conduct research concerning universal design should include disabled persons because this will obtain data from the group with needs, and cause amenities to be found as necessary for disabled persons.

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Letter from the Chairman's Desk
By Sunil Bhatia PhD

One day, I presented a duly signed cheque to the cashier of the bank but he refused to give me cash. I asked him 'What is the reason? Why are you not giving me cash against my cheque.' He informed me 'signature is not tallying with our database stored signature. If it would have 60% matched, I would have cleared your amount.' I further added 'I am the oldest customer of your branch and everybody who is in this branch knows me.' He clarified his helplessness 'I am not denying but take the permission from the branch manager. I cannot take risk of the delivery of cash to you. They will deduct later from my salary.' I understood his problem and thought to take a chance with the branch manager. He understood my genuine problem of age and on the humanitarian ground, he passed my cheque and delivered the cash.

While coming out of the building of the bank 'Man is known by his action and repetitive action cast his personality and mind gets tuned for performing such activity repetitively in replica and that is our signature and outer world has associated in establishing with the physical identity of the man.

I started brooding over that incident and realized that cashier was with a very low intelligence quotient. He is not aware that a signature can be anything that may be handwriting, graphic, or

music. Humans have the unique quality of imitating.When we write the same word with perfection in reproducing the same every time it is called our signature. It may be the name of the person because it is easy to remember or any word, an artist paints the same paintings with perfection it turned out his signature and a signature tune is associated with specific programs of the TV.

The next level of thinking pushed me that 'design' is also a kind of signature. It is the word of 'De' and sign.' De'- means the individual-specific human perspective and sign means a way of thinking and translating into actions. Our every issue has a Guest Editor's specific signature and it is a landmark of our monthly publications. It is only a ceremonial that we are publishing the 200th special issue and it is our great landmark. Our signature of publishing monthly DESIGN FOR ALL without missing any monthly issue has come to existence because of so many Guest Editor individualistic signatures expressed in their monthly issue.

 I was unknown to the design community and was unaware of inviting the authors for contribution. Some realized his call has some kind of genuine appeal. In the initial days of the publications majority appreciated and a fringe group of minority abused me like anything. This modern success was possible because contributors trusted the essence of simplicity, honesty, and sincerity in words of my email appeal for a request for the contribution of articles. They responded with an open heart and the result is a celebration of the mark of our 200th publication

 We are no exception and faced various challenges what a publisher faces but some divine power always came for rescue from the crisis Our moderate successes story has come true because of a free platform where like-minded assembled and created a new kind of

journey. We just act like a facilitator who does not interfere in the flow of thought that is emerging for the welfare of society. Let society should decide whether this idea will help in making a better world or not. We did not stop by not providing a platform.

Entire multimedia is nothing but the combination of audio, graphics, and text. It is trying to imitate the way we are conversing with one another. The telecommunication industry is trying to achieve the same when people converse it should be the same with various devices. Every person has their own signature of communication and telephone conversations missed the body gesture, so introduce the video. They are working hard but some achievement has come and it is like some imposter is forging the signature for fraud. It is my experience while conversing that some flash strikes to mind and how it is coming that I realized after my action of thought. I questioned how that idea has come to me for that I never thought of before. That element of creativity or unknown ways surfaced that completely suit that environment is always missing the conversation through devices. Even some commercial tycoons are claiming that language will be redundant in the coming days. They are trying to make habitual through creating such an environment where minds will adapt because they believe language has come to our minds through environment compulsion and over the centuries humans evolved with language. Modern man cannot think anything without language and it has become an integral part of human life. They have a hypothesis that neurons in the brain communicate without language and never fail. I believe language has come into our life because of understanding of patterns and that pattern is visible in our communication. We have patterns for numerals, text, and much later in graphics. It is human's weakness to reproducing the same

what the brain has understood. That's why the mother continuously repeats the same pattern through her voice that forces the child to produce through resonance through the vocal cord what the brain has received. A deaf child is dumb also.

Plants also communicate with each other with signals and some experts are saying their underground roots are the medium for pattern transfer and do not have language. Why not humans should behave as our designed robots who work with signals for assigned jobs? It is dangerous and disturbing idea of translating into reality and designers are not making use of their consciousness for what is good for the community in the future and creativity will suffer and society will turn slaves into the hands of a few. Individualistic living for own luxurious life will make the community suffer.

A small error of not heeding the advice of the scientific community for is prepared for the next level of virus attack after meeting challenges of the bird flu virus has made the world suffer a lot in social, economic, psychological. A new society has emerged where the focus is on isolation and discouraging any social gatherings. People are a little irritated working in isolation and a clear reflection has come to our publication. People appear normal but minor changes have affected individual personalities.

I am grateful to *Assistant Professor Dr Antika Sawadsri Chairperson, Council of Deans for Architecture School of Thailand –CDAST and Dean for School of Architecture, Art, and Design, KMITL* for accepting our invitation for celebration for our 200th special issue.

My heartiest congratulations to our esteemed readers, contributors and Guest Editor for showering love and affections for the monthly international Journal of Design for All.

Enjoy reading, be happy, and work for the betterment of society.

Lambert Academic publication for celebration of 150th special issue by publishing a book by compiling editorials "Design For All, Drivers of Design" translated in eight different languages from ENGLISH into French, German, Italian, Russian, Dutch and Portuguese. Kindly click the following link for book. "Morebooks", one of the largest online bookstores. Here's the link to it:

https://www.morebooks.de/store/gb/book/design-for-all/isbn/978-613-9-83306-1

With Regards
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Forthcoming Issues

September 2021 Vol-16 No-9

Prof. (Dr.) Mandeep Singh is presently Head Industrial Design (second tenure), former Dean (2015-17) and has held position of Head Architecture (2017-19, 2014-15) Head Urban Design (2011-14) Industrial Design (2005-10). He is full time faculty in SPA Delhi since 1986. His PhD topic Seismic Conscious Architecture resulted in Evaluation Tools for Architects, which an architect can use to evaluate built form in absence of an engineer with seismic considerations.

In addition to teaching since last 34 years and guiding many design and research projects, he has designed many buildings, Urban Design and Industrial Design projects. He won many design awards notable being part of team member which won First Prize of Urban Design of GGSIPU University, first prize of HUDCO competition of low cost housing etc.

During his tenure in Industrial Design program as Head (2005-11), he has worked with students on many design assignments especially on issues related to common man notable areas being Design for Elderly, Design for Physically Challenged, Design for Safety and Security, Energy Efficient Products etc.

He was also been invited/organized following conf./workshops, notable being Indian Design Council program at Tokyo, Japan, Planned and Exhibited students work of SPA in Venice Biennale, organized many other exhibitions of students of B.Arch and M.Arch (I.D.) in SPA.

He has been consultant, advisor and peer reviewer to many public and private sector, notable being World Bank, NDMA (on Architecture curriculum), CPWD (Rajghat, C Hexagon), Shri Mata Vaishno Devi Shrine Board, Reliance Infrastructure, advisor to Ministry of Defence for National War Memorial Competition, Selection and suggestion committee of Republic Day Tableaux (2019-21),Competition Commission of India, Basmati Export Development Foundation, Golchha Organization (Nepal) are among few notable ones. He was also associated by Bureau of Police Research and Development (BPRD) for creating identity of Police Station and conducting architectural competition.

Due to his vast experience of designing many projects, recently he has also associated with clients in selection of architects and advisor

for various projects which include hotel, hospital and industrial projects. He has also been invited as jury member in selection of architects. Ranchi High Court is one such example. He is also associated with other academic institutes as member board of studies, faculty selection, jury member etc.

He has also written many papers for National and International Conferences, notable being Multidisciplinary approach to earthquake engineering in 7NCEE at Boston and Public Transportation for Elderly and Disabled - Transed 2007 at Montreal, and Habitat Earthquake and Reconstruction at World Congress on Natural Disaster Mitigation, in addition to co-author of papers with Phd scholars (list is enclosed). In addition to Six PhD scholars he is guiding, four of the scholars guided by him have been awarded Phd.

Major Projects:

Prof. Mandeep Singh has been involved in institutional consultancy work of SPA as project in charge. The important projects include, Lawn 5 & 6 of C-Hexagon, Rajghat development, Urban Design proposal of Vaishno Devi shrine, Design of DurgaBhawan, Yatri management at Bhawan and Bhairon proposal at Vaishno Devi, Urban Design proposal for Nursing college for shrine board, institutional building for National Institute of Open Schooling (NIOS) headquarter building in Noida, factory for Machino Polymers and interior for SFAC and National Horticulture Board.

October 2021 Vol-16 No-10

Jane Bringolf is Chair of Centre for Universal Design Australia (CUDA), a registered charity seeking a more inclusive world. She wants to see a world where designers and policy makers automatically consider the diversity of the population and create inclusive built environments, products, services, and communications. Her passion for the topic is based on forty years working in the community sector. She writes regularly on universal design and inclusive practices and curates the weekly newsletter for CUDA. Jane also contributes to various advisory panels and education sessions on universal design. Jane holds a BSSc, MBA and PhD and is also a Churchill Fellow.

Africa Origin Designer year 2021
December 2021 Vol-16 No-12

Ricardo Gomes, IDSA

Professor Ricardo Gomes has been a faculty member in the School of Design at San Francisco State University for over 29 years. He was the Chair of the DAI Department from 2002-2012.

Prof. Gomes coordinates the Design Center for Global Needs and the Shapira Design Archive Project in the School of Design (DES).

This non-profit international research and development center is dedicated to promoting responsive design thinking methods and solutions to local, regional and global issues such as: inclusive/universal design, health care, the aging, community development, social innovation and sustainability of the built environment.

Prof. Gomes was awarded the 2020 Faculty Award for Excellence in Service Learning, from the Institute for Civic and Community Engagement, SFSU; and the IDSA 2020 Education Award presented in recognition of significant, distinguished, and long-term contributions of faculty to the field of industrial design academia

Prof. Gomes is on the Board of Directors of the Institute for Human Centered Design in Boston. He is also a member of the Industrial Designers Society of America; and Trustee of the Beta Beta Chapter, Epsilon Pi Tau International Honor Society for Technology in the

School of Design, SFSU. Prof. Gomes was a Fulbright Research Scholar from 1984-1986 at the University of Nairobi, Kenya. He conducted post-graduate research and product development of a container system for mobile health care delivery in East Africa from 1982 – 1987. In 1986, he was Program Coordinator of Design Projects in Developing Countries, Les Ateliers, Ecole nationale supérieure de création industrielle (ENSCI) in Paris, France where he directed student liaison projects with European international development agencies.

For over 30 years, Prof. Gomes has conducted keynote speeches, presentations, symposiums and workshops at universities and international conferences throughout Africa, Asia, Europe, Latin America and the U.S. In addition, he has served on juries related to Inclusive Design; Universal Design; Design for Social Responsibility; Sustainability; and Equity for BIPoC in the Built Environment.

Prof. Gomes received his MFA in Industrial Design for Low-Income Economies from the University of California, Los Angeles (Design of a Container System for Mobile Health Care Delivery in East Africa). He received an M.A. in Architectural Building Technology from School of Architecture and Urban Planning at UCLA (Analysis of Alternative Building Materials and Construction Systems for Small-scale Industries in the Cape Verde Islands, West Africa); and a BFA in Industrial Design from Massachusetts College of Art (Design of an Adaptive Structural Environment for Severely Disabled and Developmentally Challenged Children).

New Books

it is available on **www.morebooks.de** one of the largest online bookstores. Here's the link to it:
https://www.morebooks.de/store/gb/book/design-for-all/isbn/978-613-9-83306-1

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Rosemarie Rossetti, Ph.D., teamed with her husband Mark Leder in creating this unique Toolkit. They bring ten years of research, design and building expertise by serving as the general contractors for their home, the Universal Design Living Laboratory– which is the highest rated universal design home in North America.

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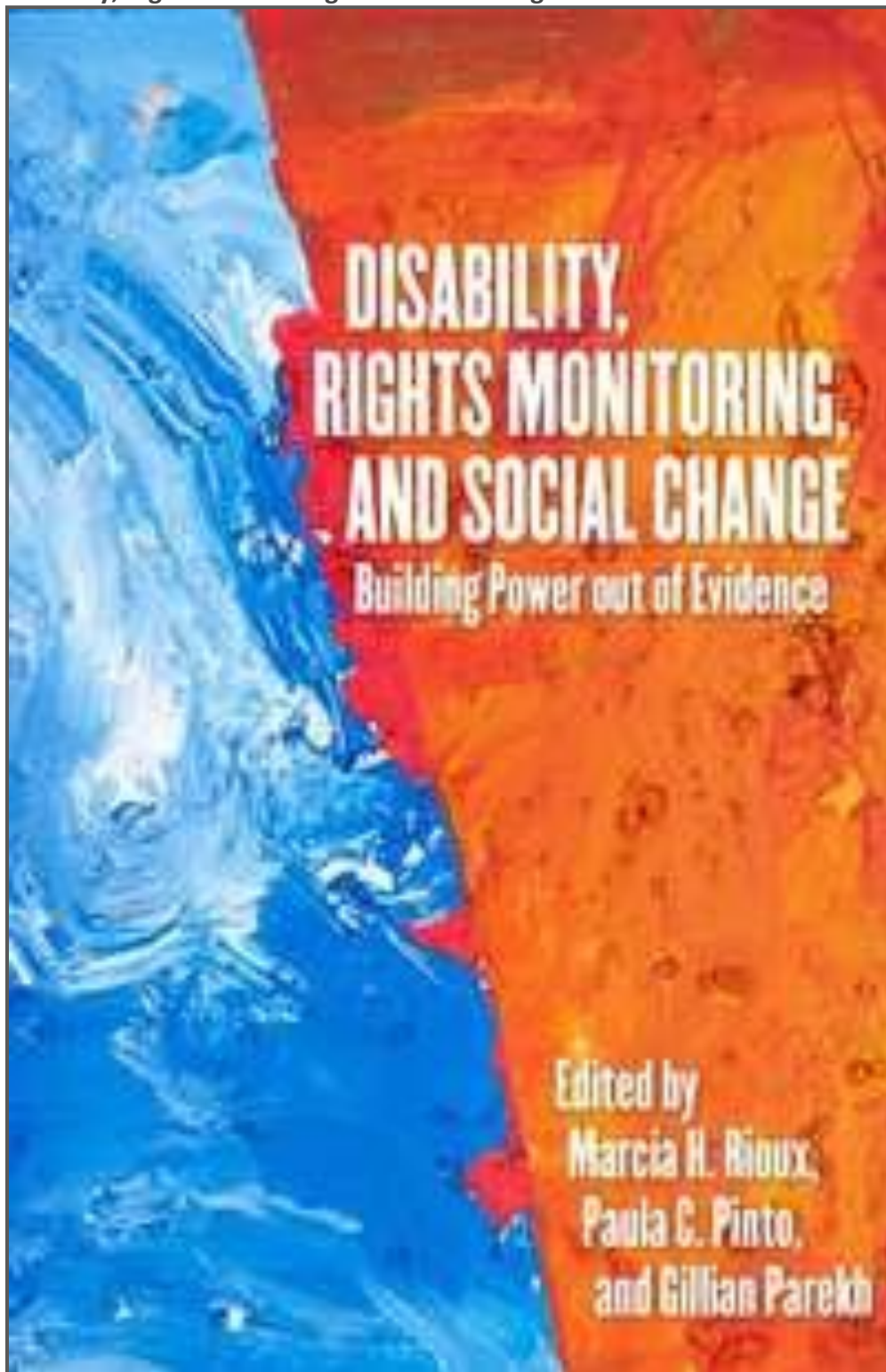
New Update: ELIVIO BONOLLO (2015/16) PRODUCT DESIGN: A COURSE IN FIRST PRINCIPLES
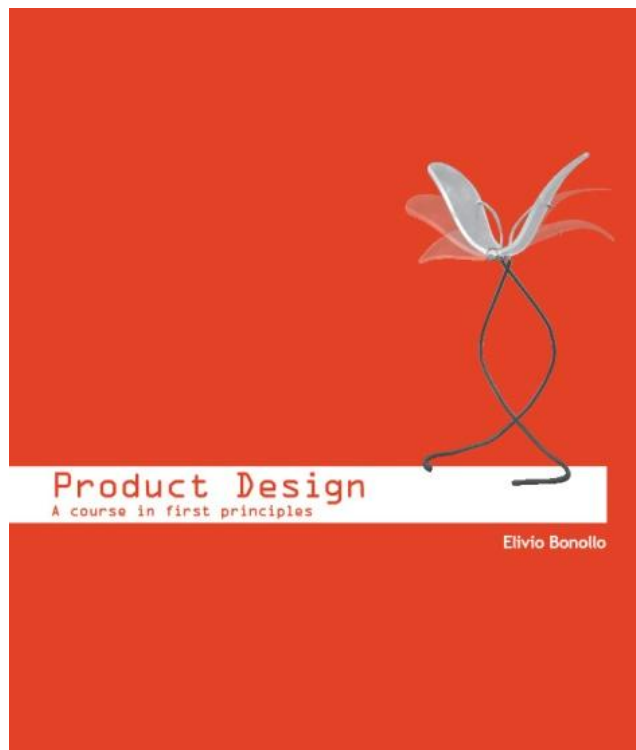
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READING HINTS: ePub files can be read with the iBook app on Apple MacBook/iPad devices; ePub files can also be read on Desktops PCs, Laptops and Surface devices using readers such as the Microsoft *freda*ePub reader. The Kindle (mobi file) reader isflexible and suitable for reading the eBook on PCs; Kobo readers can also be used to read ePub files on MacBook and iPad. All formats are very interactive with very good navigation.

DEBRA RUH

INCLUSION

BRANDING

Revealing Secrets to
Maximize ROI
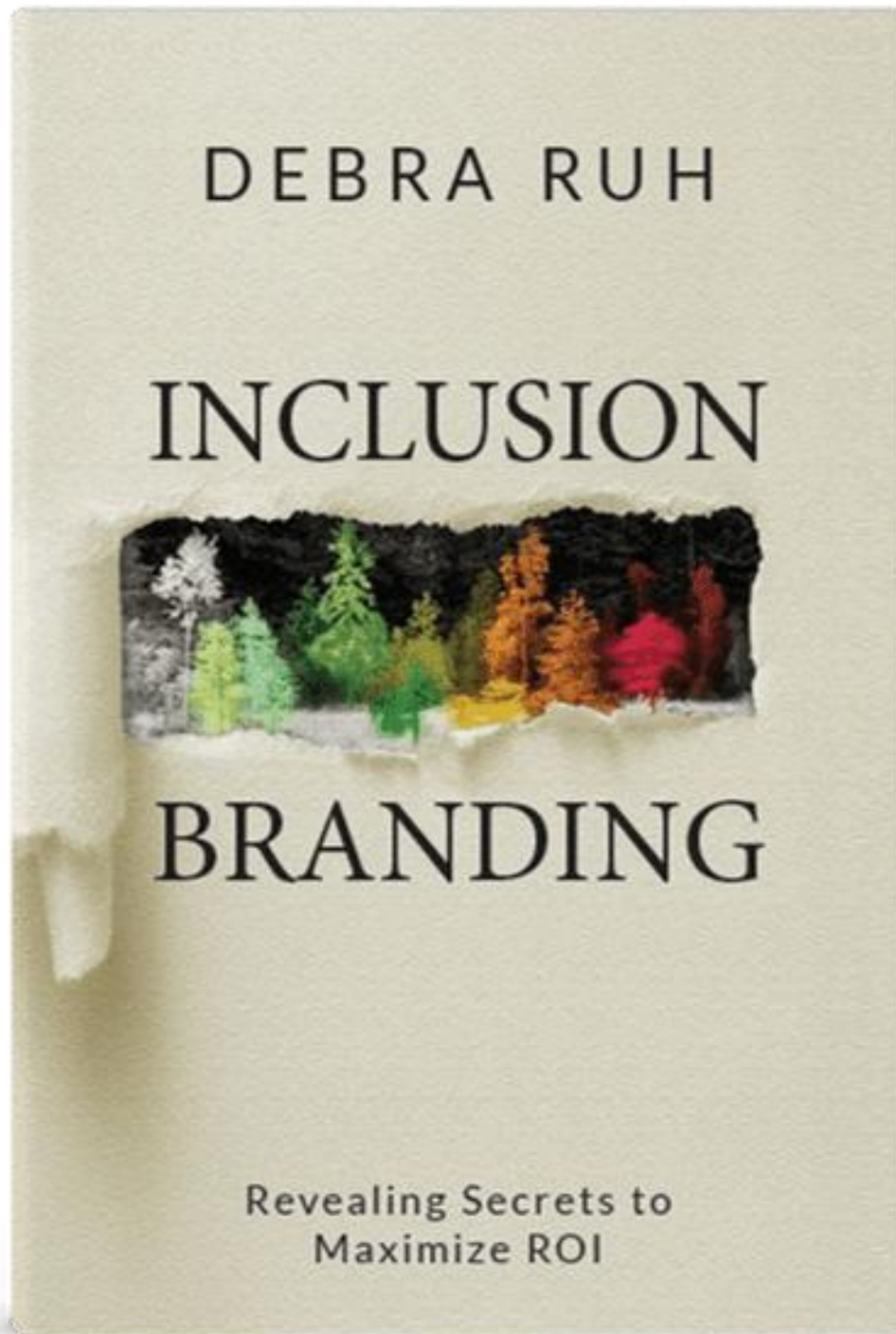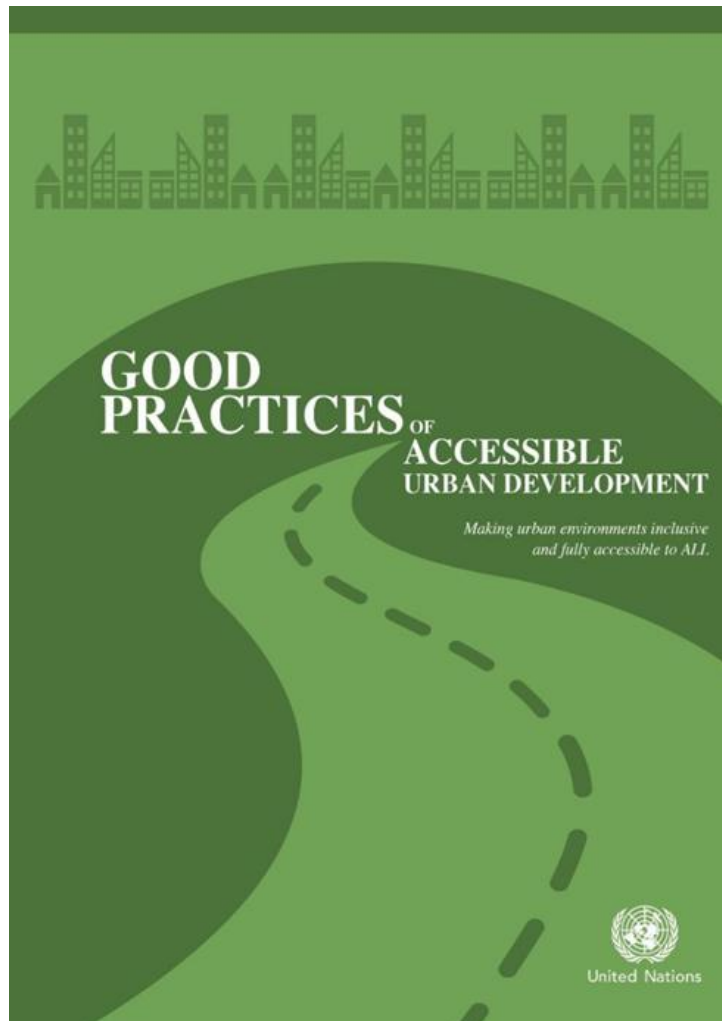
In light of the forthcoming United Nations Conference on Housing and Sustainable Urban Development (HABITAT III) and the imminent launch of the New Urban Agenda, DESA in collaboration with the Essl Foundation (Zero Project) and others have prepared a new publication entitled: "Good practices of accessible urban development".

The publication provides case studies of innovative practices and policies in housing and built environments, as well as transportation, public spaces and public services, including information and communication technology (ICT) based services.

The publication concludes with strategies and innovations for promoting accessible urban development.

The advance unedited text is available at:http://www.un.org/disabilities/documents/desa/good_practices _urban_dev.pdf
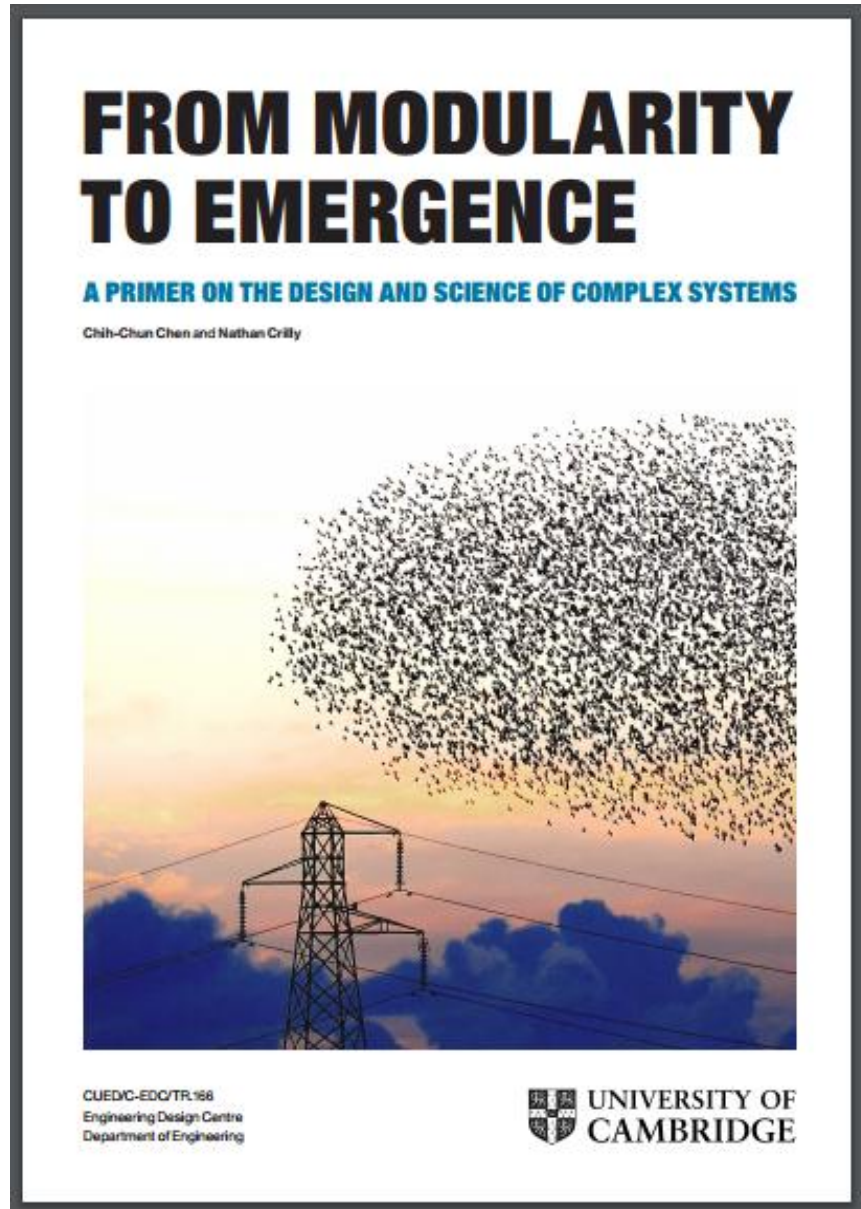
Dr Chih-Chun Chen and Dr Nathan Crilly of the Cambridge University Engineering Design Centre Design Practice Group have released a free, downloadable book, _A Primer on the Design and Science of Complex Systems_.
This project is funded by the UK Engineering and Physical Sciences Research Council (EP/K008196/1).
The book is available at URL: http://complexityprimer.eng.cam.ac.uk

Changing Paradigms: Designing for a Sustainable Future

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HOW TO DO ECODESIGN

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INCLUDING TOOLBOX

ISSUED BY THE
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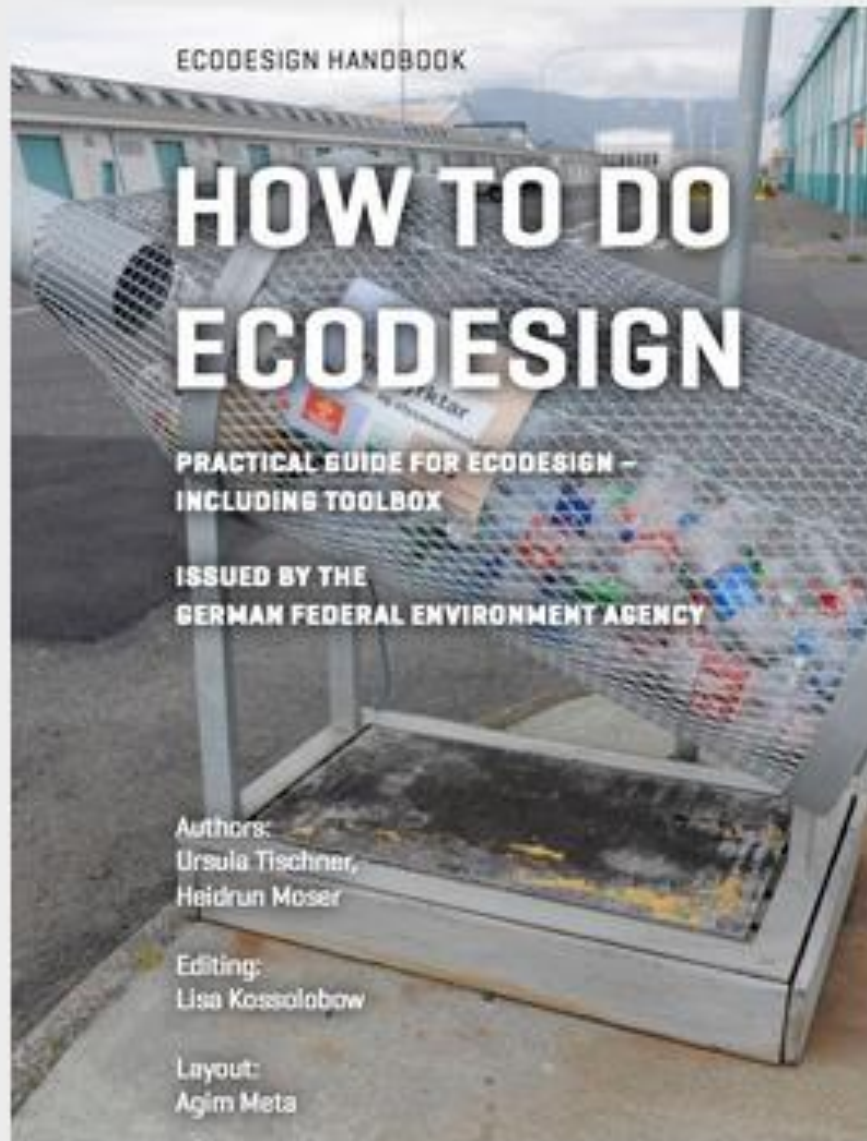
Practical Guide for Ecodesign – Including a
Toolbox
Author: Ursula Tischner

TRANSFORMATIONS
7 Roles to Drive
Change by Design

Joyce Yee / Emma Jefferies / Kamil Michlewski

Arnar Árnason and Sigurjón Baldur Hafsteinsson

DEATH AND GOVERNMENTALITY

Neo-liberalism, grief and the nation form

Universal Design: The HUMBLES Method for User-Centred Business
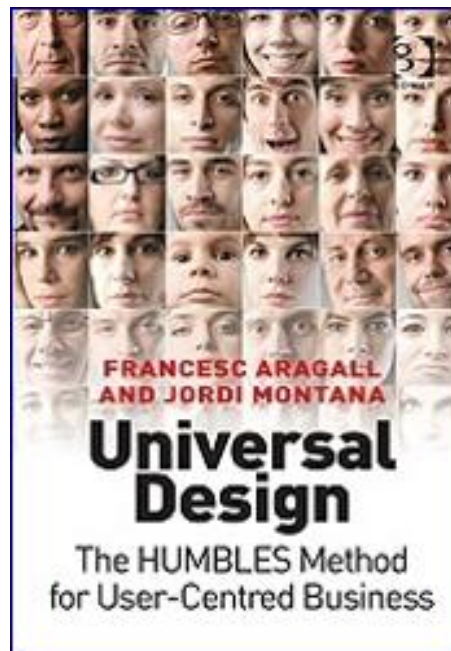
"Universal Design: The HUMBLES Method for User-Centred Business", writtenbyFrancescAragall and JordiMontañaandpublishedbyGower, providesaninnovativemethod to supportbusinesseswishing to increase the number of satisfiedusersand clients andenhancetheirreputationbyadaptingtheirproductsandservices to the diversity of their actual andpotentialcustomers, takingintoaccounttheirneeds, wishesandexpectations.

The HUMBLES method (© Aragall) consists of a progressive, seven-phaseapproach for implementing Design for All within a business. Byincorporating the user'spoint of view, itenablescompanies to evaluatetheirbusinessstrategies in order to improveprovideanimproved, morecustomer-orientedexperience, andtherebygain a competitiveadvantage in the marketplace. As well as a comprehensiveguide to the method, the bookprovidescasestudies of multinationalbusinesswhichhavesuccessfullyincorporated Design for All intotheirworkingpractices.

According to SandroRossell, President of FC Barcelona, who in company withotherleadingbusiness professionals endorsed the publication, it is "requiredreading for thosewhowish to understandhow universal design is the onlyway to connect a brand to the widest possible public, increasing client loyaltyandenhancing company prestige". To purchase the book, visiteither the **Design for All Foundation website**

Appeal

**Professor Ricardo Gomes offers a holistic vision of 2049 that relies on empathy and observation
to build trust and embed healthcare services on an experiential level.
https://www.health2049.com/health2049/designing-world-class-healthcare?fbclid=IwAR0mko9EDgpspEOme_Ph3R8vwAkVGNyqLe8C3jbN-68RCgCp_p1kdDZg8-g
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News

1.

The 2021 awards will be held on September 28

Image Credit: Shutterstock

NCPEDP-Mphasis Universal Design Awards 2021 will be held on September 28, 2021. Health startups can now apply for National Accessibility Awards. The awards are given away every year to those who have been doing exemplary work towards the cause of accessibility and thus ensuring a life of equality and dignity for people with disabilities. Since 2010, the NCPEDP-Mphasis Universal

Design Awards, have been awarding individuals and corporations who are enabling persons with disabilities to live more independently. The winners of this apex national award, over the past decade, include several healthcare innovators.

Executive Director of National Centre for Promotion of Employment for Disabled People (NCPEDP) Arman Ali says, "We believe that a person with a disability should get the same information and services as a person without a disability. These awards recognise those who are working towards making this happen. In a country like India, there are many more innovators working actively to build health services for persons with disabilities. We encourage them to apply for the NCPEDP-Mphasis Universal Design Awards."

"The availability of accessible, cost-effective software, devices, etc. will go a long way in supporting PwDs lead better lives, and through these awards, we hope to raise awareness for this important cause and promote the need for universal design," said Srikanth Karra, CHRO, Mphasis.

Applications are invited across subjects like accessibility in the built environment, transport, ICT, aids and appliances, advocacy, and public policy and services across four categories:

1. Person with Disabilities
2. Working professionals
3. Organisations/Companies
4. NCPEDP-Mphasis Javed Abidi Public Policy Award.

(Courtsey: Biospectum)

Programme and Events

ICIDM 2021: 15. International Conference on Inclusive Design and Manufacturing

August 19-20, 2021 in London, United Kingdom

UD
2021

A! **Aalto University**

FIFTH INTERNATIONAL CONFERENCE ON UNIVERSAL DESIGN

June 9 - 11 2021 at Aalto University, Espoo

GET READY TO CELEBRATE GREAT DESIGN!

As restrictions start to ease across Australia we can't wait to celebrate the very best in design and innovation with our 2021 Good Design Award Winners. Booked for Fri 17 September at The Star in Sydney, this year's Good Design Awards Ceremony will be one you don't want to miss!

We think our design community deserves an extra special celebration this year, so save the date and get your entries in!

ENTER GOOD DESIGN AWARDS

IDCS Design Excellence Awards 2021

Mar 27, 2021 2:27 am EDT

The Interior Design Confederation Singapore (IDCS) is calling for entries for its 2021 Design Excellence Awards.

The leading awards program showcases the best interior design talent in Asia-Pacific.

The deadline for submissions is August 31, 2021.

Sixth International Conference on Universal Design

September 7-9 2022 - Brescia, Italy
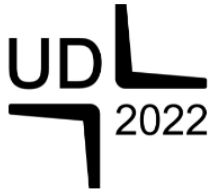
UD 2022

The UD2022 conference is co-organized by University of Brescia, Ca' Foscari University of Venice and University of Trieste, Italy.

This sixth conference in a series of major biennial international conferences on Universal Design: UD2012 (Oslo), UD2014 (Lund), UD2016 (York), UDHEIT2018 (Dublin), UD2021 (Helsinki) is the first one to be organized in southern Europe.

The conference is targeted at professionals and academics interested in the theme of Universal Design related to the built environment and users' wellbeing. The themes cover also mobility and urban environments, knowledge, and information transfer. The conference provides research knowledge and best practices from all over the world.

UNIVERSITY OF BRESCIA   **UNIVERSITY OF TRIESTE**   **Ca' Foscari University of Venice**

23rd International Conference on Engineering & Product Design Education (E&PDE 2021)

VIA Design, VIA University in Herning, Denmark

Workshops and Registration: 8th September 2021

Conference: 9th & 10th September 2021

berkeley prize

BERKELEY PRIZE 2022 LAUNCHES IN ONE MONTH

This year's topic:

DESIGN GUIDED BY CLIENTS' NEEDS:

Applying Social Factors Research to Architecture

A NEW QUESTION ON THE SOCIAL ART OF ARCHITECTURE AND A NEW OPPORTUNITY TO CONSIDER THE WHY OF DESIGN

AS ALWAYS, THE POTENTIAL FOR UNDERGRADUATE STUDENTS TO WIN CASH PRIZES IN THE ANNUAL ESSAY COMPETITION

AND, FOR THE SECOND YEAR, A CHANCE FOR PRIZE SEMIFINALISTS TO RAISE MONEY AND RECEIVE A STIPEND TO PARTICIPATE IN A LOCAL COMMUNITY SERVICE PROJECT RELATED TO THE TOPIC

IT ALL STARTS ON SEPTEMBER 15

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