

## SMART BUILDING CONCEPT IN CREATIVE INDUSTRY DEVELOPEMENT DESIGN

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### ABSTRACT

The design of Creative Industries Development Center is a developing creative industries which includes sixteen sub industry. Industrial development areas includes education, product development, creative industries community and marketing area of the creative industrial product. Smart building approach is applied to address related functions of the compound buildings with some users interacting and have different interests. Smart building method applies the principles of efficiency, effectiveness, user comfort, sustainability and systems enformental technologies. The principle of smart building analysed by theSmart Building Design Method of IBI (Intelligent Building Index) is expected to solve the problem by providing solutions in the form of integration between users. Related which gives comfort and convenience as well as integrated with the environment by implementing technology system.

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## INTRODUCTION

Smart Building System is a method of design approach integrated with building and installation technology that allows the entire facilities of the building can be designed and programmed according to user's needs, desires and centralized automatic control.

"An intellegent building is one that responsive to the occupants' needs, satisfies the aims of an organization and meets the long-term aspiration of society. It is sustainable in terms of energy and water consumption and maintains minimal impact of the environment in terms of emissions and waste. They are also healty in terms of well-being for the people living and working within them and are functional according to the user needs (Clements-Croome, 2009).<sup>1</sup>

Understanding of Smart Building by Clements-Croome, Smart Building or the Intelligent Building is the building which has a response to users ' needs, to meet the long-term needs. Smart Building are sustainable use of energy and water consumption and minimize environmental impact.

The research object is the Creative Industry Development Center. Creative Industry Development Center is Developing creative industries, both in terms of increased product quality, production and distribution. Definition of Creative Industry from UNCTAD (United Nations Conference on Trade and Development), Creative

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<sup>1</sup> Clements-Croome, 2014, Intelligent Buildings an Introduction, Routledge: 2 Park Square, Milton Park, Abingdon, Oxon.

industries<sup>2</sup>: “The creative industries: (1) are the cycles creation, production and distribution of the goods and services that use the creativity and intellectual capital as primary inputs; (2) constitute a set of knowledge-based activities, focused on but not limited to arts potentially generating revenues from trade and intellectual property rights; (3) comprise tangible products and intangible intellectual or artistic services with creative content, economic value and market objectives; (4) are at the cross road among the artisan, services and industrial sector; and (5) constitute a new dynamic sector and world trade”.

Including 16 sub sector (industry) Regulations of the President the year 2015 covers the architecture; interior design; visual communication design; product design; fashion; film, animation and video; photography; craft; culinary; music; application and game developers; publishing, advertising, performing arts, Visual Arts, as well as television and radio.

Why should a building design of Creative Industry use a smart building approach? In general terms, Smart Building should sustainable, healthy, technologically awareness, meet the needs of occupants and business, and should be flexible and adaptable to deal with change<sup>3</sup>. The more beneficial of smart building approaches are economic, they are efficient and they are effective for client and developer to invest in intelligent building.

Smart Building design approach applied in the design of Creative Industry Center has three driving forces include economic, energy and technology to answer the question that includes the performance of the building as well as the efficiency of buildings on the environment, low energy usage, optimization of integration of composition structure, service, management. The approach of the design in accordance with the design centre of the creative industry that in fact is the building of the commercial and business area and functioned as the development of creative industries.

Smart in this case interpreted on the utilization of the information technology infrastructure of the buildings and taking advantage of the technology applied in the building making it easier for users to manage and access the building. Smart building can increase property values to compromise and owners by providing more effective subsystem in the management of the building. In addition, et al. [<sup>4</sup>] argued that ‘intelligent buildings are not intelligent by themselves, but they can furnish the occupants with more intelligence and enable them to work more efficiently’.

Smart Building provides the most effective approach in the design and building technology systems. Smart Building methods reduce the inefficiencies in the process of design and construction of the building, saving time and costs by applying the building design or construction document technology is integrated and consistent. Smart building design can reduce 36% in running costs and 24% capital costs (Bowen, 2005)<sup>5</sup>. Energy cost savings between 10% and 50% (Shapiro, 2009)<sup>6</sup>

Design of Smart Building principle is the principle that will be applied to accounts as a reference in designing Smart Building. Smart building design principles applied to the natural scope of architecture includes: Hierarchical sense and Respond, Reference semantic models, Cloud Delivery of Common Service (Chen Han et al : 2007). 7. Hierarchical sense and respond allows for building management and optimization at different level of space aggregates (e.g. room, floor, building, grid, etc.), each with different usage patterns and governing policies. Reference semantic model is a core component of the architecture that facilitates the exchange of information among the various building subsystems. Reference Semantic Models (RSMs) have been deployed in production environments to connect a variety of functions throughout an enterprise, including measurements,

<sup>2</sup> Saputra, Wiko, 2010, Industri Kreatif, Praninta Offset: Jakarta.

<sup>3</sup> Clements Croome, 2014,

<sup>4</sup> A.T.P. So, A.C.W. Wong, K.C. Wong, A new definition of intelligent buildings for Asia, The Intelligent Building Index

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<sup>5</sup> Bowen, P. (2005) Integrated Approach for Information Communication Technology (ICT) AND Control System Infrastructures within Buildings: An Independent Study.

<sup>6</sup> Shapiro, S. (2009) Valuing Green CBRE Makes the Financial Case for Building Green.[Online] Available at : <http://www.greenbuildinglawblog.com/2009/09/articles/valuing-greenbre-makes-the-financial-case-for-building-green/#> [accessed 29 July 2017]

<sup>7</sup> Chen, Han, et al. "The design and implementation of a smart building control system." e-Business Engineering, 2009. ICEBE'09. IEEE International Conference on. IEEE, 2009.

planning/scheduling, and life cycle management. Another important aspect of the architecture is to minimize the cost of IT over the lifecycle of a building. From that perspective, it makes sense to support delivering and consuming common building management services based on a subscription/usage-based model over the cloud.

From some of the design principles that are used as criteria for the design of the Smart Building, summed up some of the principles that will be used as reference material in the design, namely: efficiency, Effectiveness, User Comfort, Environmental Sustainability as well as the application of technology.

The purpose of this paper is to provide a Smart Building as a solution in Creative Industries Development Center. This paper begins with the discussion of the definition of intelligent buildings. Then, the paper summarizes current research areas in intelligent building, such as: provides an overview of research in intelligent building, methodologies for investment evaluation of intelligent building projects. The third is analysis the application of research method used IBI Smart Building Design Method on Creative Industry Development Design.

## METHOD

Design method on the Smart approach to Building refers to Performance Evaluation Methodologies using methods of Intelligent building index (IBI). IBI is a quantitative assessment methods that come from the nine "Quality Environment Modules (QEM) ' (M1-M10) include:

M1: Green

M2: Space

M3: Comfort

M4: Working Efficiency

M5: Culture

M6: High-tech Image

M7: Savety and Structure

M8: Management practice and Security

M9: Cost Effectiveness


M10: Health and Sanitation


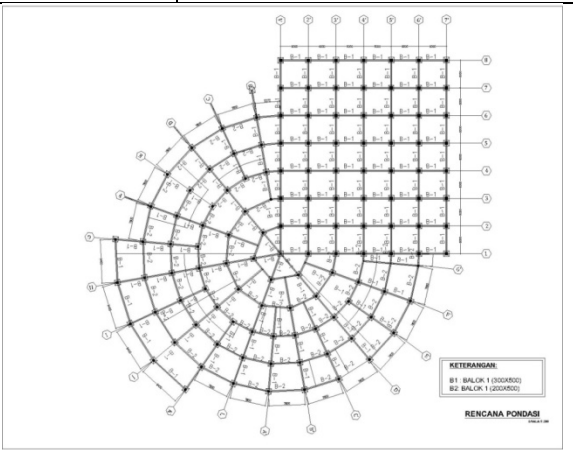
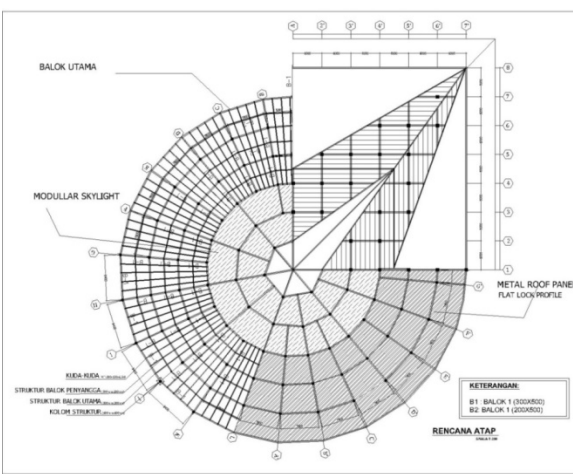
In the design of creative Industries Development Center, methods of design IBI that uses ten module smart building design criteria combined with the integration of Islamic as well as the related object design idea idea, later taken to conclusion applied to building design.



## RESULT AND ANALYSIS

The design of Local creative industries Centre in Malang using Smart Building approach produces some formula as a reference framework be used approaches the design of, among other things.

Table 1. Design Analysis

NO	PROBLEM	SOLUTION		Quality Environment Module	APPLICATION
		PROBLEM	APPROACH		
1.	Industrial Managenet System	Applying efficiency in building systems and management of building.	<i>Efficiency</i> (to facilitate the exchange of information between the various building systems)	(M4) Working Efficiency	The pattern of future governance coordinated between each other and one other building.
 <p>Figure 1. Building mass design ( Final Project Design of Creative Industries Development Ccenter, 2017)</p>					

				<table><tr><td>(M6) High Tech Image</td><td>Using the automatic system of the building on space and building.</td></tr></table>  <p>Figure 2. Building Exterior ( Final Project Design of Creative Industries Development Ccenter, 2017)</p>	(M6) High Tech Image	Using the automatic system of the building on space and building.
(M6) High Tech Image	Using the automatic system of the building on space and building.					
				<table><tr><td>(M7) Savety and Structure</td><td>The selection of structures that use the latest technology and efficiency in the construction process.</td></tr></table>  <p>Figure 3.Sub Structures of Community Center ( Final Project Design of Creative Industries Development Ccenter, 2017)</p>  <p>Figure 4. Up strutures of Community Center ( Final Project Design of Creative Industries Development Ccenter, 2017)</p>	(M7) Savety and Structure	The selection of structures that use the latest technology and efficiency in the construction process.
(M7) Savety and Structure	The selection of structures that use the latest technology and efficiency in the construction process.					

2.	Optimation of the function of Industry Center	Communication and the granting of facilities to spool the perpetrators of the creative industries.	<b>Hierarchial sense and Respond</b> Build management and optimation on the level of the different spaces.	(M8) Management Practice and Security	Coordination management system. On the level of optimization of the different spaces (e.g. room, floor, building, networking, etc.)
				(M9) Cost Effectiveness	Implement a multifunctional building (use of space has several functions)
					
				Figure 5. Interior Exhibition Area ( Final Project Design of Creative Industries Development Ccenter, 2017)	
3.	Funding on Industrial building	Provides funding, such as BEKRAF (the Agency's Creative Economy) as the national capital.	<b>Cloud Delivery of Common Service.</b> Minimize costs IT operational use of building	(M9) Cost Effectiveness	The optimization of energy efficiency building operations on system utilities, mechanical and electrical.
				(M2) Space	Provides a means of BEKRAF in the central area of the creative industries.
				(M9) Cost Effectiveness	savings on construction costs.
				(M9) Cost Effectiveness (M6) High-tech Image	Implement automation system, thus applying the savings.
4.	Environmental Integration	Creative industries Centre based environment.	<b>Energy consumption visibility</b> Energy Consumption Fisibilities on building and site.	(MI) Health and Sanitation	Recycling energy, solar cell (use of Rain Water Harvesting and processing.
					
				Figure 6. Rain Water Harvesting ( Final Project Design of Creative Industries Development Ccenter, 2017)	



				(M10) Health and Sanitation	HVAC system with good management.
				(M1) Green	Sustainable Environment aproach by using 60% open green space on site
				(M3) Comfort	Consider the Sun path and the wind and the direction of the front of the building.

Analysis, 2017

Based on table 1, the application of smart building design is applied to the design of creative industries development center, building forms, facade of buildings, utility systems and building the operating system building a coordinated and executed taking into account efficiency in energy use.

On the system building period, the building layout is separated into several masses, including: Exhibition area, Education area, Community center, creative market and supporting facilities such as mosques and the control room to achieve the efficiency of any user and coordination functions of the different spaces. Performed a mass merger between time of exhibition center, with community center. A merger between the period of the exhibition center and community center with connection bridge on second floor serves as an exhibition area.

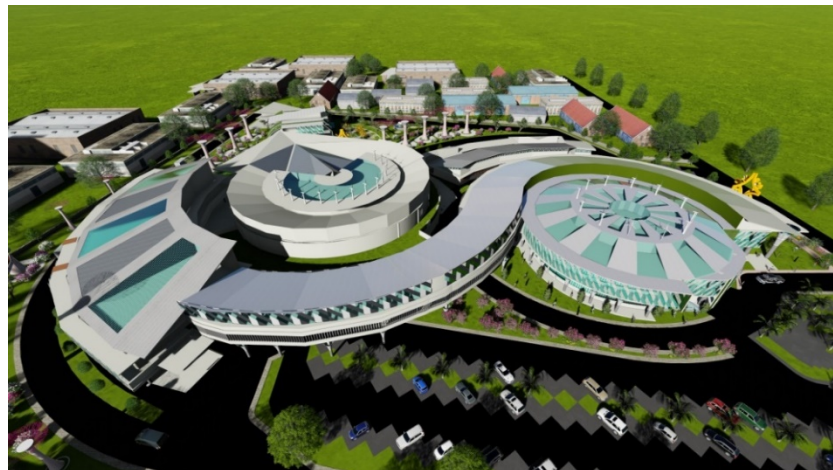


Figure 8. Connection Bridge  
( Final Project Design of Creative Industries Development Ccenter, 2017)

Application of Smart Building at building applied the use of double skin facade. Double skin facade responds to wind and light, if the light intensity is high the facade closes, when the light intensity is low the facade will open. When wind flows across a building, it can increase in pressure at the windard side. As the wind flows around the building low – pressure regions are created. Cross ventilation occures when openings are introduced at opposite sides of the building.

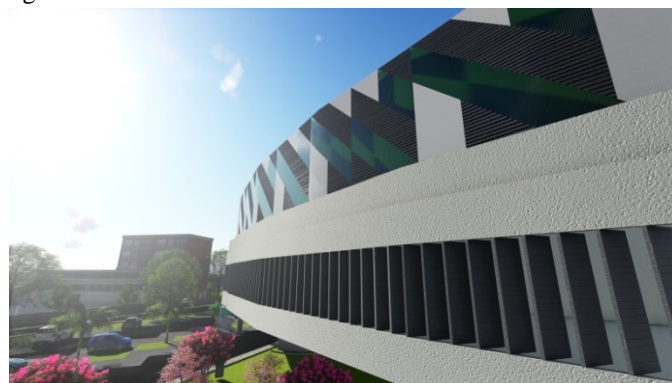


Figure 9 Connection Bridge Fasade  
( Final Project Design of Creative Industries Development Ccenter, 2017)

Application of double skin facade on the building exhibition center of mass. Double skin façade temper the daylight directly. The facade used multiple glazing with two or three layers filled with air or inert gas. Double glazing with air gap reduces U-values to around  $2 \text{ W/m}^2 \cdot \text{K}$ . As for the double skin facade details are as follows. The material of double skin facade uses Thermotropic. The spectral response of thermotropic is specular to diffuse transmission at high and low temperature. It can be reduce in transmitted radiation, emitted radiation and conductivity at high or low surface temperature.

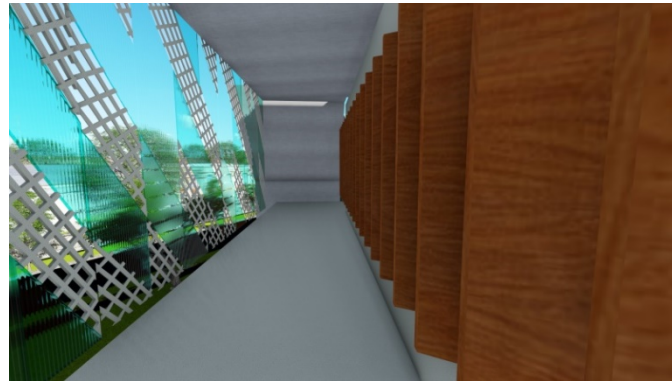


Figure 10 Double Skin Facade  
( Final Project Design of Creative Industries Development Ccenter, 2017)

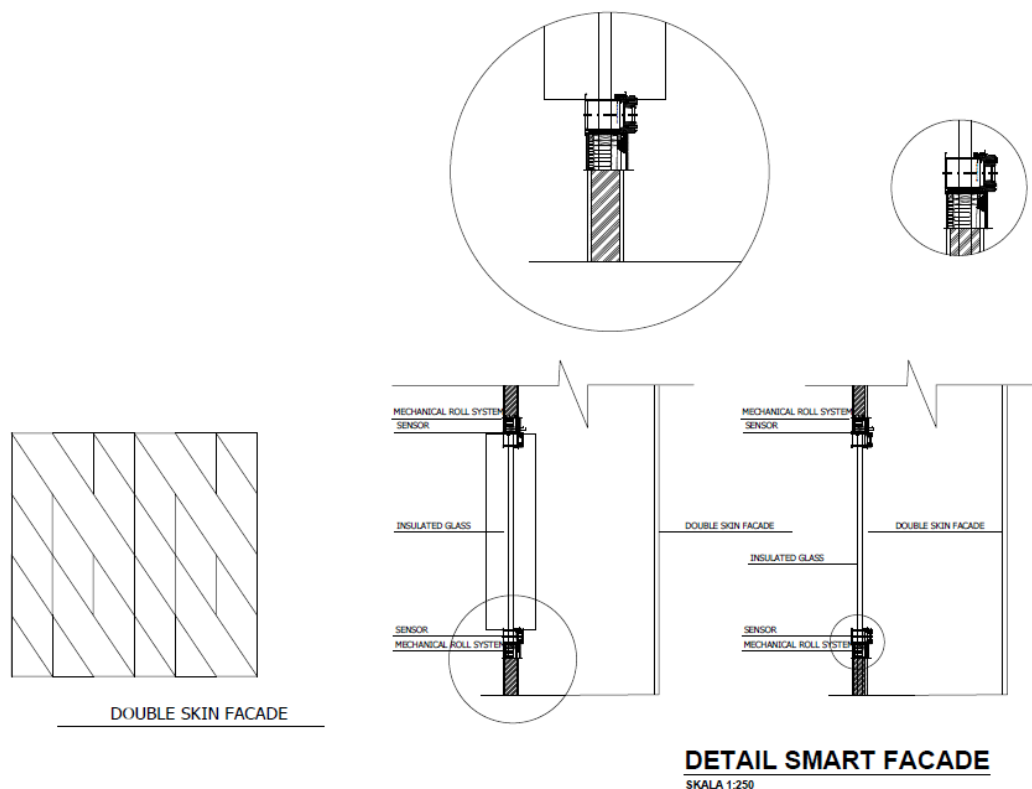


Figure 11 Detail Smart Facade  
( Final Project Design of Creative Industries Development Ccenter, 2017)

Application of Smart Building on the landscape found in the super trees as the Rain Water Harvesting System. Application of Rain Water Harvesting is also found in the form of a roof that directs rainwater in order to fit to the shelter and used again as the watering of plants. A curved buildings are also designed to direct rain water in order to be collected centrally.



Figure 12 Super trees as rainwater harvesting system on site  
( Final Project Design of Creative Industries Development Ccenter, 2017)

The use of renewable energy with photovoltaic solar cell. The use of solar cells on the roof of the building has also contributed as a means of energy efficiency in buildings. Modification of roof shape is combined with photovoltaic cell as catcher solar energy then connected to the generator to transform it into electric energy. PV (Photovoltaic) cell produces about 2 watts. PV can also reducing the energy consumption of the building.

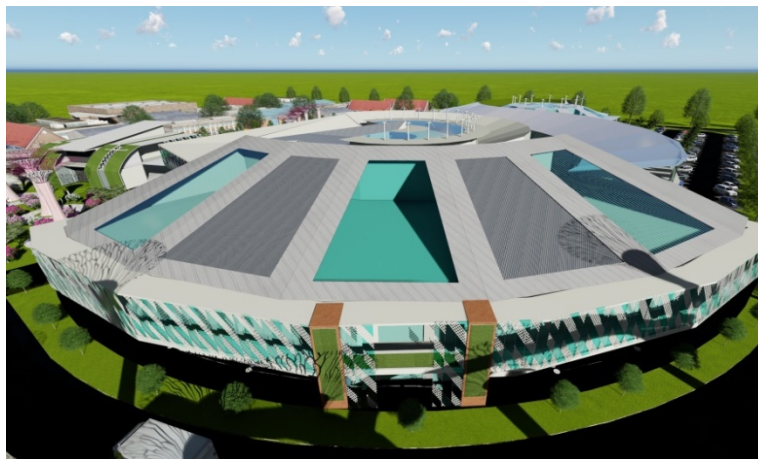


Figure 13 Aplication PV cells on building roof  
( Final Project Design of Creative Industries Development Ccenter, 2017)

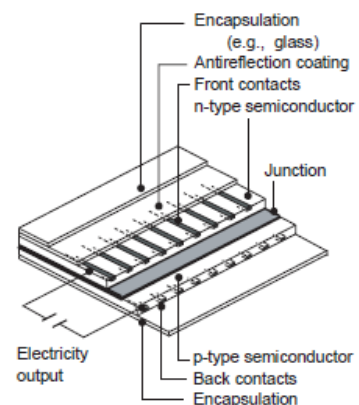


Figure 14 Detail of Photovoltaic System  
( Michel D and L, Daniel 2005)

## Conclusion

The design of Creative Industries Development Center is development activity and creative industries especially with smart building method design. In this case, the creative industry development leads by director coordination (hub agency), socialization (public outreach) and formulation (think tank). Creative industries gather means done by providing facilities in the form of a community. Smart building as the solution to answer the problem in design of creative industries development with IBI (Intelligent Building Index) method design. Design of Creative Industries includes all module of IBI. The application of smart building are on facade system technologies, rain water harvesting system on building roof and using super trees, and the last used renewable technologies with photovoltaic cell as the solar energy.

Based on the research of the design Creative Industry Development Center in the city of Malang already resolved with the approach of the Smart Building System. Application on smart building approached has the same principle with the Islamic Principles, namely efficiency, effectiveness and integrated natural system. The design of this creative industry development Center uses the concept of Integrated Building System, where there is a mutual system integrated between one and the other, the bildings, structure, and the most important is the



automation system and high technology, especially in information and communication. Smart building methods also respond to social and environmental socio-economic value.

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