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THE NOVEL PARADIGM OF “ECONOMIC DRIVEN SMART CITY” TO THE SUSTAINABILITY

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ABSTRACT

A Smart city (SmC) is a model to improve the urban and quality of life in city with the understanding that a SmC is filled with state-of-the-art technology, whether IOTs or ICT (Technology Driven). Whereas the opposite said, a SmC should be aiming to support people (Human Driven). But in an effort of the 2 concepts, got an important neglected, "what are the people real needs?" Many cities are still facing with the problem as unemployment, poverty and social disparity, that mainly caused by Economic problem. A current SmC model unable to solve this problem. This research purpose the Economic Driven and Economic Factor of a SmC model, to solve and improve this issue, The Economic Factor Analysis by GDP/GPP is developed to analyze the Localization of Economic and modeling the new SmC with the fully integrated dimension, and the direction of government policy, to ensure the SmC to a successful and sustainable.

Keywords: Economic Driven, Poverty, Smart City, Social Disparity, Sustainability

1. INTRODUCTION

A “SmC Driven Model can be divided into 2 methods, one is Technology Driven Method (TDM) and another is Human Driven Method (HDM) (Nam and Pardo 2011). The academic researches that mainly focus on TDM;-"utilization of networked infrastructures to improve economic and political efficiency and enable socio,cultural and urban development"(Hollands 2008) or “has been projected as a panacea to problems related to rapid urbanization and a way to achieve sustainable development”(Datta 2015). ICTs are claimed to be at the core of the SmC discourse (Graham and Marvin 2001) ,which emphasizes"enhancing the socio-economic,ecological,logistic and competitive performance of cities"(Kourtit and Nijkamp 2012). In summary, it is focusing about using the internet of things (IOTs) or ICT to lay the foundation to compile and connect all the city’s data together, in order to contribute to the implementation of innovative technologies, to support and elevate the city, such as real time traffic control system, parking sensor, recycle bin sensor, lamp sensor, mobile application to facilitate payment services. Also integrating data to deploy ICT-based solutions in the urban area, whether it is the community level, country or continent (Liuque-Ayala and Marvin 2015; Slavova and Okwechime 2016).

While the opposite, ideally drives the SmC by focusing on HDM, the technology is just the tools to integrate the different parts of data and activities all together to improve the quality of human life, with the key idea being the human capital and skill of citizens. IOTs or ICTs alone cannot bring a Smart city to succeed (Neirotti et al 2014). It is emphasized the usage of ICTs by communities will enable them to participate more fully in knowledge-based societies (Eurocities 2007). Anyway the two sides of researches, is not enough nor comprehensive to bring success for a SmC. One of the important drivers of a SmC that is missing is “the Economic element”. How the cities become smart, if those cities are still facing problems of unemployment, poverty and social disparity? This is the gap and misunderstanding of a SmC model that must be solve as soon as possible.

2. SMART CITY DEFINITIONS

A SmC has various definitions. Depending on each urban development, they defined their own SmC interpretation in the way they want it to be. However, under the main principles, it would not vary so much between each urban development. It is based on the definition that "The Development of community, quality of life and environment of the urban population with the ICT and IOTs



technologies to support and facilitate various aspects of the wider population, "said the summary, that SmC is currently divided into 6 main areas as Smart economy, Smart environment, Smart government, Smart living, Smart mobility and Smart people.

5.1. Current Smart Cities Dimension

(Kummitha and Crutzen 2017) has compiled and analyzed the research of a SmC since 1999 - May 2016 the estimated 211 articles and found that it can be classified into 2 categories the TDM) and people-powered SmC (HDM). Overall, the research that focuses on the TDM with the Top-Down policy, arising from the government or the city administration, which is trying to bring technologies, whether the ICT or IOTs to the city to collect data or to create a system for managing urban areas for comfort and elevating the standard of living for the population and in the view of the public sector. On the other hand, the research that focuses upon the HDM is the way to drive a SmC as Down-Top policy, which is focused on the benefit of citizens and ideally that Smart city should come from the demand and real understanding of the people, and real usefulness in practice, including the focus on the lives of people in education, safety, and environment, rather than focusing on technology investments for the modernization of the city.

5.2. Human Dimension in smart city

A SmC in the HDM has classification into 4 main types; Creative City, Learning City, Human City and Knowledge City (Nam and Pardo 2011) an important concept in common is focus upon people-centered to develop the citizens with the supporting of technology such as IOT or ICT. Whether it is knowledge, ability, health, education, social security or urban environment (OGCIO of Hongkong 2017)

5.3. Technology Dimension in smart city

A SmC in TDM, there are various perspectives, depending upon the basics ideas normally can be classified into 5 concepts; - Digital city, Intelligent city, Virtual city (hybrid city), Ubiquitous city (U-city) and Information city Department (Nam and Pardo 2011), the proposal of a SmC by Technology is reduce emission of carbon dioxide, reduce energy costs and consumption of electricity, provide new services and features for society via website and mobile applications, increase the quality of citizen's life, increase public safety, integrating ICT with infrastructure system to manage and control city and reduce waste.

6. SMART CITY INSIDE OUT

6.1. Impacts of low citizen awareness and usage in smart city services: the case of London's smart parking system

London's smart parking service claim to save costs from traffic about £68/car/year and reduce carbon emission 238.14 kgs./car/year, the total amount would be up to £183.6 million/year and lower carbon dioxide to 642,978 tons/year, but in practice the citizen's satisfaction and usage are very low for this scheme. It is demonstrating, what people want from smart city. However, public awareness and actual usage of the smart parking service is very low. The survey result showed 74% never or just occasionally heard about the service, 67% never used it, 13% often used and 4% used it very often, compared to the investment budget of £ 890,000, it is counted as a lost investment. This example demonstrates the substantial barriers to realizing the potential economic and environment benefits of the smart city service (Peng et al. 2017).

6.2. Smart city Barcelona inside vision

Barcelona was awarded the Winner of European Capital of innovation iCapital prize in 2014. The European Commission forecast a smart city model for Barcelona would be able to save money about Billion dollars as well as to improve the quality of life in the city by using technology. Barcelona Smart city's concept is "to become the Digital City", which is based on 3 main elements; Digital transformation, Digital innovation and Digital Empowerment.



6.3. Smart city to Whom?

Barcelona, seen from the outside is a very innovative, but is just the opposite from inside, nobody talks about the SmC (Giordano 2015). The SmC should be support and encourage education of its citizens. The SmC project was taken by the giant companies, instead of letting local companies or Fab Lab get it. Fab Lab Barcelona can develop a sensor devices kit that can detect environment pollution at a price of 150 Euro, but the government chose the sensor from a giant company which is more expensive 10 times. The many SmC projects in Barcelona are useless since plans like electric car rental is unavailable, sensor on bins monitors and stations charging electric cars are only installed on some demo areas. The Barcelona citizens never pay attention to the SmC. The policy of Barcelona is Top-Down management. Barcelona and Spain had experienced the economic difficulties, while the government had tried to push the technology innovation into the city. People cannot focus upon the technology benefits when they are simply trying to survive the economic times they live in unemployment rate 20%, youth unemployment in Spain 43.5% and homelessness increased from 2916 in 2008 to 47% in 2013.

In practical, HDM and TDM are not enough SmC to improve the quality of life for citizens, the Economics is one of the main driving forces of the SmC that play a very important role, without being economic benefit, all the things that tried to push to the cities will be meaningless. This is the original SmC's internationally acknowledged definition that has tried to direct the way such as the sustainability model (Tabane et al. 2015) "these urban environments as promoters of urban development and resilience, and safe-guarders of the three pillars of sustainability – namely, economic, social and environmental -, through the information technology using.

7. PURPOSED NEW MODEL "THE SMART CITIES ECONOMICS DRIVEN" AND ECONOMIC FACTOR

The Economics is very important for the well-being of people and business, to the drive a SmC to success. Otherwise, a SmC without the Economic Driven (ED), will not be able to succeed, so the ED is a core driver of a SmC and must be working together with other SmC driven aspects for the sustainability. The current SmC driver (TDM and HDM), is not enough in practice. So, this paper has purposed the ED and the Economic Factor (EF) of a SmC, which direct impact on the well-being of people, economic and a sustainable of SmC. Many articles tried to connect Economics with a SmC in the various way. (Tabane et al. 2015) "the Economic value allied with IoT will be large and ROI (return of investment) will be massive for example, it is perceived that the US GDP will increase by 2-5% by 2025 the accelerated productivity growth and the significant increase in terms of job creation and poverty alleviation, However, it was using the Smart city to drive the Macro Economics of a country, which in fact, it has overlooked the key points that "how the SmC drive the economics, If a SmC still cannot drive the economy itself?"

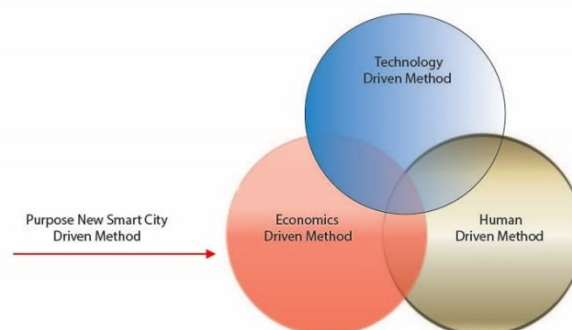


Figure 1: Purposed new smart city Economic Driven



8. LOCALIZATION AND LOCAL ECONOMIC, THE FACTOR THAT MUST BE ANALYZE (THE BEGINNING OF ECONOMIC FACTOR ANALYSIS; EFA)

The cities with more advanced technological and economic development are likely to be more active in launching and implementing a SmC initiative. A city's GDP and its growth rate may influence the development of SmC initiatives for several reasons, related mainly to the “**Local Economic**” and development rate. The cities and countries with a higher GDP growth rate undergo a higher economic expansion, which influences the financial resources that are available for investments (Neirotti et al. 2014). Each city has a different infrastructure and Economics, or so-called “Localization”, that make the cities to be unique. For example, In Eastern Thailand, the government has a plan to developing the Eastern Economic Corridor (EEC) to a path of trade and economic connections to neighboring countries. Rayong has a big seaport and many industrial factories. A SmC must be built base on the local EF and synchronize with the government policy.

Table 1 Comparing of Gross Provincial Product (GPP) at current market prices by industrial origin, Rayong, Phuket, Chiangmai and Chiangrai Province: 2012 – 2014

Industrial Origin	Rayong				Phuket				Chiangmai				Chiangrai			
	2012	2013	2014	%	2012	2013	2014	%	2012	2013	2014	%	2012	2013	2014	%
Agriculture	25,199	22,115	20,962	-2.62	5,153	5,176	4,792	-3.85	45,520	42,916	49,008	23.12	35,448	36,754	37,202	39.13
Agriculture, Hunting and Forestry	20,698	18,040	16,892	-2.13	1,961	2,057	1,811	-1.48	45,340	42,698	48,765	-23.01	34,656	35,793	36,130	38.12
Fishing	4,501	4,075	4,070	0.49	3,192	3,119	2,981	-2.37	180	218	243	0.11	792	961	1,072	1.01
Non-Agriculture	816,736	867,343	853,585	97.38	116,187	128,209	133,108	95.15	139,367	145,408	172,207	76.88	53,346	58,081	58,793	60.87
Mining and Quarrying	344,663	353,021	349,770	40.19	-	-	-	-	1,358	520	1,233	0.52	762	781	749	0.82
Manufacturing	299,090	335,906	314,381	36.43	2,970	2,944	2,556	2.16	14,558	16,522	17,089	8.10	4,170	4,887	5,028	5.04
Electricity, Gas and Water Supply	47,542	46,297	52,570	5.62	2,444	2,933	3,150	2.17	3,299	3,748	4,082	1.87	1,155	1,321	1,424	1.39
Construction	4,663	6,741	5,800	0.66	5,077	5,714	5,055	4.04	13,164	14,192	10,979	-6.45	2,328	3,455	3,510	3.32
Wholesale & Retail Trade & Personal Household Goods	49,087	53,167	53,316	5.97	7,694	7,752	8,488	6.10	23,129	22,874	26,270	12.16	11,790	11,961	13,270	13.24
Hotels and Restaurants	2,377	2,685	2,644	0.30	43,922	51,527	49,832	37.00	11,271	13,201	34,582	9.93	2,374	2,651	2,385	2.43
Transport, Storage and Communications	16,171	15,495	16,277	1.84	29,462	31,226	35,819	24.58	9,497	10,227	11,624	5.23	3,491	3,980	3,779	4.03
Financial Intermediation	6,894	7,727	9,622	0.92	6,286	7,676	8,185	5.64	12,327	13,267	15,259	-6.87	4,828	5,694	6,530	6.30
Real Estate, Renting and Business Activities	32,637	32,931	34,385	3.84	5,376	5,265	6,555	4.38	10,139	9,804	11,512	5.29	4,232	4,941	3,820	4.63
Public Administration and Defence, Compulsory Social Security	7,074	6,743	7,226	0.81	5,897	6,050	5,898	4.55	16,053	14,792	11,962	7.20	5,672	4,889	3,720	5.11
Education	3,406	3,570	3,888	0.42	1,484	1,348	1,547	1.12	12,860	13,548	14,777	6.93	8,634	9,118	10,202	10.90
Health and Social Work	2,073	1,845	2,286	0.24	2,560	2,780	2,895	2.10	8,497	8,806	9,201	4.46	2,614	2,736	2,851	2.93
Other Community, Social and Personal Services Activities	1,022	1,032	1,133	0.12	2,814	2,839	2,859	2.17	2,427	2,610	2,659	1.29	1,006	1,113	1,129	1.16
Private Households with Employed Persons	235	183	288	0.03	202	154	271	0.16	788	1,298	989	0.52	289	553	396	0.44
Gross Provincial Product (GPP)	841,935	889,458	874,547		121,340	133,386	137,901		184,886	188,323	221,216		88,794	94,534	95,995	
GPP Per capita (Baht)	997,343	1,039,356	1,008,615		229,328	251,144	258,817		106,909	109,136	128,503		76,167	81,601	82,899	
Population (1,000 persons)	844	856	867		529	531	533		1,729	1,726	1,721		1,166	1,162	1,158	

The way to develop Rayong to be the EEC Smart industrial City (SmIC), must consider the local EF. The analysis of local Economic illustrated by the table of the GPP (table1), the main GPP value of Rayong and Phuket come from Non-Agriculture sector 96-97%, but the difference is GPP Rayong mainly from Mining/Quarrying and Manufacturing, with a total 77% of total GPP. The EFA from GPP illustrate to develop the Rayong SmC in the direction of industrial/mining into the mainstream, by set up the policy to support and facilitate the industrial park, free trade zone, infrastructure, transportation, environmental protection, city administration management, public health, education and including the local Economic to stimulate employment, citizen's revenue, poverty. While the main GPP Phuket value comes from the sectors of hotel, restaurant, transport, storage, communications, financial intermediary, real estate, renting and business activities. Which sum up to be the Tourism sector. The value is about 72% of the total GPP. The EFA would give us a clear reference, why Phuket needs to be developed into the Smart Tourism city (SmTC).



Table 2. Smart City Economic factor analysis and model priority from GPP Value

City	Primary Economic Factor	Secondary Economic Facotor	EFA %	Smart City Model	SmC model Priority
Rayong	Non-Agriculture	Mining	40.19	Smart Industrial City	1
		Manufacturing	36.43		
Phuket	Non-Agriculture	Hotels and Restaurants	37.00	Smart Tourism City	1
		Transport, Storage and Communications	24.58		
		Financial Intermediation	5.64		
		Real Estate, Renting and Business Activities	4.38		
Chiangmai	Agriculture	Agriculture, Hunting and Forestry	23.01	Smart Agriculture(Farming) City	
	Non-Agriculture	Wholesale & Retail Trade & Personal Household Goods	12.16	Smart Trading City	2
		Hotels and Restaurants	9.93	Smat Tourism City	1
		Transport, Storage and Communications	5.27		
		Financial Intermediation	6.87		
		Real Estate, Renting and Business Activities	5.29		
Education	6.93	Smart Education City	3		
Chiangrai	Agriculture	Agriculture, Hunting and Forestry	38.12	Smart Agriculture(Farming) City	1
	Non-Agriculture	Wholesale & Retail Trade & Personal Household Goods	13.24	Smart Trading City	3
		Hotels and Restaurants	2.65	Smat Tourism City	2
		Transport, Storage and Communications	4.02		
		Financial Intermediation	6.10		
		Real Estate, Renting and Business Activities	4.65		
		Education	10.00	Smart Education City	4

The GPP figure of Chiangmai and Chiangrai are more in the Non-Agriculture with 76.88% and 60.87% of total GPP respectively, but the Agriculture also has meaning value at 23.1% and 39.13% respective. The local EF showing in detail of Non-Agriculture that both Chiangmai and Chiangrai are figure on Wholesale & Retail Trade and Personal Household Goods with 12.16% and 13.24%, 27.37% and 17.47 on the sectors of the tourism. On top of that Chiangmai and Chiangrai have the Education figure 6.93% and 10.00%. For example, if the government want to develop Chiangmai and Phuket to be the Smart Tourism City.

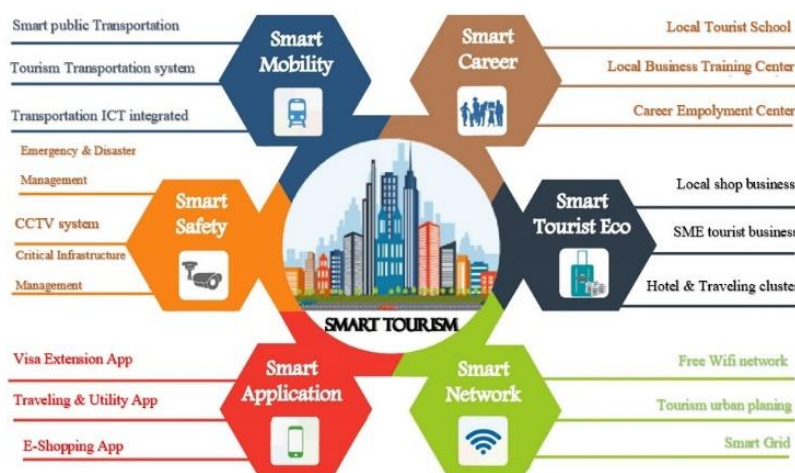


Figure 2: Purposed the sample of Smart Tourism Model from EFA process

The six pillars of SmC model has changed from the current general SmC model that most of the SmC using (Figure2). The EFA process will analyze and illustrate the local Economic of city and lead it to the new local SmC model. So, the government or SmC developer will truly build the SmC from the real need of people and city, and drive the Economic with the Economic policy to stimulate the local economic and settle the problem of unemployment rate, poverty and social disparity, which is one of the important fundamental of sustainable and SmC model.



9. CONCLUSIONS

A Smart city is a model to improve urban and quality of life in city. With the understanding that a Smart city is filled with state-of-the-art technology, whether IOTs or ICT (TDM). Whereas the other side said, all the things in a Smart city should be aiming to support people (Human Driven). In fact both of a Smart city driven could not be meet the citizen and city needed. The real issues causing by poverty and social disparity in the citizen are still there. Innovative but not featured on Economic benefits of the citizen makes a smart city is only the outer shell of innovative.

This paper has purposed the Economic Driven to drive the main important role of a Smart city model to solve problems of unemployment, poverty and social disparity. Then presents the Economic Factors and Economic Factor Analysis to illustrate the local Economic structure of the cities, and then modeling the new type of a Smart city model which is synchronize with the cities' local Economic structure and government policy, such as Smart Industrial city, Smart Tourism city, Smart Trading city, Smart Farming city and Smart Education city, which make a Smart city model will be real useful and proper to the localization of each city and available to proper define the direction and manage the policy to ensure a successful smart city implementation based upon the real needs of the people to be "A Truly Sustainable Smart City".

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