Comprehend the Term 'Info-City'

A Comparison between Two Primary Cities in Taiwan

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The rising of Information Communication Technology influences cities globally. 'Info-city' is the very topic to be reconsidered if each city acts as a combination of the physical and virtual. This research is an attempt to understand and formalize the comprehension of Taiwan people about 'Info-city'. For the sake of reliability, there are 37 interviewees from Taiwan's enterprises providing experiences of daily urban lives as a field to explore. In order to organize oral corpus, the research method applies encoding in term of cognitive semantics. Every sentence in the database is regarded as a basic unit to analyze. Besides that, there's a framework consisted of two analytical dimensions to reveal a clear picture of the collective minds. The results are concluded that concepts of 'info-city' in Taiwan value the mechanism of synergy most instead of the effect of substitution as an arbitrary assumption among urban studies.

1. Introduction

Information is one of the main factors which make urbanization possible (Lin, 2000). Furthermore, the rising of Information Communication Technology (ICT) probably causes the restructuring of established productive industrial networks in urban areas (Castell, 1996), and induces a brand new appearance for cities globally. Because of ICT, a new urban paradigm has drawn attention to what 'info-city' should be.

The work of identifying the impacts of ICT on city development is not as easy as at first glance. Although ICT facilities are visible in urban environment, telecommunication companies are not willing to disclose their physical networks due to commercial secrets. Furthermore, there are many other economic and social forces driving city developments simultaneously. It is hard to measure how much ICT by itself contributes to city development. However, it is still possible to have a general idea about this issue by collecting and analyzing people's opinions. Human's daily language, although it is not expressed as precise as mathematics, do possess valuable meanings based on the speakers' observations, experiences, imaginations, expectations, and reasoning.

'Info-city' is a very common compound term referred to a city with a combination of physical and virtual aspects. A compound term may result in a new meaning that is totally different from original meanings of component terms. For example,

Table 1
The explanations of four effects are given by Webster's dictionary.

Effects	Explanation
Synergi	Action of a combined enterprise to produce results greater than the sum of the separate enterprises.
Substitution	A person or thing serving or used in place of another.
Generation	To originate or produce by a certain process.
Enhancement	To make greater or improve to the quality or condition of, as in cost, value, attractiveness, etc..

'glass', 'ceiling' and 'glass ceiling' are respectively with different senses, where 'glass ceiling,' irrelevant to neither glass nor ceiling, is usually taken as a metaphor for a hard situations for women. Thus, it arouses a question: 'What is the exact meaning of info-city?' Although there's little argument to make sense of 'city' or 'information' respectively, the compound term info-city may be realized in quite different ways, such as a new kind of city image or something else relevant to the innovations of ICT. It will be not surprised if the implications of info-city are totally different or even opposite in different societies.

While clarifying the meaning of info-city, it is inevitable to explore the relationship between ICT and city development. The exploration reveals a new possibility for researchers of urban studies to examine the tension between ICT and city development and foresee their future trends, and to test an urban theory where it is usually assumed that ICT will result in a decentralized spatial pattern and many traditional urban activities will be substituted by ICT-related activities (Mitchell, 1999).

By proposing a formal method, this research has three purposes: (1) to understand the comprehensions of the term 'Info-city' by Taiwan's people, (2) to foresee the possible trends of Taiwan city developments affected by ICT through some key persons' eyes, (3) to argue that synergy instead of substitution will be the major effect when ICT is adopted by cities.

2. Analysis Framework

To comprehend the meaning of 'info-city,' this research proposes a framework that is a matrix with two analytical dimensions to analysis corpus. One consists of possible effects when ICT is introduced to cities, while the other one consists of possible sector pairs where the impacts may occur.

2.1 Dimension of Effects

Graham and Marvin (1996) have discussed complex interactions between urban development and ICT. Various economic, social, political and administrative forces are driving the development of cities. These driving forces may be conflict or complementary and cause different results. Graham and Marvin (1996) propose that there are different relationships between physical urban form and electronic virtual space, and these relationships result in four effects, namely synergy, substitution, generation and enhancement. According to Webster's dictionary, the meaning of the four effects can be further explained in Table 1.

To further elaborate Graham and Marvin's idea, this research proposes a semantic analysis approach. Let 'P-Q' denote the lexical form of a compound term of P and Q, and $X^{initial} \rightarrow X^{next}$ denote a state transformation, where $X \rightarrow X^{+}$ represents that X become better, and $X \rightarrow X^{-}$ means that X becomes worse. Hence, in addition to the original state PQ, there are eight possible results after transformation, namely $P^{+}Q^{+}$, $P^{+}Q$, PQ^{+}, $P^{-}Q^{+}$, $P^{+}Q^{-}$, $P^{-}Q$, PQ^{-} and $P^{-}Q^{-}$. Therefore, we are able to associate these eight transformation results with the four effects pro-

Table 2
The matrix of sector interactions.

	G	B	C
G	G to G	G to B	G to C
B	--	B to B	B to C
C	--	--	C to C

posed by Graham and Marvin. For example, if P and Q possess core competences, CC (P) and CC (Q), respectively, 'synergy' can be realized as CC (PQ) > CC (P) + CC (Q). Thus, based on the interviewees' descriptions about future trends of urban places and electronic space, the term 'info-city' becomes an observable phenomenon and an understandable term.

2.2 Dimension of Sector Pairs

Urban activities are complex interactions among three sectors the administrative agencies in the government, business organizations who are pursuing their economic profits, and the general citizens who demand convenient daily life and living environment. Therefore, in the Table 2, there are six possible interaction pairs between the three sectors, where G stands for the government sector, B for the business sector, and C for the citizens' sector. This research uses these six pairs, namely 'G to G', 'G to B', 'G to C', 'B to B', 'B to C' and 'C to C', to indicate where the impacts of ICT on city occur.

3. Method

3.1 Sentence Identification

The entire corpus1 in this research is gathered from 37 interviewees who lived in Taipei (22 interviewees) and Kaoshiung (15 interviewees), the two largest and most informationalized cities in Taiwan. In the beginning the collections of audio sources have to be completely transformed into written texts. Only meaningful and relevant sentences are recorded. Sentences are basic units for further analysis. As a result, there are 207 sections of corpus encoded in the case of Taipei and 44 sections of corpus encoded in the case of Kaoshiung.

3.2 Semantic Assignment

Any description in a sentence mattered with ICT or urbanization will be evaluated if its semantic form or meanings is relevant to the matrix of analysis framework. If it is relevant, the sentence will be assigned to a corresponding cell in the framework matrix. Since there are four possibilities in the effect dimension and six possibilities in the dimension of sector pairs, it totals 24 possible cells for a sentence to be assigned. For example, a part of corpus of the interviewee H2 is shown below:

…. the so-called 'useful utilities' will be much more casual to common people; additionally, it results from the stimulus by industries of ICT, even in transnational. After a period of time, people will know about benefits from infrastructures of networks to the whole society more than the initial investments….

(translated from Chinese)

What *H* expressed is that government invests huge capitals in ICT facilities for expecting to create much more benefits for the whole society. Thus , the *H*'s corpus is assigned to the cell intersected by '*G-C*' and '*Enhancing*'. From this example, it is noticed that the sentence assignment is one of the most crucial steps and determines the usefulness of the research result.

We may define the idea of semantic assignment in a formal way. Let the set R be the relationships among sectors. In other words, R ={G-to-G, G-to-B, G-to-C, B-to-B, B-to-C, C-to-C}, where |R|, the cardinality of R, is equal to 6. Also, let the set E be the effects caused by influences of ICT. That is E = {synergy, substitution, generation, enhancement}, where |E| = 4. It follows that there are 24 possible combinations of set R and set E.

$$/ R *E / = 24 \qquad (1)$$

Let *S* be a set of sentences which are semantically relevant to *R* and *E*. An one-to-one function *Assign* can be defined as follows.

$$\text{Assign} : S \rightarrow R \times E \qquad (2)$$

Table3
Semantic Tagging intensity of Taipei.

Relaioship Effects	G to G	G to B	G to C	B to B	B to C	C to C
Synergi	A2,E1 (2/3)	E2, F1, G3 H6, P8, R3, S1 (7/28)	B1 H1, T1 (3/3)	A1, C2, E2, F2, H2, K2, L2, N1, P2, Q4, R3, T1, U1, V4 (14/29)	B1, E2, L1, O1, U2 (5/7)	(0/0)
Substitution	A1, (1/1)	H2, P1, F1, Q1, R1 (5/6)	H2 (1/1)	A1, B1, E1, M1, O2, R1, S1, T1, U1, V1 (10/11)	A2, B1, D1, F1, G1, H2, K1, N1, O1, P2, Q1, T1, U1 (13/16)	(0/0)
Generation	L1, T1 (2/2)	B1, E2, F1, H2, L1, O3, P2, R2, U2 V2 (10/18)	P2, Q1, R1 (3/4)	A1, B2, C5, F1, L1, O2, P1, Q5, R1 (9/9)	A1, D1, F1, M1, V1 (5/5)	(0/0)
Enhancement	A1, E1	G1, H2, P3	G1,	B1, C2, D1E1, F1,	A2, B1, D1, F1	Q1

3.3 Semantic Tagging

When all the sentences are assigned to corresponding cells, we may tag every cell in the framework matrix. A tag is a two-tuple with interviewee's identification code and the corresponding number of sentences that are assigned to the cell. For example, in the cell associated with G-G and Synergy in the Table 3, 'A2' denotes that 2 sentences expressed by interviewee A are assigned to the cell, while 'E1'means that only one sentence of interviewee E is assigned to the cell. Using this method, the results of semantic tagging of Taipei and Kaoshiung are shown in Tables 3 and 4, respectively.

3.4 Estimation of Semantic Intensity

After tagging all oral corpus into appropriate cells in the analysis framework, we may be able to calculate the degree of semantic intensity (SI). The number of interviewees and semantic tags attached in the framework measures the semantic intensity. A formal definition can be denoted as follows (Grimaldi, 1994):

$$SI: R \times E \rightarrow N \times N \qquad (3)$$

In equation (3), N denotes the set of nature numbers. The first N is associated with the number of interviewees whose corpuses are relevant to R × E, while the second N is associated with the number of sentences referred by the interviewees in corresponding R × E. For example, in Table 3, two semantic tags, namely A2 and E1, are encoded in the cell associated with G-G and Synergy. Since there are two interviewees A and E, and three sentences

Relaioship Effects	G to G	G to B	G to C	B to B	B to C	C to C
Synergi	(0/0)	C1, G1, I3, J1, N2 (5/8)	(0/0)	N1, F1, I1, M3 (4/6)	12 (1/1)	(0/0)
Substitution	(0/0)	(0/0)	(0/0)	B1, E2, M1 (3/4)	C1, D1 (2/2)	(0/0)
Generation	(0/0)	E1, J1 (2/2)	(0/0)	M1 (1/1)	E1, F2, I2, J1 (4/6)	(0/0)
Enhancement	(0/0)	D1, E1, H1, I1, J2 (5/6)	A1, B1 (2/2	N1, G1, I1, J1 (4/4)	A1, J1 (2/2)	(0/0)

Table 4
Semantic tagging and Intensity of Kaoshiung..

Relaionships Effects	G to G 3.87	G to B 26.09	G to C 6.28	B to B 42.03	B to C 21.26	C to C 0.48
Synergi 31.88	1.45	11.59	1.45	14.01	3.38	0
Substitution 16.90	0.48	2.90	0.48	5.31	7.73	0

Table 5
The SQ matrix for Taipei

Relaionships Effects	G to G 0	G to B 36.37	G to C 4.55	B to B 34.09	B to C 25.01	C to C 0
Synergi 34.09	0	18.18	0	13.64	2.27	0
Substitution 13.64	0	0	0	9.09	4.55	0

Table 6
The SQ matrix for Kaoshiung

from these two interviewees are assigned, (2,3) is attached to the cell (equation 4.)
SI (G-to-G, synergy) = (2,3)

4. A Comparative Study about Taipei and Kaoshiung

Having semantic intensities of the two primary cities in Taiwan – Taipei and Kaoshiung, we are going to compare the city developments in the future cognized by interviewees. The notion of Semantic Quotient (*SQ*) is employed to quantify the distribution of the semantic intensity. The SQ of each cell is defined as follows.

$$SQ_i = S_i / \text{TNS} \qquad (5)$$

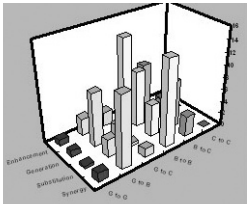
In equation (5), SQ_i denotes the *SQ* of cell *i,* S_i the number of sentences tagged to the cell i, and *TNS* denotes the total number of sentences. Equation (5) is applied to all the semantic intensities in Tables 3 and 4, and the results of the two cities are shown in Tables 5 and 6.
Based on the Tables 5 and 6, Figures 1 and 2 visualize the distribution of semantic intensity over two dimensions. According to Figures 1 and 2, there are several findings from the comparison between Taipei and Kaoshiung:

I. The four leading possibilities of two cities are not exactly the same. Those are 14.01% (B to B, synergy), 13.53% (B to B, enhancement), 11.59% (G to B, synergy) and 9.18% (B to B, generation) for Taipei versus 18.18% (G to B, synergy), 13.64% (G t o B, enhancement), 13.64% (B to B, synergy) and 13.64% (B to C, generation) for Kaoshiung.

II. In the dimension of effects, many interviewees from Taipei and Kaoshiung agree on synergy and their SQ are over 30%. However, Taipei values the B-to-B relationship most different from the result of Kaoshiung values G-to-B most.

III. In the dimension of relationships, Kaoshiung values the G-to-B relationship of 36.37%, which is not the same to Taipei's B-to-B relationship of 42.03%.

IV. Substitution is the weakest effect for both cities in the context of the relationships.



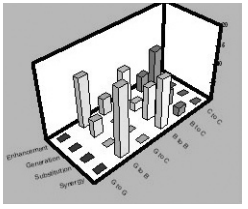


Figure 1
The result of the SQ value for Taipei

Figure 2
The result of the SQ value for Kaoshiung

V. Since the values of SQ are almost to zero in the two cities, it tells a fact that all interviewees terribly ignore the C-to-C relationship.

5. Conclusion

The aim of the research is to comprehend the term 'info-city' as a rising urban tendency and foresee the future trend of city development impacted by ICT. By studying two cases of Taipei and Kaoshiung, this research reaches the following conclusions.

First of all, the term 'info-city' has different senses in different cities. This finding coincides with a conjecture: 'Although ICT influences cities globally; it may not have two cities possessing the same meaning of info-city (Tao, 2000).

Secondly, the semantic approach used in the research to comprehend the meaning of compound terms shows that it is possible to construct a whole vision from individual experiences and cognitions by analyzing the semantics of the sentences adopted from personal interviews.

Thirdly, this research finds that ICT will largely induce the effect of synergy with other city development forces. This finding will modify a previous conjecture that ICT may dissolve or substitute physical urban entities. In other words, although some of existing activities may be substituted by ICT, most people believe that the effect of synergy will firmly embed ICT into existing urban context further.

At last, by measuring semantic quotient, the research visualizes the senses of 'info-city' in Taipei and Kaoshiung. However, due to the diversity of data sources, subjectivity of sampling and semantic tagging, it remains risky to obtain a different outcome by other research teams. It depends on possible ways people involved and the perceptions from their urban lives. This research expects to be continuously aware of such critical issues. After all, the outcome of the research is based on recorded concepts, contexts and situations to foresee where cities may go under the tension between urbanization and ICT.

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Footnotes

[1] A corpus is a collection of written texts on a particular subject. In particular, it is recorded in a searchable database for the purpose of studying the ways that words are used or the frequency with which they occur.

[2] A CEO of a company located in Taipei.