

# A Chameleon's Harmonic Correlation, Criteria, and Diversity for a Win-Win and Sharing World

Masayuki Matsui<sup>1,2</sup>

<sup>1</sup>The University of Electro-Communications, Tokyo, Japan

<sup>2</sup>Kanagawa University, Yokohama, Japan

Email: mmatsui55@nifty.com

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## Abstract

Toward a balancing (win-win) and sharing world (Matsui, 2018), there might exist a class of kernels or black-holes at the harmonic cross zone. This article discusses the marginal diversity toward balancing, integration (win-win), and a sharing equilibrium, and obtains the relative or Chameleon's condition of the correlation coefficient at the lower level, and the information amount at the upper level, on the dualism of artifacts. Instead of Simon's bounded rationality, the new concept of a pair (diversity, integration) is introduced, and there are the relative pairs with a lower correlation coefficient of 0.8, and upper marginal diversity with a ratio of 0.6 at the knowledgeable or higher society. Finally, this pair map (microcosm) of the body is obtained for the win-win and sharing world and its harmony, and the Chameleon's existence (marginal diversity) is ascertained and positioned at the hyperboloid of the pair-map (integration, sharing).

## Keywords

Bounded Rationality, Dualism of Artifacts, Marginal Diversity, Knowledgeable Artifacts, Pair-Map

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## 1. Introduction

The world of artifacts (Matsui, 2016, 2019) is progressing from being concerned with the tangible (material) toward being more concerned with the intangible (knowledge). This world is closer to that of invisible artifacts and the related black box, and as a result we are faced with the design problem of this new normal, or smart life, and the extent of diversity within the intangible, risky, and rapid world under globalization.

Matsui (2018) provided a few construction examples of a harmonic world,

with the pursuit of growing social wealth, and found a harmonic condition for the balancing (win-win) vs. sharing issues (4.6) for the Chameleon Criteria (Matsui, 2013, 2019). Matsui, Yamada, and Takanokura (2019) formulated the integration (win-win) vs. sharing issue for certain collaborations from a scientific and economic perspective.

However, the cross or equilibrium zone at the balancing, integration (win-win) vs. sharing center might have a kernel or a black-hole (Matsui, 2019, 2020) on Chameleon's correlation, criteria, and diversity issues. The problem occurs under uncertainty, is especially critical for knowledge or higher society under closer correlation, and is considered numerically based on three sample correlation tables.

This article discusses marginal diversity toward balancing, integration (win-win) vs. sharing, and could obtain the relative or Chameleon's condition of a correlation coefficient at the lower level, and an information amount at the upper level. This is referred to as the dualism of artifacts (Matsui, 2019). Instead of drawing on bounded rationality in economics, the new concept of a pair (diversity, integrity) is introduced, and there is the relative pair of a lower correlation coefficient of 0.8 and upper marginal diversity with a ratio of 0.6 for knowledge or higher society.

Finally, these facts are systemized as a pair-map (microcosm) of artifacts for the win-win and sharing world, and its harmony (Matsui, 2018). The pair-map first originated in 1983 (Matsui, 1983, 1988, 2002, 2008), and is simplified here as a sandwich or composition of the pair (diversity, integrity) at the lower level, and the pair (integration, sharing) at the upper level.

## 2. Outline of Knowledgeable and Intelligent Artifacts

### 2.1. Pair-Hierarchy in Relation to the $S = W$ Scheme

From the 3-skyme ( $S = W$ ) sandwich principle (Matsui, 2016), we have developed the pair-hierarchy theory of nature vs. artifacts body as a pair-like type (Figure 1), which is similar to relativity theory in physics. In physics, relativity theory is comparable to the relative (pair) gap in the world of speed in the lower field, and acceleration in the upper field.

For the artifacts, this pair-hierarchy shows the tangible stages with weight at the lower level, and the intangible stages without weight at the upper level. Each level in the six pair-hierarchy in Figure 1 is corresponded to Matsui's pair-matrix, and is vertically sequenced in the following order: introduction (I), development (D), transformation (T), conclusion (C), balance (B), and goal (G), where the first four levels follow a Ki-Sho-Ten-Ketsu story composition, and the fifth and sixth levels follow a B-G story (Matsui, 2019).

In Figure 1, it should be noted that the vertical line is composed of fractal mappings, which is similar to Matsui's matrix equation (Matsui's ME) (Matsui, 2019), and ranges from the micro to the macro level and vice versa. The fractal,

which originates in geometry, describes a pattern where a part of the whole figure is self-similar or recursive.

### 2.2. Balancing, Sharing, and Integration Issues

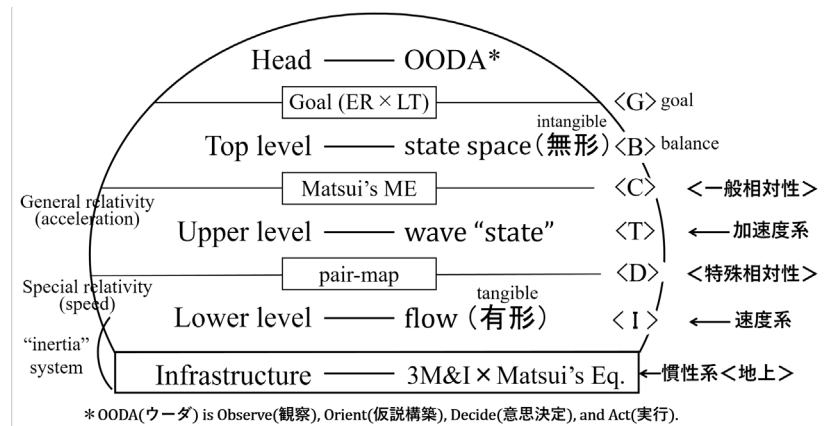
Recently, the relationship between the pair of bodies A and B has been formulated using a Venn diagram from a scientific and economic perspective. For example, this relationship is represented by the profit equation shown in **Figure 2** (Matsui, Yamada, & Takanokura, 2019).

In **Figure 2**, EN and EC refer to the marginal profit and the variable or operating cost, respectively. It should be noted that the following equation holds under certainty (Matsui, Yamada, & Takanokura, 2019).

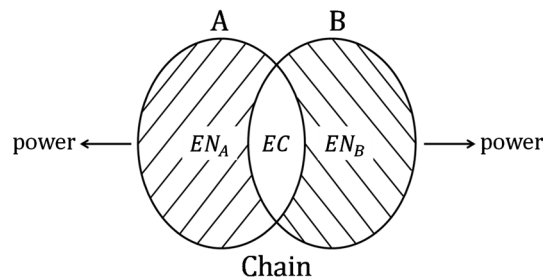
$$(EN_A + EN_B)/2 \geq \sqrt{EN_A \times EN_B} \tag{1}$$

The inequality presented in Equation (1) shows that balancing (win-win) would be better than integration, and if the profits of A and B are equal, then both sides of the inequality are equal.

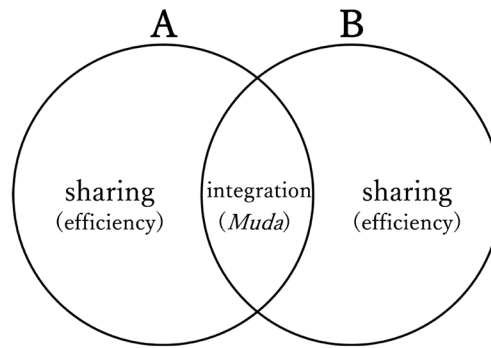
Regarding collaboration issues, the relationship between balancing, sharing, and integration are presented in **Figure 3**. **Figure 3** shows that the intersection of bodies A and B corresponds to integration, the sharing is the sum of the set of differences, which is  $(A - B) + (B - A)$ , the balancing is the case of having the same difference set.



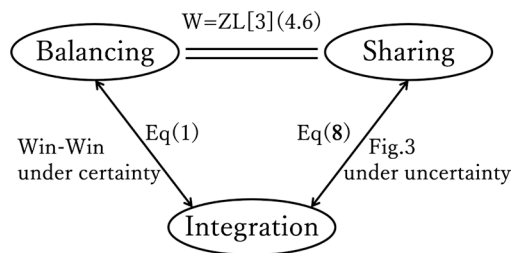
**Figure 1.** Pair-hierarchy and relative view of nature vs. artifacts body.



**Figure 2.** Sharing vs. integration in collaboration (A, B), where the integration (intersection) is  $EN_A \times EN_B$  and the sharing is  $EN_A + EN_B$  in Equation (1).



**Figure 3.** Pair image of integration (*Muda*) and sharing (efficiency) in collaboration (A, B).



**Figure 4.** Outline of balancing, sharing vs. integration issues.

Based on previous research (Matsui, 2018; Matsui, Yamada, & Takanokura, 2019), this three-way relationship can be outlined as presented in Figure 4. In Figure 4, an unknown problem remains for Equation (6) based on the sharing vs. integration relationship presented in Figure 3, and would be further considered in the dualism of the correlation vs. information amount and its pair-map.

### 3. Correlation vs. Information Amount in Dualism

#### 3.1. Three Examples of Correlation at the Lower Level

Generally, the artifacts body would be characterized by the dualism of materials vs. value. This refers to the value of some function of material or data, and money (profit) is representative of value and the information amount. Under the lower level, the relationships between balancing, sharing, and integration are shown in Figure 3, and the correlation can be quantified by using the information amount in information theory.

The fundamental equation [1] is as follows:

$$H(X, Y) = H(X) + H(Y) - T(X, Y) \tag{2}$$

In Equation (2),  $H(X)$  and  $H(Y)$  are the information amounts of  $A$  and  $B$  respectively, and  $H(X, Y)$  and  $T(X, Y)$  are the information amounts of integrity and integration, respectively.

Table 1 presents three examples of correlation at the lower level. These examples allow for the examination of correlation vs. information amounts, and the tables are taken from Attneave (Attneave, 1959), Isotani and Matsui (Isotani & Matsui, 1969), and Enkawa (Enkawa, 1988).

**Table 1.** Three examples of correlation tables. (a) Stimulus vs response (Attneave, 1959); (b) Job vs. satisfaction (Matsui, 2019; Isotani & Matsui, 1969); (c) Society vs. mathematics scores (Enkawa, 1988).

(a)

		response (role), y					
		1	2	3	4	5	
stimulus (function), x	1	46	3	1			50
	2	2	44	4			50
	3		5	38	6	1	50
	4			7	40	3	50
	5			1	4	45	50
		48	52	51	50	49	250

(b)

		Balancing satisfaction score (role), y					
		1 (14)	2 (17)	3 (20)	4 (23)	5 (26)	
Job attributes (function), x	1 (35)	1	1				2
	2 (45)	1	6	1			8
	3 (55)		1	4	1		6
	4 (65)			4	1	1	6
	5 (75)					2	2
		2	8	9	2	3	24

(c)

		society score, (y)					
		1	2	3	4	5	
mathematics score, (x)	1	1		2			3
	2		2	1			3
	3	2	1	2	1	1	7
	4			1	2	1	4
	5		1		1	1	3
		3	4	6	4	3	20

### 3.2. Several Information Amounts at the Upper Level

At the upper level, several information amounts are available for the three correlation tables. An additional information amount is the sharing amount of information, and is introduced below.

The total sample number is denoted as follows:

$$N = N^+ + N^- + N^0, \tag{3}$$

In Equation (3),  $N^+ = \sum f_k^+$  is the area of the upper half,  $N^- = \sum f_k^-$  is

the area of the lower half, and  $N^0 = \sum f_k^0$  is the diagonal area, in which  $f^k$  is the frequency of cell  $k$ ,  $k = 1, 2, \dots$ .

The information,  $H$ , is defined as follows:

$$H = -\sum (f^k/N) \log(f^k/N) \tag{4}$$

More specifically, the information amounts of integration and sharing are defined and calculated as follows:

Integrity (joint) amount:

$$H(X, Y) = H^+ + H^- + H^0 \tag{5}$$

$$N = 250 (N^+ = 18, N^- = 19, N^0 = 213),$$

Sharing amount:

$$H(X \Delta Y) = H^+ + H^- \rightarrow 0.6111$$

$$H^+ = (N^+/N) \log N - (1/N) \sum f_k^+ \log f_k^+ = 0.3975 - 0.0916 = 0.3059 \tag{6}$$

$$H^- = (N^-/N) \log N - (1/N) \sum f_k^- \log f_k^- = 0.4196 - 0.1144 = 0.3052 \tag{7}$$

in which  $N^+ \rightarrow H^+$ ,  $N^- \rightarrow H^-$  and  $N^0 \rightarrow H^0$ .

## 4. Summary of Analysis and Pair-Map of Artifacts

### 4.1. Numerical Summary and Pair Part at the Upper Level

**Table 2** shows a summary of analysis for the three tables included in **Table 1**, and provides values of correlation,  $r$ , and several information amounts. From **Table 2**, the image map of hyperboloid type (Matsui, 2020) is shown in **Figure 5**. **Figure 5** is a specific kind of 1-leaf, or elliptical hyperboloid, and can be understood as a rotation of the hyperbolic shape in **Table 3** and **Figure 7**.

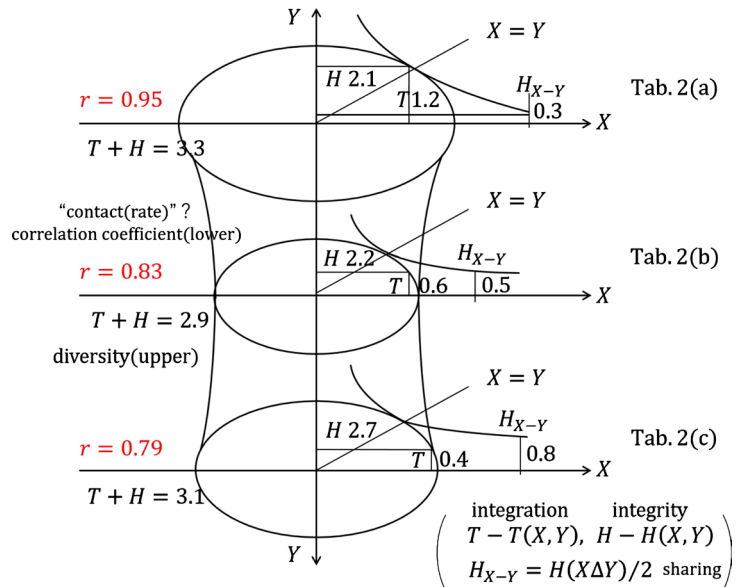
From **Table 2** and **Figure 5**, it is found that the correlation coefficient of **Table 1(b)** (Matsui, 2019; Isotani & Matsui, 1969) is  $r = 0.83$  under the minimum value ( $T + H = 2.9$ ) of the sum of integration and sharing in **Table 1(b)**. The Chameleon’s criteria (*Muda*), 0.4, vs. sharing (efficiency), 0.6, is satisfied (Matsui, 2019).

Through examining the correlation and information amounts, **Figure 6** presents

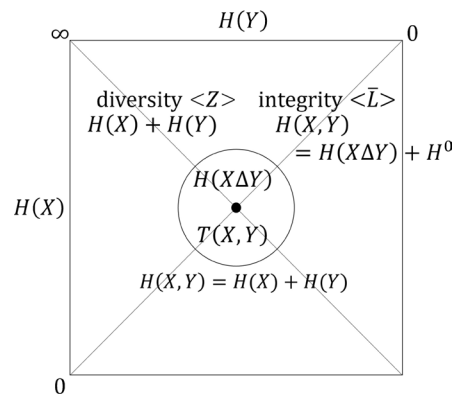
**Table 2.** Correlation coefficients, diversity amounts and the integration vs. sharing rule on Chameleon’s criteria for **Table 1**.

summary	correlation coefficient	diversity**	integration	sharing	integrity	diagonal ( $H^0$ )
<b>Table 1 (a)</b>	0.95	3.3	1.197 (0.7)	0.6111 (0.4)	2.113	1.502
<b>Table 1 (b)</b>	0.83	2.9	0.6382 (0.4)	1.0933 (0.6)	2.252	1.159
<b>Table 1 (c)</b>	0.79	3.1	0.3983 (0.2)	1.6588 (0.8)	2.718	1.059
chameleon’s criteria	0.83(0.48)*	2.9	0.369 (0.4)	0.631 (0.6)	0.4 versus 0.6	

\*concise result (Isotani & Matsui, 1969) \*\* $H(X) + H(Y)$ .



**Figure 5.** Correlation versus Chameleon’s criteria image (map) of hyperboloid type in **Table 2**, **Table 3** and **Figure 7**.



**Figure 6.** Outline of pair-map (diversity, integration) vs (integrity, sharing), in which diversity:  $H(X) + H(Y) = T(X,Y) + (X,Y)$ .

the pair-map of knowledgeable and intelligent artifacts. **Figure 6** and Equation (2) show that the cross zone of the diversity and integration diagonals becomes the balancing point of the trade-off in diversity. This zone, represented by the equation  $H(X < Y) = H(X) + H(Y)$ , maximizes the total information amount.

**4.2. Pair Part (Integration, Sharing) at the Lower Level**

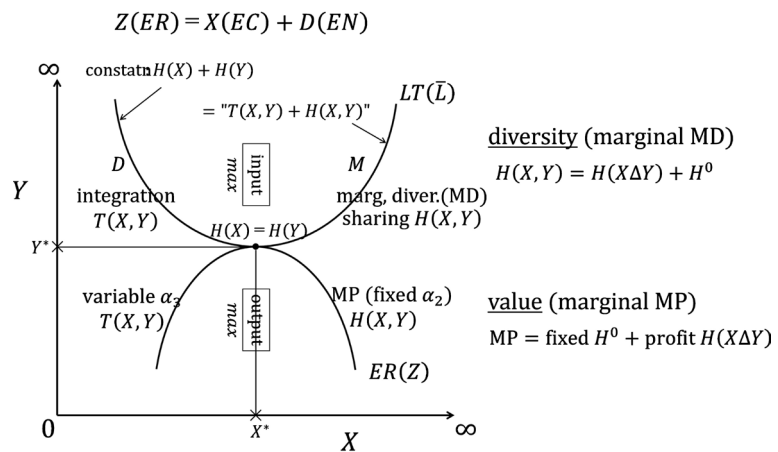
According to **Figure 6**, the pair (integration, sharing) can be considered to follow the cycle equation (Matsui, 2008):  $Z = X + D$  which is composed of processing ( $X$ ) and delay ( $D$ ). By introducing several accounting terms, **Table 3** presents the relationship between information amounts and cost accounting in the field of economics.

From **Table 3**, **Figure 7** is obtained. **Figure 7** shows the hyperbolic shape of the pair-map in **Figure 5**, and this shape becomes a pair of ellipse maps

**Table 3.** Relationship between information amounts and cost accounting terms.

type	cycle* $Z (= X + D)$		constraints (redundancy)	marginal diversity (MP)	
	processing (X)	delay (D)	integration (Muda)	sharing(efficiency), EN	
cost system	variable cost	(marginal) profit	variable cost (EC)	fixed cost	value (profit)
diversity (Z)	$H(X)$ 1.609*	$H(Y)$ 1.691**	$T(X, Y)$ 1.197**	$H^0$ 1.5019**	$H(X, \Delta Y)$ 0.6111**
integrity ( $\bar{L}$ )				$H(X, Y)$ 2.113**	

\*cycle (revenue):  $ER(Z) = EN(\bar{L}) + EC$ ; \*\*case of Table 2(a).



**Figure 7.** Hyperbolic system: Integration (*Muda*) vs. sharing (efficiency) on the pair-map of knowledge type.

from Figure 6 (Matsui, Ishii, & Fujita, 2020). The cross point  $(X, Y)$  of  $H(X) = H(Y)$  in Figure 6 is maximized and corresponds to the diversity vs. integration cross zone,  $H(X, Y) = H(X) + H(Y)$ , in Figure 6.

From these results, we can ascertain the equilibrium inequality of knowledge and intelligence as follows:

0.4 vs. 0.6 (upper)

$$\text{Integration (Muda)} > (\text{Chameleon's diversity}) < \text{Sharing (efficiency)}. \quad (8)$$

$R = 0.83$  (lower)

The inequality presented in Equation (8) shows that Chameleon's diversity can be understood as being conceptually similar to, or updating, Simon's concept of bounded rationality (Simon, 1947). That is, for the industrial or real world, the boundness of rationality would be result in the lack of diversity at the finite time and space.

## 5. Conclusion and Remarks

By utilizing correlation tables and pair-maps, this article approached and inves-



tigated the existence of kernels or black-holes at the harmonic cross zone of the balancing (win-win) and sharing world. Under uncertainty, a Chameleon's harmonic correlation was found in criteria and diversity, instead of bounded rationality in economics, for knowledgeable and intelligent artifacts.

We should notice the existence (zone) of Chameleon's diversity in dualism at the industrial or real system, probably escape of GAFA, CONVID-19 and so on.

However, our article might not yet reach the visible quantification or mechanism of bounded rationality at the view of marginal diversity.

Further research should investigate the harmonic progress on win-win and the sharing world toward smart supply chain and city. A critical problem would be resolved by using the dualism of artifacts and its skewness in the gap between things (lower) vs. value (upper), and/or motion vs. energy, at body.

This research is now advancing from factory physics, economics (Matsui, 2008, 2014) and artifacts science (Matsui, 2016, 2019) to the new academic discipline of indivisibility/body (Matsui, 2020). Some characteristics of the discipline would be mainly seen on pair body, indivisibility and marginal diversity.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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