The 2018 Kailua-Kona Global Conference
on Business and Finance （GCBF2018）
HI081817500 on January 3rd, 2018

HOW TO CREATE RESEARCH INVENTIONS BY THE COMBINATION OF MULTIPLE THEORIES AND CONCEPTS: AN IMPLICATION FROM DEVELOPING A NEW MATHEMATICAL MODEL FOR CORPORATE ALLIANCES

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Main topics and background

- These days, research activities including the management studies are becoming progressively mature, much more segmented, and increasingly specific.
- So, it's more difficult to create new research inventions by using single theory, concept, or method ONLY.

- *A mathematical model to express the mutual complementary relationship between two in a corporate alliance was developed by Satoshi Tomita and Yoshiyasu Takefuji in 2015 and 2016*

- The model combines the several theoretical frameworks of
  (1) Resource Based View (RBV)
  (2) The concept of flow in physics
  (3) The concept of Give and Take in psychological science
  (4) The methodology of cyber informatics

- *The development of the model is a good case to understand that the combination of multiple theories and concepts has proven to be the key factor for creating new inventions in management studies.*

What is a Corporate Alliance?

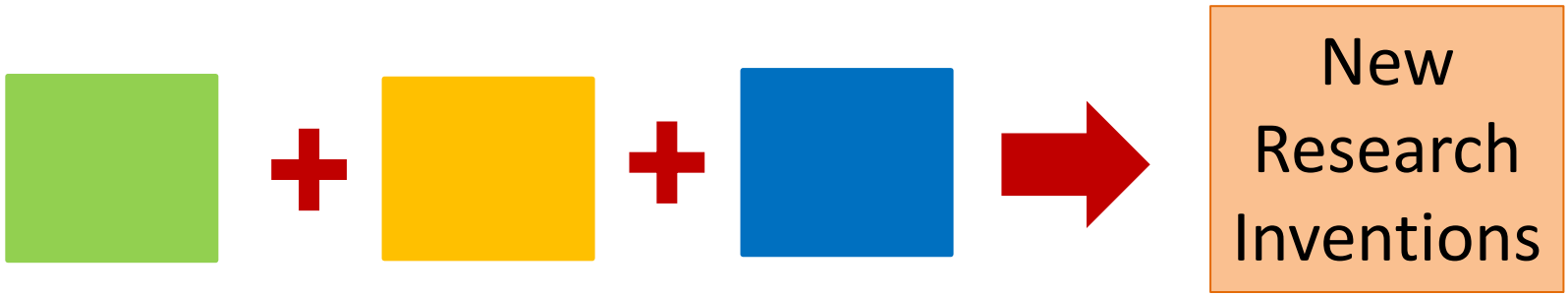
- **“The state in which two or more companies are independent, in order to develop new business or expand existing business by the exchange of complementary management resources provided to each company regardless of the presence or absence of a binding contract or capital relationship, with continued cooperation, to share the outcome.”**

  - Tomita and Takefuji (2015, 2016a, 2016b, 2016c, 2016d) and Tomita (2017)

- Defined originally from Yoshino and Rangan (1995)

What is A New Mathematical Model of Mutually Complementary for Corporate Alliances ?

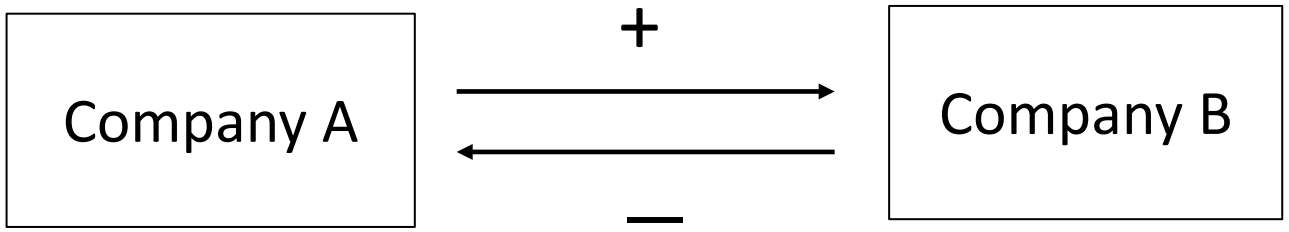
- The construction of the model shows the new way to create research inventions by the combination of multiple theories and concepts.
- This is a good case study for it!



Exchange of management resources - strengths and weaknesses

- The strengths of company B will complement the weaknesses of company A, and vice versa.
- If the complements from one of the companies or both are large, the mutually complementary strength will also be large. ➔ Flow intensity

- If both companies are committed to complementing the strengths and weaknesses of each other, they will more strongly complement mutually. ➔ Flow balance



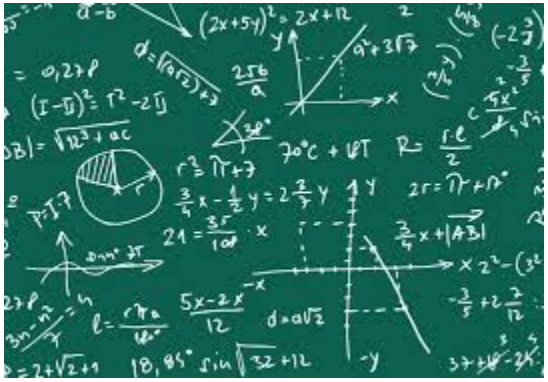
Utilizing a One-Dimensional Matrix and Bipolar Vector to Express the Strengths and Weaknesses between Two Companies

- Each company is scored on 8 characteristics on a 5 grade scale

  Company A a = (1, 5, 4, 2, 2, 1, 3, 5)
  Company B b = (5, 1, 1, 3, 4, 2, 3, 2)

- Company A – Company B

  c = a-b = (-4, 4, 3, -1, -2, -1, 0, 3)



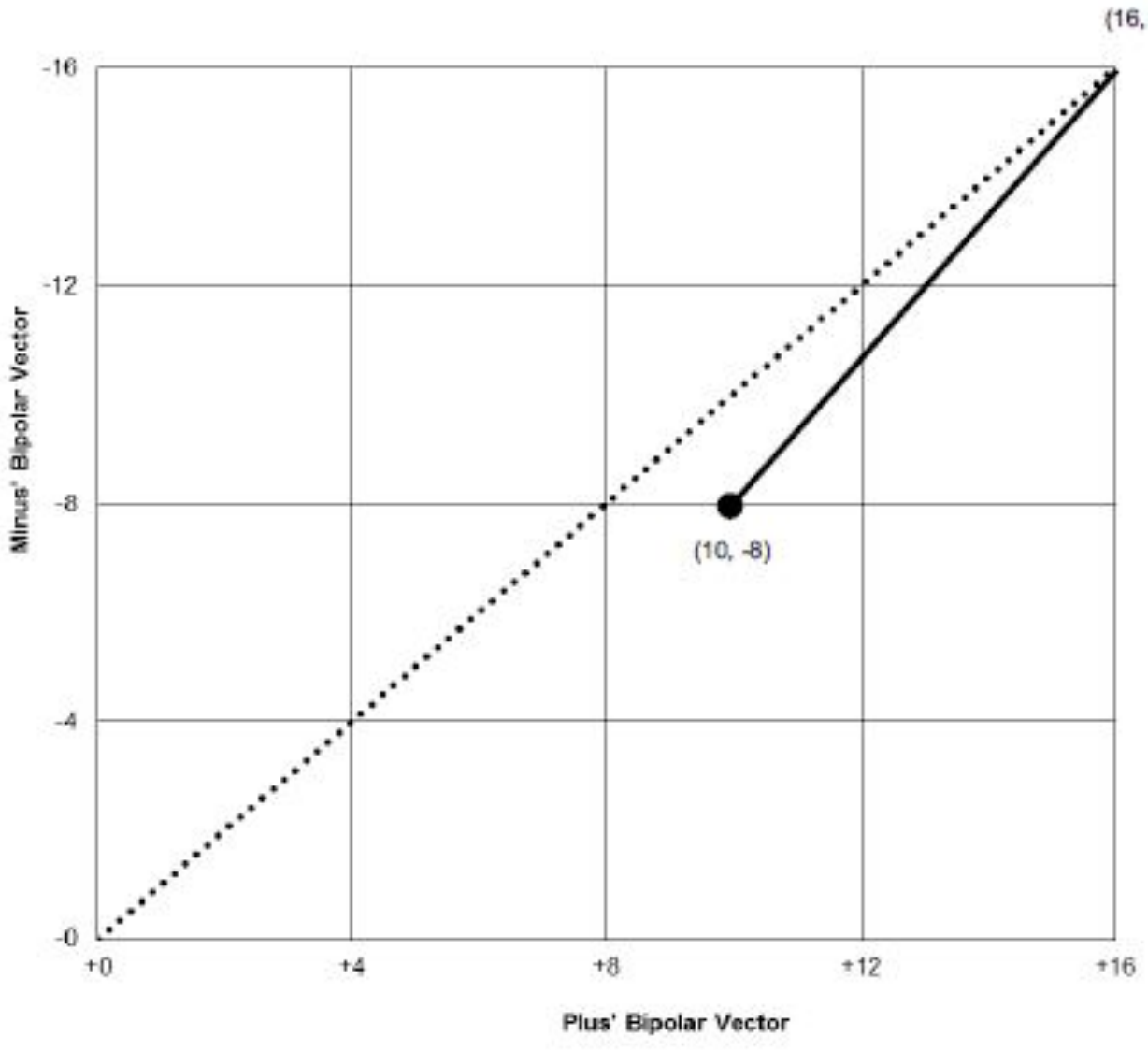
The Relationship Strength Expressed as the Distance from the Maximum Point

- The strengths of the mutually complimentary are mathematically expressed by measuring the distance from the largest mutually complimentary strength point
  = ”The Maximum Point”.

- The bipolar vector of the length from 0 to 4 of the eight characteristics, the maximum mutually complementary value determined from taking two sets of half the number of characteristics with a maximum length of 4 for each, which is the longest possible bipolar vector bilaterally.

- (8 characteristics / 2) * Maximum length of 4 = (16, -16)

Mathematical expression by the distance from the maximum point



Maximum Point

Formula: Mutually Complementary Strength and the Related Coefficient as a Value

- The mutually complementary strength derived and explained above can be expressed by the following formula:

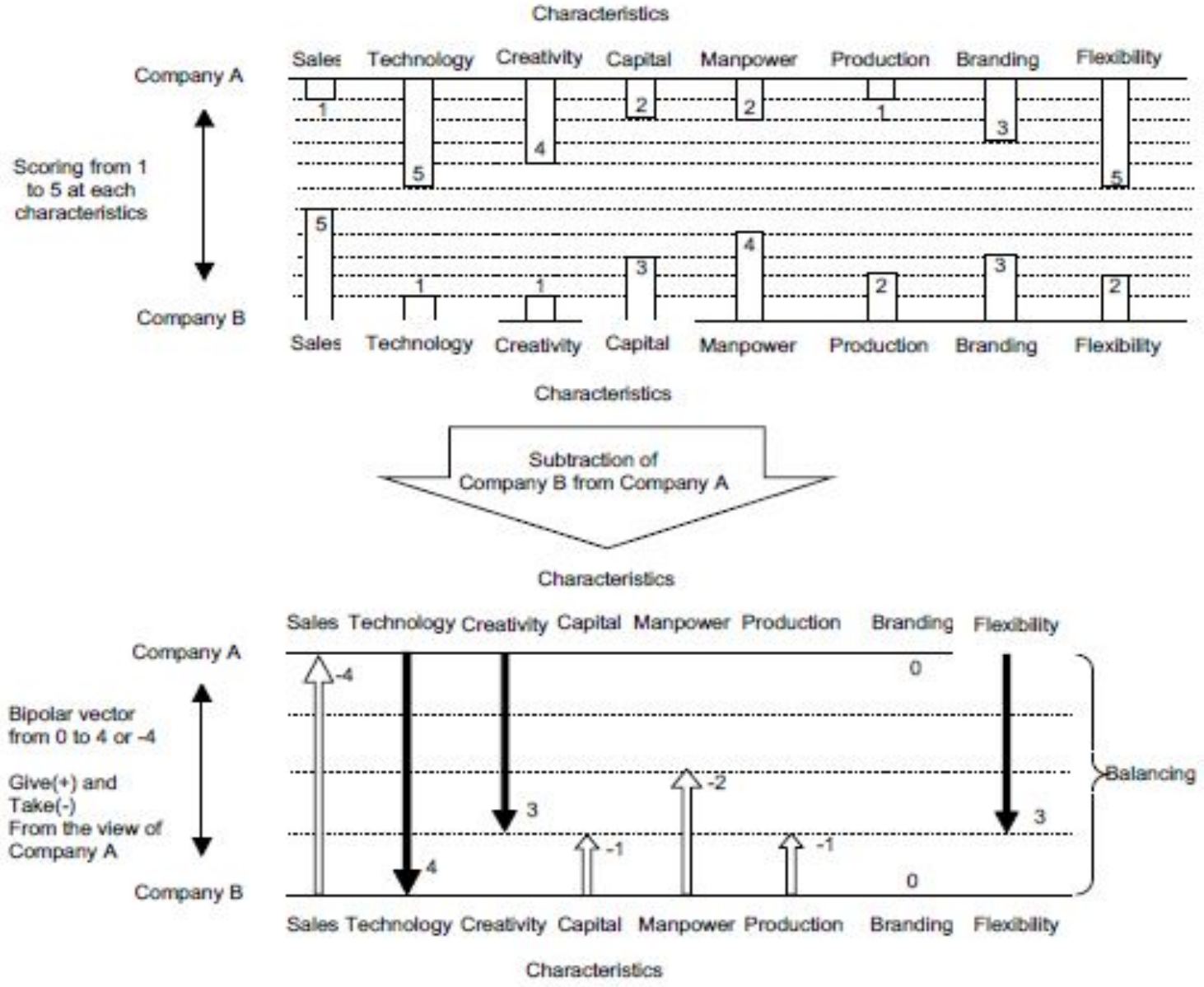
$$\sqrt{2\times\left(\frac{4\times len(c)}{2}\right)^2}-\sqrt{\left(\frac{4\times len(c)}{2}-plus\right)^2+\left(\frac{-4\times len(c)}{2}-minus\right)^2}$$

$$1-\frac{\sqrt{\left(\frac{4\times len(c)}{2}-plus\right)^2+\left(\frac{-4\times len(c)}{2}-minus\right)^2}}{\sqrt{2\times\left(\frac{4\times len(c)}{2}\right)^2}}$$

len(c) is the number of characteristics, plus=Σ (positive integers), and minus=Σ (negative integers)

- The model of the formation was implemented by Python programmatically and computed as a value.

Explanation by Flow Intensity and Flow Balance



This figure illustrates the complimentary relationship between Companies A and B by flow intensity and flow balance as new concepts.

What is a Key for the invention in the research?

- Nobody can create a mathematical model to express the mutual complementary relationship between two companies during the matching phase in a corporate alliance by using theories, methods, and concepts on management studies ONLY.

- The study is based on (1)Resource Based View(RBV), applied by the methodology of (2)cyber informatics and also imported (3) the concept of flow from Physics & (4) the concept of flow balance from psychology.

Concluding Comments

- This innovative outcome in management studies comes from the combination of several theoretical concepts and imports methodologies from other science fields

- The method of this research was accorded to the thinking way of Schumpeter (1912) : new knowledge is created by new combinations of already existing knowledge.

New Combinations are important to create research inventions in management studies