

# Business Ventures Modelling using Chemical Bonding Concepts

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**Abstract-** Modelling successful business ventures can be a challenging process, which needs innovative concepts or methodologies. We propose an innovative methodology that is to apply the chemical bonding concepts in business ventures, where chemical elements bonding can be mapped to people association. This paper introduces implementation concepts of how the business ventures can be realized utilizing chemical bonding process and describes the model in detail with numerical examples. A business matching table is also introduced to identify suitable matches (read partners) to enter into business ventures based on the valences. The identification of a suitable partner is done through a search algorithm, and as the data gets larger and larger, the time complexity also gets bigger and the best algorithm takes  $O(n \log(n))$  time.

**Index Terms-** Business Ventures, Chemical Bonding, Valency, Normalization, Business Matching Table, Search Pattern

## I. INTRODUCTION AND FORMATION

### A) Business Ventures

Capital accumulation occurs mostly through promotion of business ventures, where investments flow into new business domains, strengthen or expand the existing domains. Business venture is a kind of partnership association, where seeker may not have sufficient knowledge or strength in a certain business domain but want to enter into that business domain, where some others have good amount of strengths, and vice versa [1]. Two types of Ventures can happen a) between domestic and domestic or b) domestic – foreign investors. Most of the present ventures in developing countries are of the type domestic – foreign in the form of FDIs [2] or through technology transfer [3][4]. In whatever form the association of two partners may be, it can be viewed as

conglomeration of Strengths, Weaknesses and Needs; and promotion and realization of a concrete association that leads to business venture in a mutually beneficial way.

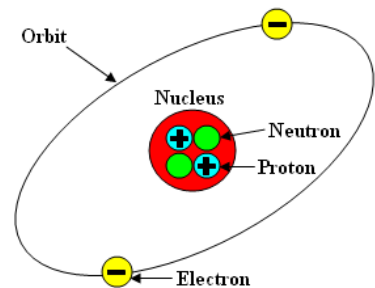
But how concrete the association can be realized? who does this job? and how it can be done? Is there any scientific methodology? These are all questions which have many answers and varied solutions based on situational needs. We consider chemical bonding concepts where atomic structure itself can be mapped to organization setup, and atomic number as strength of business domain, identifying the corresponding chemical element, etc., details of which are described in the next sections. Organization and company are interchangeably used to mean the same.

### *B) Chemical Concepts*

Chemical elements are combined to form compounds. In the combination of the elements we see bonding among all the participating elements. This is due to valency or the electronic charge in the outermost shell of atom. Similarly, individual organizations combine their common business interests to form venture by sharing the strengths and weaknesses [5].

#### Atomic structure

Atom is a smallest constituent unit of ordinary matter that has the properties of a chemical element. Every atom is composed of Nucleus and Electron orbits bound to the nucleus. Nucleus is composed of protons (positive charges) and neutrons (no charge), while the Electrons (negative charges) orbit around it. The number of protons of an atom defines its chemical element. We don't go in details of quantum mechanics of atoms, but for simplicity we stick to the Bohr model of atom, focus on atomic number and the valency (number of electrons in outermost shell), who can give or take electrons to form chemical bonding.



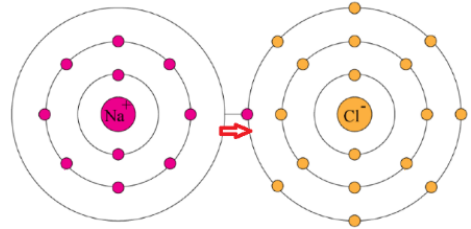
#### Valency

Electrons in an atom are arranged in orbitals or shells and those electrons that are present in the outermost orbit are called valence electrons, which are excess in the configuration [6]. If the outermost shell gets filled, there will be very little chemical activity and the combining capacity turns to zero eventually. Noble gases have no valence electrons. All the other elements look for bonding. Bohr model says that the outermost shell consists of a maximum of 8 valence electrons [7] in the electron configuration of  $2n^2$ , where n represents (K, L, M, N, ...) shell. Eg. 12 electrons =  $2 * 2^0 + 2 * 2^2 + 2$ , which implies K, L shells are full and M shell contains 2 electrons. Therefore, valence is 2.

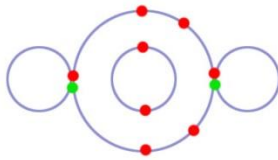
## Chemical Bonding

Chemical bonding involves transfer of an electron, so if one atom gains an electron while the other atom loses an electron. Because opposite charges attract, the atoms bond together to form a molecule.

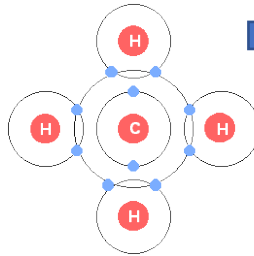
Transforming this concept to business venture that an organization wants to enhance in a certain domain but has no strength and there exists one or more organizations which have this required strength which can be shared to form a new venture (molecule). In the depicted image, Sodium Na has 1 electron excess and Chlorine has 1 electron deficient, hence these two elements can combine to form Sodium chloride [8] (ionic bonding), like a new venture. Some more examples are shown in the following pictures. These pictures are anonymous to only describe the concepts.



Hydrogen    Oxygen    Hydrogen



Water - H<sub>2</sub>O

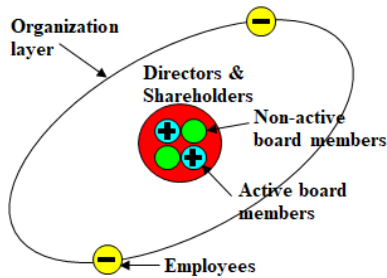


Oxygen forms two bonds with two hydrogens to form water molecule (covalent bonding). Carbon form 4 bonds with hydrogen to form Methane (covalent bonding). As such, companies form partnerships with other companies to form new business ventures. As Garry describes the science that results from the integration of a constellation of underlying disciplines such as chemistry, biology and physics to evolve biotechnology, nanotechnology, in his science-based business paper [9], the proposed methodology can also be a result of proper implementation of chemistry principles to evolve successful business ventures. Ionic bonding is stronger in some compounds and Covalent is stronger on other compounds. We use both types of bonding as with the situation needs.

## II. ATOMIC AND ORGANIZATIONAL CONCEPTS AND CALCULATIONS

Atom is a structured configuration of particles while company is a structured configuration of people. Although atomic structure and company structure are two different perspectives, a commonality can be identified. We identify the commonalities in two structures and map them to observe principal character that can be utilized in forming business ventures.

### A) Atomic Organization



Every combination of people or elements or for that matter anything in nature whether physical or abstract, is a perfect organization of charges that move around in search of a mate or matching for evolution. It is nature. Business is a need of people who are charged with positive or negative and coexist in an organizational setup.

If we look at the basic structures, one can see commonness between an atomic structure and a company structure as described in below Table 1. Let us consider the atomic number of an element, which provides valency information for that element. And consider the business domain strength of a company as an atomic number of that business domain, where we can calculate the valency, which describe the capability to donate or acquire at employee (knowledge) level.

	Atom	Company
Nucleus	Nucleus	Board of Directors & shareholders
Protons	Particles with positive electric charge	Active directors & shareholders
Neutrons	Particles with no net electric Charge	Non-active directors & shareholders
Orbit	Path in which electrons move	Organization layer
Electron	Particle with negative electric charge, characterize the element	Employees and others responsible for the performance of organization
Valence electrons	Excess or Deficient electrons in the outermost orbit	Strengths and weaknesses

Table 1: Atomic Organization Mapping

### B) Normalized Domain Strength Calculation

All companies create their customer bases for each domain of their business (for example, mobiles, cars, toys, computers, sports equipment, etc) in different regions (North, South, East and West). In order to find out atomic number of a business domain, we summarize the strengths information in Table 2, in terms of customer bases in the four as given below. Also, we summarize the existing ventures or collaborations information in the same table.

n	N	e
W	A#	E
w	S	s

Table 2: Strength-identify for each business domain

A#: Normalized domain strength of a particular business domain

N, S, E, W: Existing customers in North, South, East, West regions

n, s, e, w: Existing ventures and collaborations in these regions respectively.

Normalized domain strength of a company can be calculated using below formula.

Normalized domain strength: 
$$nC_i = C_i - \frac{\sum_i C_i}{\sum_j V_j}, \forall i, j$$

where,

$$C_i = \{\text{existing customers}\}, i \in [N, S, E, W],$$

$$V_j = \{\text{existing ventures}\}, j \in [n, s, e, w]$$

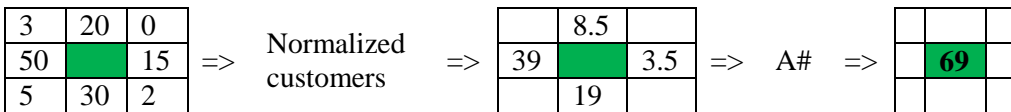
Special cases:

- 1)  $V_j = 0, \forall j$ : means that there is no at least one venture in any region. Without having venture, no organization can survive. Business truth, so  $\sum_j V_j \neq 0$
- 2)  $\sum_j V_j = 4, \forall j$ : means that there is at least one venture in each region, which cannot help determining the strength, so  $\sum_j V_j > 4$ , no need to be an integer value, it can be a fraction value.
- 3)  $\sum_i C_i = 8, \forall i$ : then  $nC_i$  becomes  $< 1$ . We cannot work with chemical periodic table, so  $\sum_i C_i > 9$ .

### C) Numerical Examples

Numerical examples can help understand the calculation of normalized domain strength (A#), we provide two example, general case and extreme case:

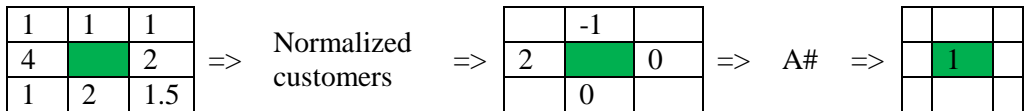
Example1 (General case): Let the existing customers in four regions be:  $C_i = \{20, 30, 15, 50\}$  where  $i \in [N, S, E, W]$  and the existing ventures in four regions be:  $V_j = \{3, 2, 0, 5\}$  where  $j \in [n, s, e, w]$



This 69 can be taken as an atomic number of this particular business domain (not the whole organization). We can now look into the chemical periodic table which chemical element it represents. In this particular example, it represents Thulium whose valency is 3+. Place this valency in the Business Matching Table which is described in next section, to find out matching partner for a perfect venture.

Another example which calculates with bottom line values.

Example 2 (Boundary case) Let the existing customers in four regions be:  $C_i = \{1, 2, 2, 4\}$  where  $i \in [N, S, E, W]$  and the existing ventures in four regions be:  $V_j = \{1, 1, 1, 1.5\}$  where  $j \in [n, s, e, w]$



The atomic number of this particular business domain is 1, which represents Hydrogen in the chemical periodic table and whose valency is 1+. The negative value in normalized customers table signals the organization need to mobilize the strengths in the corresponding region if interested.

### III. BUSINESS MATCHING TABLE CONCEPT

Business matching table (BMT) is a table that helps business units to identify themselves in a position, based on their strengths and weaknesses (valences), also can find a right match to form a perfect chemical bonding or business venture to fulfil their business interests. A company which has less than 5 employees is termed as Micro and can be categorized as Sole Proprietor organization, similarly, a company which has more than 2500 employees can be termed as a corporation and can be categorized as large corporation. These are common terminologies in the business world.

		Business Matching Table																
		Weakness								Strength								
		-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8
		A8	A7	A6	A5	A4	A3	A2	A1	AB	B1	B2	B3	B4	B5	B6	B7	B8
Corporation	> 2500 Corp.																	
Small Corp	< 2500 XXLarge																	
	< 1000 Xlarge																	
LLC	< 500 Large																	
	< 250 Medium																	
Partnership	< 50 Small																	
	< 25 Mini																	
Sole Proprietor	< 5 Micro																	

Table 3: Business Matching Table

A1-A8: Negative valency numbers from -1 to -8

AB: No valency, inert state

B1-B10: Positive valency numbers from 1 to 8

Strength / Weakness: Every company will have a kind of strength / weakness in certain business domain. Such as a service provider company can have weakness in mobile technology or security technology, etc. Weakness can be overcome by making bonds with suitable companies which are stronger in those business domains.

Each cell in business matching table shall represent a set of characteristics which will be reflected in all those organizations. In this BMT definition, organizations will have continuous opportunity to move from one cell to another based on their changing strength in customer base. The relative gap in characteristics of cells will help guide organizations to determine the required resources to move in to desired cell by calculating the valency.

Initially, most of the companies shall be established on their own strengths, however, in the course of business running, their strengths change. Strengths and weakness change continuously. If each organization documents the valences of their business domains in this table, it is easy to find venture partner from this BMT table.

Business matching table though looks simple, but if we do simulation of strengths / weaknesses (valences) and business aspiration (needs) in all geographical regions and in all the business domains, the input size (number of parameters) increase, which leads to big-data analytics, we skip the details of this direction of research in this paper.

#### IV. RESULTS AND ANALYSIS

Thulium valency is 3+, it can have strong bonding with elements whose valency = 1 to form 3 bonds

valency = 1 to form 1 bond + valency = 2 form 1 double bond give total 3 bonds. Thulium has chemical bonding solutions with Oxygen and Ferrous to form Thulium Oxide ( $Tm_2O_3$ ) and Thulium Fluoride ( $TmF_3$ ), these are common. Here, we are not interested in the core chemistry but interested in the patterns of chemical bonding which can reflect in forming partnership towards ventures. In this particular example, Thulium valency can be positioned in our BMT at (Xlarge, B3) cell as shown in below figure. From the BMT table (Xlarge, B3) can form 3 bonds with any of A1 cells. In business terms it can form 3 single partnership associations with the companies whose valency is in A1 column. Or, (Xlarge, B3) can form 1 bond with any cell in A1 column and one double with any cell in A2. This can be seen in below figure.

			Business Matching Table																
			Weakness								Strength								
			-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8
			A8	A7	A6	A5	A4	A3	A2	A1	AB	B1	B2	B3	B4	B5	B6	B7	B8
Corporation	> 2500	Corp.																	
Small Corp	< 2500	XXLarge								1									
	< 1000	Xlarge								1				3					
LLC	< 500	Large								2									
	< 250	Medium								1									
Partnership	< 50	Small																	
	< 25	Mini								1									
Sole Proprietor	< 5	Micro																	

In business ventures it always recommended to have minimum number of bindings, which necessitates to a search problem in order to find closer valency to 3. Here the valency is small number, we do not worry much but if the valency gets larger and positioned in B7, we will have to search all columns A1-A6 for suitable pairs. We can use “Find a pair with given difference” algorithm to achieve this search. In this particular search the difference number can be half of valency number so that we can minimize the number of associations. The time complexity of this search algorithm can be reduced to  $O(n \log(n))$  time by writing best logic algorithm, where big-O is order and n is the valency number.

### V. CONCLUSION

Capital accumulation strategies are tools in economy growth. However, the ultimate players in this process are organizations. These organizations in the globalization trend scenarios need to go into ventures across the world. Forming ventures is not easy, which may end up in mutual losses. To avoid any losses, it is recommended to adopt suitable concepts or methodologies. One of these concepts described in this paper is chemical bonding concepts. The paper described what the chemical elements are and how the bonding concept could be applied in business. Then creating a mapping with business organization structure where the chemical bonding process is implemented. The business matching table introduced here provides a way to find the partners to form stronger ventures. The process of finding venture partners is described with one example, but if we fill all the columns of the BMT, we will get large sets of data. As an extension of this research we create datasets and implement search algorithms to find the best match for a given valency.



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