Available online www.jocpr.com

Journal of Chemical and Pharmaceutical Research, 2014, 6(1):351-354

Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Research on game analysis of chemical and pharmaceutical enterprise behavior

Changhui Yang* and Ju Kang

School of Business, Zhengzhou University, Zhengzhou City, Henan Province, China

---

ABSTRACT

To analyze the two basic characters of information abundance and reachness, build and explain the information utility indifference curve of information abundance and reachness combination, put forward the information combination must be evolved higher utility based on the advancement of information technology, and carries through game analysis of enterprise behavior of realizing information combination the most utility. This will help Enterprise to realize the maximization of information combination utility by means of merging, forming a virtual enterprise with other enterprise and other different means.

Keywords: Information Technology, Information Abundance and Reachness, Information Combination, Information Utility Indifference Curve, Game Theory.

INTRODUCTION

The development of information tech and the appearance of digital network allow people to communicate quicker and share richer information with much more people, which make information more important among the four production factors (labor force, capital, land and information) of enterprise. All these have directly forced change of enterprise behavior model under the traditional economy, led to rebuild it under the new economy wave, promoted evolution of enterprise behavior model from closed hierarchy system in the industry age to open network in the information era and made enterprise must change itself model based on information[1,2].

INFORMATION COMBINATION UTILITY INDIFFERENCE CURVE

When transmission relies on entity, information should make a choice between its abundance and reachness[3, 4] (see Figure 1). Reachness means the amount of people changing information while abundance can be defined as several aspects based on information itself: a) amplitude (or bandwidth), it can complete the whole process from senders to receivers within the specific time. b) pertinence of information. c) interactivity, reliability, security and mobility etc. of information. According to this basis, the formula of information abundance and accepted quantity are as follows:

$$x = f(a,b,c,d,e,f) \qquad \text{formula 1}$$

$$y = f(p) \qquad \text{formula 2}$$

Hereinto, x stands for abundance function which is decide by amplitude (a), pertinence (b), interactivity (c), reliability (d), security (e) and mobility (f), y stands for reachness function, decided by the amount of people exchanging information (p).

Combination utility indifference curve is built by means of ordinal utility of microeconomics[5].

Three hypotheses are created through the curve:
1. The combination of information abundance and reachness from enterprise can tell its preference.
2. The preference of information combination from enterprise is transmissibility.
3. The preference of more information abundance and reachness from enterprise is always more than less information abundance and reachness.

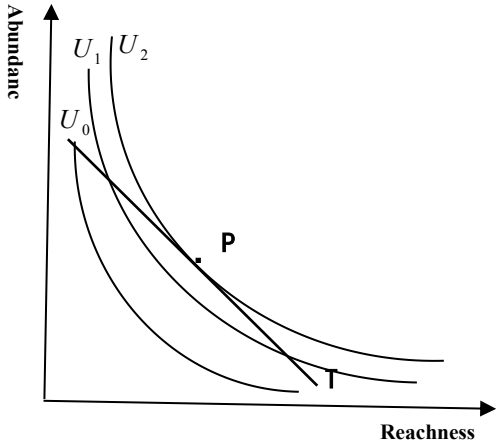

Figure 1. Indifference Curve of Information Combination Utility

Suppose, U stands for information abundance and reachness of information utility, q_1 stands for the quantity of information abundance, q_2 stands for the amount of reachness, then an information utility function has been calculated:

$$U = f(q_1, q_2)$$ formula 3

Now study different combination form of information abundance and reachness under the same utility level, namely, U in formula 3 is a constant. Under this level, many combination of q_1, q_2 satisfy formula 3 and these different combination mean no difference to enterprise, that is the same utility. Thus we can draw Figure 1, the information utility indifference curves U_0, U_1, U_2 of information abundance and reachness.

In the curve, every point stands for a combination of information abundance and reachness; therefore, information utility indifference curve brings all kinds of tracks of information abundance and reachness of the same utility. In the curves, every curve means a utility level. For example, on the curve U_1, A_1 and E respectively means information abundance and reachness both of which bring the same utility to enterprise. However, the curves U_0, U_1, U_2 represent different utility levels. In the figure, the utility level of U_2 is greater than U_1 and the utility level of U_1 is greater than U_0, namely, $U_2 > U_1 > U_0$.

Information utility indifference curve has characters as follows:
1. When the curve inclines to lower right, the slope is negative.
2. Any two curves cannot intersect.
3. The curves are convex to the origin, the slope is higher.
When the curves are convex to the origin, the slope is lower.

GAME ANALYSIS OF CHEMICAL AND PHARMACEUTICAL ENTERPRISE BEHAVIOR

Suppose that the information combination utility indifference curve U_2 is the biggest reached information combination utility indifference curve under the control of information technology line T, the point of tangency P is balance point, U_1 is the information combination utility indifference curve of enterprise A.

Enterprise A, with its final target to realize the maximization of information combination utility, can use different means like alliance or making a virtual enterprise with other enterprise (hereinafter called by a joint name “alliance”

for convenience of analysis), namely reaching the point P in Figure 1.

Suppose many companies (M) are taken into enterprise A's consideration, then the action set of A and the alternative enterprise (m) are respectively expressed as β_A and β_m （ $m = 1,2,3,\cdots,M$ ）， then we can get $\beta_A = \beta_m \in C =$ {consent， refuse} which is expressed as $C = \{Y, N\}$. Suppose the values of information combination utility of enterprise A and the alternative enterprise m are $P_A^{'}$ and $P_m^{'}$ respectively. After enterprise m is combined, the related expected values of information combination utility are $EP_A = P_A^{'} + \Delta P_A$ and $EP_m = P_m^{'} + \Delta P_m$, ΔP_A and ΔP_m stand for value increments of information combination utility with unlimited symbols.

Then there are four action sets between enterprise A and alternative enterprise m, namely, (Y,Y) , (Y,N) , (N,Y) and (N,N) . If expected value of information combination utility means payment value, we can get payoff matrix, see Sheet 1.

Sheet 1 payoff matrix of action set

		Alternative Enterprises m	
		Y	N
Enterprise A	Y	EP_{AY}, EP_{mY}	EP_{AY}, EP_{mN}
	N	EP_{AN}, EP_{mY}	EP_{AN}, EP_{mN}

When (Y,Y) is the best strategy combination of two-way selection between enterprise A and m and no transfer payment happened, it shall satisfy the formula 4:

$$\begin{cases} EP_{AY} > EP_{AN} \\ EP_{mY} > EP_{mN} \end{cases}$$ formula 4

Namely

$$\begin{cases} \Delta P_A > EP_{AN} - P_A^{'} \\ \Delta P_m > EP_{mN} - P_m^{'} \end{cases}$$ formula 5

The inequation $EP_{AN} \geq P_A^{'}$ and $EP_{mN} \geq P_m^{'}$ shall be always effective when analyzing the primary term of combining the alternative enterprise m, it is:

$$\begin{cases} \Delta P_A > 0 \\ \Delta P_m > 0 \end{cases}$$ formula 6

The formula 6 illustrate that the precondition for decision makers of enterprise A and m both agreeing to implement combination should make the expected value of information combination utility greater than zero after combination, this kind of game is a win-win game.

Suppose transfer payment exists, which means enterprise A shall make compensation to m, thus the condition for realizing the best strategy combination (Y,Y) is:

$$EP_{AY} + EP_{mY} > EP_{AN} + EP_{mN}$$ formula 7

That is:

$$\Delta P_A + \Delta P_m > EP_{AN} + EP_{mN} - (P_A^{'} + P_m^{'}) > 0$$ formula 8

So :

$\Delta P_A + \Delta P_m > 0$ formula 9

Suppose that there existing many alternative enterprises (N) satisfy the basic condition of the best strategy combination (Y,Y) , hereinto, $1 \le N \le M$, then these alternative enterprises are the target enterprises that enterprise A is ready to ally and the one selected should subject to the preferential game result between decision makers.

Suppose the expected values of information combination utility are EP_{An} and EP_n respectively after enterprise A allies with target enterprise $n(n = 1,2,3,\cdots,M)$, then $EP_{nN} \ge P_n^{'}$ shall be the external opportunity value if target enterprise n is not willing to ally with enterprise A.

If no transfer payment exists, the optimal target enterprise n shall satisfy the following formula to realize the best strategy combination:

$$\begin{cases} EP_{An'} \ge EP_{An} \\ EP_{n'} \ge EP_{n'N} \end{cases} \quad (n \ne n') \qquad \text{formula 10}$$

The best strategy combination (Y,Y) to satisfy the formula 10 can be called weak dominate strategy balance between enterprise A and target enterprise $n^{'}$. If formula 10 is a strong inequality, the best strategy combination (Y,Y) shall be called strictly dominate strategy balance.

If transfer payment exists, the best strategy combination (Y,Y) shall satisfy:

$$EP_{An'} + EP_n^{'} \ge EP_{An} + EP_{n'N} \quad (n \ne n') \qquad \text{formula 11}$$

The formula 11 illustrates that the total expected value of information combination utility happening between enterprise A and target enterprise $n^{'}$ shall be no less than total expected value from any other selected actions between enterprise A and target enterprise $n^{'}$, then alliance between them reaches the best information combination utility.

CONCLUSION

The development of information technology has made bigger utility tendency of information abundance and reachness combination. Enterprise can realize the maximization of information combination utility through merging, forming a virtual enterprise with other enterprise and other different means. This paper has discussed behavior selection during the progress of realizing the maximized information combination utility based on analyzing the information utility indifference curves of information abundance and reachness combination.

Acknowledgment
This paper was supported by NSFC (71272207, 71301150, U1304705), NSSF 13BGL061 and 10YJC630326 (Humanity and Social Science Foundation of Ministry of Education).

REFERENCES

[1] Tang, Triplex Scott, Art, Caston, *Paradigm shift - IT prospects*, **1999**, 6: 9-23.
[2] Barbara McNurlin. *MIT Sloan Management Review*, **2001**.Winter, 42(2): 13-26.
[3] Philip B. Evans & Thomas S. Wurster, *Harvard Business Review,* **1997,** 5: 71-82.
[4] Robert S. Pindyck, Daniel L. Rubinfeld, Microeconomics, Prentice-Hall International, Inc. **1998**, 57-92.
[5] Hitt. L. M and Brynjolfsson. E., *MIS Quarterly*,**1996**, 20(2): 121-142.