Machine Learning and Statistical Based Investigations on Competitor Analysis – Certain Novel Discovered Facts

Prasun Chakrabarti[1], Prasant Kumar Sahoo[2]

[1]Department of Computer Science and Engineering ,Sir PadampatSinghania University, Udaipur, Rajasthan, Pin- 313601
[2]The Vice-Chancellor, UtkalUniversity ,Bhubaneswar, Orissa ,Pin-751004
INDIA.

[1]prasun9999@rediffmail.com, [2]prasantsahoo12@yahoo.co.in

ABSTRACT

The paper entails certain discovered facts related to concept learning , artificial neural modeling of customer based approach of identifying competitors. Statistical based investigations have also been carried out based upon two significant factors of image and positioning strategy viz. market impact and profitability.

Keywords*: Concept learning ,artificial neural modeling , market impact , profitability*

INTRODUCTION

Competitor analysis (Aaker,2005) starts with identifying current and potential competitors. Understanding the competitors plays a pivotal role towards efficient external analysis in strategic market management. Based on the understanding of market impact of the competitor, strategic decisions has to be taken. Similarly profitability also is an essential parameter of judgement. A business that has a downfall trend in profitability may find it extremely difficult to gain access to capital either externally or internally.

DISCOVERED FACTS BASED ON MACHINE LEARNING AND STATISTICS

Claim 1- The customer-based approach of identifying competitors can be governed by concept learning and artificial neural modeling.

Illustration –

The objective of customer-based approach (Levitt,1960) is to investigate the intensity and market impact of competitors and also to understand whether they are grouped in strategic groups on the basis of their assets, competencies, etc.

In the view of above, the prosed concept learning based 4-tuple hypothesis indicated (£,€,α,β) where

£ indicates any value that is accepted ,

€ indicates a necessary and sufficient value,

α indicates no value is acceptable, and

β indicates undefined value.

Let the random variables μ1, μ2 , μ3 and μ4 denote relative level of intensity, relative measure of market impact , strength grid based on assets ,and sales-profit level in the past.

Based on the aforesaid variables ,the statistical hypothesis (Giri and Banerjee ,1999) is to be investigated . Accordingly the variables are to be mapped with the 4-tuple form (£,€,α,β).

Let us take a X is a potential competitive entrant. Since no trend analysis is available, the alternate hypothesis leads to be mapped 4-tuple representation (φ , μ3, φ , (μ1, μ2 , μ4)) where φ indicates null attribute.

Based on the statistical assertion, the concept learning based mapped representation is as follows–

(φ , (μ3, μ4), (μ1, μ2) ,φ) if X is less intense competitor and

((μ1, μ2) ,(μ3, μ4), φ ,φ) if X is more intense competitor.

We propose artificial neural based model (Mitchell, 1997) based on the input parameters (quantified value in 1-point scale as per hypothesis) related to competitor analysis.

Let   x1 : level of commitment of competitor

x2 : cost structure of competitor

x3 : effective image and positioning strategy of competitor

x4 : market growth rate of competitor

x5 : estimate of strength of competitor

x6 : strength grid of competitor

The output received by the soma of artificial neuron is

$$\delta = \sum_{i=1}^{6} w_i * x_i \quad \text{...(1)}$$

 where wi is the corresponding weight of the parameter xi.

The bias is the output received by the soma of the artificial neuron of the organization whose competitor analysis is to be examined.

Hence, the actualoutput of the proposed neural model can be represented as the trivalent form

(-1,0,+1) based on the following conditions –

If δ >bias , then output is +1 indicating competitor is more intense ;

If δ< bias ,then output is -1 indicating competitor is less intense ;

If δ = bias ,then output is -1 indicating competitor is at per level.

Claim 2- Understanding competitors based upon profitability can be governed by exponential growth model.Reduction in tolerance limit in level of growth of sales and market share is a function of level of degrade in vitality of business strategy ,measure of threshold tolerance limit and probabilistic measure of profit.

Illustration –

Increase in profitability on timing basis leads to increase in level to access capital in investment.

ISSN: 2186-8476, ISSN: 2186-8468 Print
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The proposed mathematical relation is a follows:

$$\ln (L_{P2} / L_{P1}) = (L(C2) - L(C1)) . x \dots\dots\dots\dots\dots\dots\dots\dots\dots.\dots\dots\dots\dots\dots....(2)$$

where L_{P2}, L_{P1} denote the profitability levels at timing instants t2 and t1 respectively (t2 > t1), $L(C2)$, $L(C1)$ be the levels to access capital for investment at timing instants t2 and t1 respectively and x be a parameter such that x = 1/T, T being a time constant which provides a measure of how rapidly the variable L_{Pi} changes.

Therefore, $L_P = L_{P0} . e^{(L(C)/T)}$ …………………..(3)

Hence, the Eq(2) signifies the validity of exponential growth pattern.

We further propose

$$RT_E = \max (0, RT_{(Ti)}) \dots\dots\dots\dots\dots\dots\dots\dots\dots.......................................\dots\dots(4)$$

and

$$RT_{(Ti)} = (€ .LT_N - \beta) \dots\dots.....\dots\dots\dots\dots\dots\dots\dots\dots\dots.......................................\dots\dots.(5)$$

where RT_E is reduction in tolerance limit in level and growth of sales and market share ,
$RT_{(Ti)}$ is reduction measure of tolerance limit,
€ is level of degrade in vitality in business strategy,
LT_N is measure of threshold tolerance limit
and β   is probabilistic measure of profit.

Also, € = (1-β) and assign LT_N =0.5 as average fuzzy value (Zadeh , 1965).

Hence   when β ≈ 1, then € ≈ 0 whereby RT_E =0. It signifies that tolerance limit LT_N is maintained corresponding to significant probabilistic measure of profit.

If β ≈ 0, then € ≈ 1 whereby $RT_E = RT_{(Ti)} = x$ (say).

Therefore, $LT_C = LT_N - x$ …………………………………………………….………(6)
where LT_C = the current tolerance limit.

C. Claim 3 - In case of competitor analysis of image and positioning strategy with respect to the most two significant factors viz. market impact as well as profitability, a future prediction regarding the competitor analysis based on any one of the factors can be realized based upon the past trend analysis of the other .

Illustration –

Let us assume that the observation period of competitor analysis of image and positioning strategy with respect to market impact as well as profitability is of x units and between timing instants t1 and tx.

We propose a bivalent state [-1,+1] such that -1 indicates the competitor to be less intense or at par level while +1 indicates the competitor to be more intense.

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In the initial two observation periods , status of each of market impact and profitability has been observed in 4 timing instants. Let M_1= (+1,-1,-1,+1), P_1 = (+1,-1,+1,-1), M_2= (-1,-1,+1,+1), P_2= (+1,-1,+1,+1) .

We proposeto compute $M_1^T P_1 + M_2^T P_2$ which is in the form of a 4 x 4 matrix (say S1). This S1 will serve as the need matrix and in the next observation period the following inferences are hereby proposed –

Step 1 – Form a matrix (1 x4) either for market impact or for profitability (say S2).

Step 2 – Compute S2 * S1 and yield a 1 x 4 matrix (say S3).

Step 3 – Map the values of the 4 elements of S3 with that of the bivalent state [-1,+1] such that a value less than or equal to zero is represented by (-1) while a value more than zero by (+1) .

Step 4- The resultant mapped 1 x 4 matrix will predict the corresponding predicted status of the associated factor (either market impact or profitability).

Hence, in case of competitor analysis of image and positioning strategy with respect to the most two significant factors viz. market impact as well as profitability, a future prediction regarding the competitor analysis based on any one of the factors can be realized based upon the past trend analysis of the other .

CONCLUSION

The paper points out the following discovered facts:

1. The customer-based approach of identifying competitors can be governed by concept learning and artificial neural modeling.

2. Understanding competitors based upon profitability can be governed by exponential growth model. Reduction in tolerance limit in level of growth of sales and market share is a function of level of degrade in vitality of business strategy ,measure of threshold tolerance limit and probabilistic measure of profit.

3. In case of competitor analysis of image and positioning strategy with respect to the most two significant factors viz. market impact as well as profitability, a future prediction regarding the competitor analysis based on any one of the factors can be realized based upon the past trend analysis of the other.

ISSN: 2186-8476, ISSN: 2186-8468 Print
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ABOUT AUTHORS

Dr. Prasun Chakrabartiis currently serving as Associate Professor and Head of the Department of Computer Science and Engineering of Sir Padampat Singhania University, Udaipur. He obtained Ph.D(Engg) degree from Jadavpur University in 2009, M.E. in Computer Science and Engineering in 2005 and B.Tech in Computer Engineering in 2003. He has about 101 papers in reputed national and international journals and conferences as well as 9 filed Indian patents in his credit . He has several visiting assignments at BHU Varanasi , IIT Indore et al. He visited Graduate School of IPS, Waseda University, Fukuoka, Japan Honorary Visiting Professor in May 2012 under INSA-CICS Travel Fellowship. He has been invited as Honorary Visiting Professor by Dr.H.Guo Associate Professor ,College of Management and Economics, China University of Geosciences, Wuhan China for delivering expert lectures on Application of Artificial Intelligence in Industrial Informatics in May 2014.

Prof. Prasant Kumar Sahoo, M.Com., FDPM, Ph.D. is educated at Utkal University and the Indian Institute of Management, Ahmedabad. Before joining as Professor of Management in Utkal University in 1991, he was also a Professor of Management in Berhampur University from 1987 to 1991 and was a faculty member of the P.G. Department of Commerce, Utkal University from 1976 to 1987. He was the Head of the Department of Business Administration in Utkal University from 1995 to 1997 and from 1990 to 19991 in Berhampur University. He was the Programme Director of MBA (Executive) Programme of Utkal University for two years (1995-1997). He has a large number of research papers published in various journals to his credit and is the author of four text-books. In addition, thirty two scholars have successfully completed their doctoral research under his supervision in the areas of Accounting and Finance.Three scholars working under his guidance have earned D.Litt. Prof. P.K. Sahoo is a core member of the AICTE expert Committee, a member of Editorial Board of Bima Quest, Journal of National Insurance Academy, Pune and was the Managing Editor of Sankalpa Journal for Management Development and Application for two years. He was also the Director, Directorate of Distance and Continuing Education, Utkal University in addition to hisnormal duties in the Department. Prof. Sahoo was also Head of the Department of Business Administration, Utkal University and the Warden of P.G. Hostels in the same University in 2006-2007. He was the Coordinator of the 5 Year Integrated MBA Programme, Chairman, P.G. Council and a member of the Syndicate of Utkal University. At present, Prof. Sahoo is the Vice-Chancellor, Utkal University. His current research interest is the investigation of the practical application and utility of Accounting and Finance theories in the Indian context.

ISSN: 2186-8476, ISSN: 2186-8468 Print
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