

**An Empirical Study of the Patterns of Competitive Dynamics in the Smart Phone
Industry**

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ABSTRACT

This research developed a model to discuss a potential pattern of competitive dynamics in the smart phone industry. We used structured content analysis and time series analysis to conduct the research on four major smart phone manufacturers, including HTC, Nokia, RIM and Apple, during 2007 and 2010. The data were collected from The Liberty Times of Taiwan from the third quarter of 2007 to the end of 2010, the US Securities and Exchange Commission (SEC), Wharton Research Data Services (WRDS) and Market Observation Post System (MOPS). The results indicate that in the smart phone sector, individual firms may not attack against each other, while their foci may only be on how they manage the market and increase market share.

Keywords: competitive dynamics, organisational performance, competitive environment, emerging markets, the smart phone industry, action-response perspectives.

INTRODUCTION

In the 1950s, Schumpeter (1950) proposed the idea of creative destruction to explain the importance of innovation in competitive dynamics (Bouwer, 1981). With the Schumpeterian view in mind, the Austrian School (Jacobson, 1992) further considers that competition among firms is dynamic instead of static, and that entrepreneurial innovation is the key to business success. Firms initiate creative actions (new products and services, new promotions, alliances, and so on) to create opportunities and gain profits, and in so doing they replace older initiatives that are no longer competitive. If their strategies are successfully executed, they may be able to earn monopolistic profits and gain advantages (Lee, et al., 2000).

In general, competitive advantage can only be retained until competitors imitate or exceed the advantage threshold (D'Aveni, 1998). In competition between the focal firm and rival firms, once the advantage is copied or surpassed, it is no longer an advantage. For each of individual advantages, it may be understood that there is a narrow time window for utilizing innovation or other strategic actions to gain competitive advantage; the advantageous edge of the innovators may begin to crumble, as soon as the rivals or even the oppositions begin to fight back (D'Aveni, 1998; Grimm, et al., 2005). This is related to a critical argument in strategic research stream in terms of *competitive dynamics* that argues that the causal understanding between firm strategy and performance lies in the competition level between the focal firm and rival firms (i.e. rivalry) (D'Aveni, 1998). Thus, the investigations of competitive dynamics research are often on the action-response relationship between (or among) the focal and rivals.

While most of the previous studies have tended to contribute a dynamic view on how firms compete in a competition market, they have adopted a simple and static characterization of competition that has no direct correlation to the real business environment. In D'Aveni's (1998) study of strategic manoeuvring, he came up with a dynamic theory of competitive advantage that states firms succeed by

creating temporary measures which place them one step ahead of the competition. His theory has sparked considerable interest among scholars. However, empirical studies to support the dynamic theory of competition are relatively deficient. The research aims to fill this gap by proving that an empirical model of dynamic competition is the underlying force of the smart phone industry.

Following the concept of D'Aveni's (1998) strategic manoeuvring and Chen's (Chen, et al., 1995) idea in modelling the phenomenon of competitive dynamics, the research tends to reveal the pattern of competitive dynamic in the smart phone industry. Dynamic thinking is essential in the smart phone industry where the competition is tough as we can observe. An analogy may be made with wrestling – while all the wrestlers in the rink want to stay on their feet, the only way they can do this is by knocking down their opponents. This is just the situation in the smart phone industry. Winning means devising competitive strategies that place one firm ahead of all the others.

THE PARADIGM: THE ACTION-BASED COMPETITION

The most important factor in forecasting the actions and capabilities of initiatives and responses of rival firms is understanding how their managerial and strategic activities operate. To explain how firms compete with their competitors according to the action-response philosophy, especially in dynamic, rapidly changing markets, In Chen's framework (1996) – the integrated framework of competitor analysis and interfirm rivalry, he came up with propositions in seeking possible drivers of competitive behaviours of the firm, namely, the *awareness - motivation - capability* (AMC) perspective. By using the AMC perspective, he tended to illustrate a firm's internal operational drivers in triggering its strategic actions (and responses), and thus providing a complete analysis for understanding the patterns of competitive dynamics.

In the same vein, Ferrier and his colleagues employed two proxy measures, “stock price” and “market share”, to quantify the competitive dynamics (Ferrier, et al., 2002; Ferrier et al., 1999). Although Ferrier and colleague (1999 & 2002) contributions are significant, only using stock price or market share to measure competitive dynamics is rather limited. In thinking so, this study builds a framework that explains what antecedents of firm strategic actions can affect a firm's outcomes in reflecting the firm's competitive dynamics by measuring its operational performance. Hence we used the measures in terms of net income to measure the firm's competitive dynamics.

The Patterns of Competitive Dynamics

Following the study of Ferrier et al (2002), the research used a “*U-shape*” structure to illustrate the potential patterns of competitive dynamics in a rapidly changing environment. As Ferrier and his fellows (2002) defined, a generalized sequential pattern of actions and risks on the abnormal returns of focal firms may attribute, as following patterns,

- When action sequence attributes are intensive, complex, unpredictable and heterogeneous, decision risk is high, action risk is low, and the focal firm can get good abnormal returns.
- When action sequence attributes are restrained, simple, predictable and homogeneous, decision

risk is low, action risk is high, and the focal firm can also get good abnormal returns.

According to this generalized pattern, the research reshaped the potential patterns of “strategic intensity,” “strategic complexity” and “strategic predictability” on firm performance for the measurement of strategic actions in firm operations in response to the actions raised by the rival firms.

Strategic intensity is defined as the level of attack that a company uses in attempting to gain competitive advantages. This definition is the same as that found in previous research (Ferrier & Lee, 2002; Young, et al., 1996). Typically, a series of attacks are put out, and strategic intensity measures these from the beginning to the end (Ferrier & Lee, 2002; D’Aveni, 1998). A related concept is the inclusion of tactical/strategic offensive action.

Strategic complexity refers to the different types of actions used to gain competitive advantages. A company with strategic complexity is one that uses various kinds of attacks (Miller & Chen, 1996; Ferrier & Lee, 2002). If an industry uses complex attacks, it indicates that the competition in this industry is fierce; conversely, if the attacks are straightforward and few in number, there is little competition in this industry (D’Aveni, 1998; Miller & Chen, 1996; Ferrier & Lee, 2002).

Strategic predictability is the ability to forecast the strategic actions of a company. Firms that surprise their opponents disrupt the status quo in order to create advantages within the industry (Ferrier & Lee, 2002; D’Aveni, 1998; MacCrimmon, 1993).

Hypotheses

In a hypothesis form (as following the style of Ferrier and Lee (2002)), we defined the following hypotheses in order for the illustration of the patterns of competitive dynamics in a “hypo-competitive” environment:

Hypothesis 1: There is a positive U-shaped relationship between a firm’s strategic intensity and its net income returns.

Hypothesis 1a: There is a positive U-shaped relationship between the focal firm's level of strategic intensity and its net income returns.

Hypothesis 1b: There is a negative U-shaped relationship between the focal firm's level of strategic intensity and the rival firm's net income returns.

Hypothesis 2: There is a negative U-shaped relationship between a firm’s strategic complexity and its net income returns.

Hypothesis 2a: There is a negative U-shaped relationship between the focal firm's level of strategic complexity and its net income returns.

Hypothesis 2b: There is a positive U-shaped relationship between the focal firm's level of strategic complexity and the rival firm's net income returns.

Hypothesis 3: There is a negative U-shaped relationship between a firm's strategic predictability and its net income returns.

Hypothesis 3a: There is a negative U-shaped relationship between the focal firm's level of strategic predictability and its net income returns.

Hypothesis 3b: There is a positive U-shaped relationship between the focal firm's level of strategic predictability and the rival firm's net income returns.

METHODS

Sample and data collection

We investigated the pattern of competitive dynamics in the smart phone industry as it may reflect a dynamic and rapidly changing environment, in response to the contemporary environmental manner of 'hyper-competition' (D'Aveni, 1998). We set the scope to the smart phone industry by taking the top four smart phone manufacturers in the world as the panel. These include Nokia, RIM, Apple and HTC. These four smart phone manufacturers in total occupy very high shares (over 80%) of the global market share within the survey years (from 2007 to 2010).

For data collection, the research conducted structured content analysis in quantifying news information. Data was collected from the "news data bank" available from the Liberty Times in Taiwan within the period from the third quarter of 2007 to the end of 2010. The research also collected financial information in relation to net profits from the US Securities and Exchange Commission (SEC), Wharton Research Data Services (WRDS) and Market Observation Post System (MOPS) within the same period of survey years. The data was collected according to the financial information in terms of net incomes and the actions (reactions/responses) that were taken by those four leading companies in the smart phone industry. In addition, for Apple specifically, its financial information was involved its other products, such as notebooks, personal computers and tablet PCs. The research extracted Apple's i-phone net profits individually. This was to ensure the accuracy of data collection.

Measurement

Dependent Variable

The research used *event study methodology* to test the quarter of the sum of the companies' net profit as the dependent variable. This approach is recommended by McWilliams & Siegel (1997). Analysing net profit is the best way to obtain direct results regarding different types of attacks. It is also the most convincing outcome reflecting a company's operations. After gathering this information, the research collected news on the strategy attacks of the companies in this study to try to understand the logic of the smart-phone industry. The attacks that did not affect the opponent's counter-attack in a given season served as the dependent variable for the research.

Independent Variables

The research used three kinds of attacks as independent variables (Ferrier, et al., 1999). Actions were measured using structured content analysis (Harrigan, 1980). There were six general competitive action categories: signalling actions, service actions, capacity-related actions, marketing actions, product actions and pricing actions (Ferrier, et al., 1999). To quantify the independent variables, the research modified the weight of the six general competitive action categories. Since direct information about what categories of actions are more and less important for company profits could not be found, the research consulted industry papers to determine the different reasons that consumers give for buying smart phones and repartitioned the weight of the action categories accordingly.

According to many researches and industry papers, smart phone consumers care most about the following product attributes: product action (product capacity), pricing, marketing, service, strategy and signalling. Product action was deemed the most important, so this research gave it the highest weight.

For the measurement of *strategic intensity*, according to Ferrier's (2001; 2002) operational definition on it, we calculated the average number of days in a given season that a firm carried out competitive action events. A high mark for attacks indicates that a firm typically executes strong attacks against rivals, while a low mark points out a firm's attacks that are not fiercely competitive activities. By this operational definition, the research thus counted the days of action for each attack from the beginning to the end for the measurement of strategic intensity.

Strategic complexity was measured by the variety in the company's attacks. The research uses the *Herfindahl-type* index (Ferrier, et al., 1999), which illustrates the weighted diversity among all six action categories in which tactical or strategic actions are executed. For each attack, the research calculated the ratio of events of the attacks, with six event categories in total (see Table 1). By measuring strategic complexity based on such the weighting methods, firms of being noted with a high mark of strategic complexity use a larger scope and complexity of attacks, while firms with the low mark in a specific season might be perceived as conducting a relatively smaller scope and/or simple type of attacks.

Table 1. The weighting levels of strategic actions

Actions	Quantitative Weight
product action (capacity action)	6
pricing action	5
promoting (marketing) action	4
service action	3
strategy action	2
signaling action	1

Adapted from Ferrier, W.J., Smith, K.G., & Grimm, C.M. 1999. The Role of Competitive Action in Market Share Erosion and Industry Dethronement: A study of Industry Leaders and Challengers. *Academy of Management Journal*, 42:372-388.

To measure *strategic predictability*, this research uses the concept of the magnitude of change to measure the strategic predictability of the series of actions undertaken by the companies (Abbott, 1990; Sabherwal & Robey, 1993). As firms (firm 1 and firm 2) are in competition, the first action of attack in firm 1 is a product action, so it is weighted 6 (referring to the weighting levels in Table 1), which has the distance (difference) of 2, if comparing with the second action of firm 1 if it is a marketing action (weighted 4). According to this calculation, we established the matrix of events across all action categories (as noted in Table 1) for all of the four leading smart phone manufacturers. We then summed each attack distance to measure the strategic predictability of the firms. We thus note that a firm with a high mark of strategic predictability is viewed as conducting unpredictable strategies in a specific season, while a firm with a low mark in this part is understood as employing a set of predictable strategies.

Control Variables

In longitudinal analysis, it has been suggested that to decompose a time series, a usual and practical approach is the adoption of assuming an additive model involving trend, seasonal, cyclical patterns. By observing the time plot of the net incomes series of HTC and other three companies, we controlled the time effect in a quadratic form. This arrangement of the control variables of trending effects, on the other hand, is to control the contributions of variation from some unobserved factors in the research as we could not observe or identify them from the news information we collected. These factors might involve the changes and development of industrial technology and a firm's internal arrangement in terms of its very specific or critical business operations or models.

ANALYSIS AND RESULTS

Pre-testing for stationarity

Before regression analysis was undertaken, tests of stationarity were conducted. This test was organized to ensure that the dependent variables employed in the research did not involve unit roots. A unit root involved in a dependent variable may cause spurious results of linear regression in time series analysis, hence, the problem of unit roots should be avoided.

As the focal firm we noted is HTC, on inspection of the data series of the focal firm's net income change rate (HTC_NIC), the series did not appear to be a random walk. However, the presence of a unit root may not be ruled out with no statistical evidence. Thus, this study conducted an Augmented Dickey-Fuller test to assess whether the HTC_NIC data series involve any unit roots. The Augmented Dickey-Fuller test for the presence of a unit root confirmed that there is no evidence of a unit root in the data series of HTC's net income change rate when the p-value = 0.0111 is less than the significance level, which is assumed to be at a level of 0.05.

By this result, it was able to be concluded that there is no statistically significant evidence that the data series of HTC's net income change rate is non-stationary. It was assumed that there are no unit roots in

the regressors included in subsequent regression analysis. Therefore, regression analysis was able to be conducted without encountering non-stationarity on the regression results. Other data series that were used as dependent variables in the research for Apple (APP_NIC), Rim (RIM_NIC) and Nokia (NOKIA_NIC) were also assessed for their statistical stationarity. The results showed that there is no unit root involved in these three data series, where the p-value of APP_NIC = 0, p-value of RIM_NIC = 0.0145 and p-value of NOKIA_NIC = 0.0074.

Model Assessment

The statistical results, summarized in Table 2, show the pattern of competitive dynamics in each sample firm. To understand these dynamics, the research used the HTC model as the basis of the assessment. By conducting the BLUE (best linear unbiased estimate, Studenmund, 2011) test to verify the validity of the HTC model, the research determined the extent to which other models will then follow it.

A valid and well-specified (BLUE) econometric model was constructed according to the data series of HTC's net income change rate, using an ordinary least squares (OLS) econometric analysis. Evidence used in all statistical tests in this report is majorly assessed at 5% ($\alpha = 0.05$, and the least significance level is often at a 10% level). All of the p values presented are rounded to four decimal places and represent evidence for a two tail test (as we conduct the modelling in a mathematical quadratic form). First, adjusted R^2 (the HTC model) indicates that 97.2% of variation in the data series of HTC's net income change rate is explained by the independent variables. Concerning with the F statistics, it shows that the overall model is highly significant ($p=0.022 < 0.05$).

For the model's Blueness, the model produced was almost BLUE. The Ramsey RESET test indicates that the model was not misspecified ($p = 0.3263 < \alpha = 0.05$). This result is consistent with the first three rules of classical assumptions. Where, Assumption I: The regression model in linear form is correctly specified, and has an additive error term; Assumption II: The error term has a zero population mean; and Assumption III: All explanatory variables are uncorrelated with the error term.

Also, when the research can be run, the statistics data is successful which means the three variables used in this study indicate different means. This is consistent with the sixth rule of classical assumptions (Assumption VI: No explanatory variable is a perfect linear function of any other explanatory variable(s) - no perfect multicollinearity is indicated).

Furthermore, there is no evidence for auto correlation, which is consistent with the fourth rule of classical assumptions (Assumption IV: Observations of the error term are uncorrelated with the each other). The diagnostics included the Durbin-Watson test (DWTS) and the Q-statistics. The Durbin-Watson test statistic is considered as quite close 2.0 (within a range from 1.6 to 2.4) at 1.7814. In addition, For Q-statistics, we test the residual correlogram at all ten lags of the residual. All of the p values were greater than $\alpha (= 0.05)$. These results indicate that there is no evidence that the residual series involve autocorrelation effects among themselves at each of considered legs. For all above diagnostics, the estimates according our model are almost BLUE and the standard error calculations do not require correction for autocorrelation.

Finally, for the assessment of normality of the error term, the Jarque-Bara test (JBTS) indicates that there is no evidence of non-normality of the errors ($p = 0.94$). This conforms to the seventh rule of classical assumptions (Assumption VII: The error term is normally distributed). This assumption is optional but usually is invoked if conducting a classical linear normal regression model (CLNRM), especially when the sample size of a regression is considered inadequate. Therefore, in the BLUE assessment of the research, the t-statistics and F-statistics from this model can be indeed relied upon.

Table 2. The patterns of competitive dynamics for each sample firm.

Variables/Models	HTC	RIM	NOKIA	APPLE
Time	-0.4406+	0.1591+	-2.0441*	-1.8414+
Time ²	0.0405*	-0.0091	0.1191*	0.1169
Strategic Intensity	-85.0807*	0.3081*	0.5210**	2.0529
Strategic Intensity ²	145.7526*	-0.0137*	-0.01634**	na
Strategic Complexity	66.8291*	-11.2174*	224.6727+	-2.5836
Strategic Complexity ²	-270.9945*	28.4992*	-527.3020	na
Strategic Predictability	34.3286**	1.39285*	3.1098	-0.3260
Strategic Predictability ²	-3.28896**	-0.1794*	-0.2499	na
Seas_2	na	na	na	3.6161+
R-squared	0.9945	0.9842	0.9930	0.8235
Adjusted R-squared	0.9722	0.9212	0.9651	0.5589
F-statistic	44.792	15.6205	35.583	3.1122
Prob(F-statistic)	0.0220	0.0615	0.0276	0.1457
Durbin-Watson stat (DWTS)	1.7815	1.9820	2.1531	1.8750
Ramsey RESET test	p=0.3263			
Jarque-Bara stat (JBTS)				

Note:

Values of significance of estimates reported are based on a two-tailed test with notations: + ($p < 0.1$), * ($p < 0.05$), ** ($p < 0.01$).

For each model, the dependent variable is the net income change rate of each company, respectively.

Time² = Square of Time effects.

Strategic Intensity² = Square of Strategy Intensity.

Strategic Complexity² = Square of Strategy Complexity.

Strategic Predictability² = Square of Strategy Predictability.

Seas_2: the season effect at the second quarters within the survey years.

Hypothesis tests

The statistics, listed in Table 2, also reports the regression results for testing the hypotheses that predict the underlying characteristics of a firm's competitive performance in line with its strategic actions and responses.

In the HTC model, the t test results supported *hypothesis 1a*, the focal firm's strategic intensity exhibited a U-shaped relationship with its net income ($\beta(\text{strategic intensity}) = -85.08007$, $p < .05$; $\beta(\text{strategic intensity}^2) = 145.7526$, $p < .05$). The results also provided support for *hypothesis 2a*. The focal firm's strategic complexity exhibited a negative U-shaped relationship with its net profits ($\beta(\text{strategic complexity}) = 66.82910$, $p < .05$; $\beta(\text{strategic complexity}^2) = -270.9945$, $p < .05$). Also, *hypothesis 3a* gained its support from the results of the HTC model. Like strategic complexity, the focal firm's strategic predictability exhibited a negative U-shaped relationship with its net income

change rate ($\beta(\text{strategic predictability}) = 34.32864, p < .01$; $\beta(\text{strategic predictability}^2) = -3.288968, p < .01$).

In the part of the RIM model, we found support from the present statistics for *hypothesis 1b* that the rival firm's strategic intensity would exhibit a negative U-shaped relationship with its net income ($\beta(\text{strategic intensity}) = 0.308138, p < .05$; $\beta(\text{strategic intensity}^2) = -0.013780, p < .05$). *Hypothesis 2b* also found its support from the sample that the rival firm's strategic complexity would exhibit a U-shaped relationship with its net income ($\beta(\text{strategic complexity}) = -11.21743, p < .05$; $\beta(\text{strategic complexity}^2) = 28.49923, p < .05$). The research found support for *hypothesis 3b*, which predicted that the rival firm's strategic predictability would exhibit a U-shaped relationship with its net income (linear: $\beta = -11.21743, p < .05$; square: $\beta = 28.49923, p < .05$).

Table 3. The models of rival-to-focal competitive patterns.

Variables/Models	RIM to HTC	NOKIA to HTC	APPLE to HTC
Time	-0.6408	-2.2689	-0.4489
Time ²	0.0462	0.1416	0.0361
Strategic Intensity	-0.5269	0.0815	-2.3853
Strategic Intensity ²	0.0225	-0.0034	na
Strategic Complexity	20.658	43.2061	8.1337
Strategic Complexity ²	-45.533	-60.8181	na
Strategic Predictability	-2.4271	0.7398	-1.3396
Strategic Predictability ²	0.3504	-0.1472	0.1470
R-squared	0.2969	0.5944	0.5870
Adjusted R-squared	-2.5150	-1.0275	-0.0324
F-statistic	0.1056	0.3664	0.9476
Prob(F-statistic)	0.9922	0.8751	0.5470

Note:

Values of significance of estimates reported are based on a two-tailed test with notations: + ($p < 0.1$), * ($p < 0.05$), ** ($p < 0.01$).

Time² = Square of Time effects.

Strategic Intensity² = Square of Strategy Intensity.

Strategic Complexity² = Square of Strategy Complexity.

Strategic Predictability² = Square of Strategy Predictability.

Due to perfect multicollinearity, in the model of APPLE to HTC, the variables of strategic Intensity² and Strategic Complexity² are not included.

In the Nokia model, the research found support for *hypothesis 1b*, which predicted that the rival firm's strategic intensity would exhibit a negative U-shaped relationship with its net income ($\beta(\text{strategic intensity}) = 0.521068, p < .01$; $\beta(\text{strategic intensity}^2) = -0.016348, p < .01$). The research found partial support for *hypothesis 2b*, which predicted that the rival firm's strategic complexity would exhibit a negative U-shaped relationship with its net income ($\beta = 224.6727, p < 0.1$). While the second power term appears to be insignificant ($\beta = 0.1059, p > 0.1$), from a long-term view, the effects of strategic complexity on firm performance form a quadratic model.

For Apple, we found that there was not any support from the model in terms of the effects of strategic intensity, strategic complexity and strategic predictability on firm performance, where only the effects

from time (the first power) and season (at the second quarter) appear to be significant. This may demonstrate that Apple's competitive dynamics are absolutely different from the others (as these three firms, HTC, Nokia and RIM, we noted in the research).

Finally, for the investigation on the effects of strategic intensity, strategic complexity and strategic predictability of rival firms (RIM, NOKIA and APPLE) on the focal firm's (HTC) performance, the statistical results (Table 3) showed that there was not any support.

DISCUSSIONS AND CONCLUSIONS

Discussions

HTC pays attention to each of the big manufacturers' actions in the smart phone industry, but HTC does not launch attacks against individual firms. The research learns that in the smart phone industry, a firm's strategic action specifically against an individual company may be useless, or even meaningless. As soon as one company is defeated, there will be a new firm attempting to enter the emerging market as the smart phone industry is perceived. These results are different from those in the aviation industry (Chen, et al., 1992). All actions in the smart phone industry are done to make a firm grow bigger rather than to defeat an opponent.

Competitive dynamics in an emerging industry may not evidence a 'linear' pattern. Chen et al (1992) used a linear model to explain the competition in the aviation industry. This research has tried to use a set of non-linear (quadratic) patterns to investigate the competitive dynamics in the smart phone industry. The idea is that a *U-shape* pattern may be far more suitable than other pattern to analyse the competitive dynamics in this industry.

We have learnt from the present findings that firms tend not to employ extreme attacks to develop their strategic actions in response to the competition they meet. They tend to develop their strategic actions in pursuing a bigger market share in an emerging market. For example, as it has long been perceived, lowering down the market prices of the focal products to attract customers is not always a wise strategy, while focusing on advancement in technology or making cooperation or strategic alliance with the key firms (like telecom service providers) is far more effective to gain competitive performance.

Because the smart phone market is an emerging market, firms in this industry focus on the establishment of market shares. This view has been proved by Porter's idea of the emerging market and economies of scale (Porter, 1985). When the market is not matured, companies profit by choosing to rapidly expand their territory and by trying not to focus on the number of their competitors. All the related manufacturers in this industry want to enter this market, so the pursuit of self-innovation is the best policy. Firms all do economies of scale and new product development. This strategy represents the emerging situation in the model of static competition (D'Aveni, 1998). Compared with the aviation industry where companies are often concerned about an individual company's actions (Chen., et al., 1992), the situation in the smart phone industry is invisible.

RIM and NOKIA use the same mode of competition in this market. RIM and Nokia pay attention

to each other's actions in the smart phone industry. To catch up with the pace in this industry, Nokia, for example, did many of the innovative actions that increase phone functions and increase operating system functions. Eventually it still lost on the environmental changes. Nokia ultimately selected Microsoft's windows operating system as a partner in the smart phone market in an attempt to snatch away the market share, which it previously lost. RIM's business model is similar to Nokia's. It also has been attempting to increase innovation to get its market share in the smart phone industry.

APPLE has its own way to operate in the smart phone industry. The present results in relation to Apple showed that Apple is not influenced by the market competition. It seems to be a company that tends to perceive the trend of the market and makes more innovative actions to lead the industry. The significant seasonal effect (at the second quarters) and the trending effect show that Apple increases the market share gradually, step by step in line with its own timelines of the market development. This indicates that Apple may not do any amendments with its business model according to the market competition (the rivals' attacks). Instead, it seems to only focus its resources on the company's internal operations.

All the attacks of the leading four manufacturers in the smart phone industry tended to be against the entire market. After conducting the literature review and amassing news information, the research predicted that all attacks in the smart phone industry would be against the entire market, not against individual manufacturers. This prediction was proved accurate. When the attacks are against whole market, most of the t-tests are shown to be significant. However, the results of the t-tests are not significant for attacks made against individual manufacturers. Such the results confirm that manufacturers in emerging markets do not wage attacks against individual manufacturers, nor do they usually wage extreme attacks (Barney & Hesterly, 2009). Implicitly, in emerging markets, manufactures tend to pursue growth in the aspect of market share.

Implications

The research's results reinforce the notion of competitor analysis according to which a manager must understand and predict the competitive actions of firms and the responses of rivals (Porter, 1980). The research extracted data of the four biggest companies in the smart phone industry in the world. The total market share of these companies accounts for over 80% in that sector. This figure might convince readers of the competitive dynamics among these companies.

This research used a company's financial performance (net incomes) as a dependent variable to measure all actions of companies, since it is the most direct and effective way to know how attacks work for companies. Financial performance is the last accounting title for a company's income statement. Having high sales, high operating income, etc. doesn't mean that a company will earn good profits; however, a company with a high net income is a profitable company; hence, net income performance is valued by both the management of companies and shareholders.

In doing analysis, the research also used time effects (in a quadratic form) as a set of control variables in order to gain knowledge of the quarterly financial performance of firms and the performance trend. Time effects can solve some variables which the research could not find in public sources, such as, the

reason for a company's internal decisions, information that is unpublicized, etc.

In this process of gathering news information, the research found that market segmentation is not obvious in the smart phone industry. In other words, the consumers in this industry are not particularly distinguished from one another. This might be useful information for managers. The leading four smart phone firms in this study all focus on the emerging markets. Thus future analysis of this industry may want to switch from market segmentation to brand and product segmentation.

Limitations

Although our contribution to the action-based competition theory includes (1) the use of a set new proxy measures (net incomes) to measure competitive dynamics; and (2) a potential understanding of competitive dynamics in the emerging market as we conducted our research with the coverage of 80% with the top four leading firms in the smart phone industry. However, this research is not without limitations. First, the smart phone industry is too new to collect a relatively long-term dataset as we investigated. Future researchers interested in this industry may be able to collect more data with an increased time period of data collection.¹

Second, after the research finished collecting data for the next quarter (third quarter of 2010), "Business Week" (Lin, 2010) released the latest information that Samsung's sales of smart phone in the third quarter of 2010 reached 7.2 million, higher than the HTC's 580 million. Samsung won over HTC in just seven months with its first released smart phones and has become the world's fourth largest smart-phone brand company. Hence, associated researchers may pay particular attention on Samsung in the future.

Although the research found substantial support for its hypotheses, there is no way of knowing the specific intent behind any actions that were investigated. Future researchers may be able to adopt the "social construction of rivalry" approach (Porac & Thomas, 1990), or some others relating to the exploration, to the understanding of a firm's internal behaviour in developing strategies and making decisions to analyse the pattern of competitive dynamics. Further, future research might try to understand whether internal business strategies, product strategies, and so on, run into any interference factors, and, if so, at what stages of development. Since different companies have different levels of market power, researchers may want to try to find a new weighted model before weighing the dependent variables. This step could allow the qualitative results to become more robust by the addition of quantitative data.

Finally, The Liberty Times, which this study chose as its source of news information, may not be the most professional media on the industry fields. Still, it is one of Taiwan's three major newspapers. As

¹ It has recently reported that Samsung is at the second place in the smart phone industry. Because Samsung is a newcomer in the smart phone industry, the research could only collect a small amount of data for this company. Therefore, the research cannot conduct a balanced statistical analysis when the sample involves the data of Samsung.

the major news firms in Taiwan, the Liberty Times is a member of the News Discipline Committee of Taiwan, which has as its main thrust to report fair and impartial news.

REFERENCES

- Abbott A (1990) A Primer on Sequence Methods. *Organization Science*. 1, no.4, 375-392.
- Barney J. B. & Hesterly. W. S. 2009. Strategic Management and Competitive Advantage: Concepts and Cases. Pearson Education (US).
- Bettis RA & Weeks D (1987) Financial returns and strategic interactions: The case of the instant photography. *Strategic Management Journal*, 8. 549-563.
- Brouwer M (1991) Schumpeterian Puzzles: Technological Competition and Economic Evolution. Harvester Wheatsheaf: London.
- Brandenburger AM & Nalebuff BJ (1996) Co-opetition. New York: Doubleday.
- Chaney PK, Devinney TM & Winer RS (1991) The impact of new product introductions on the market value of firms. *Journal of Business*, 64. 573-610.
- Chen MJ (2008) *Competitive Dynamic : A Research Odyssey, 1st ed.* Best-Wise Publishing Co, Ltd.(in Chinese) °
- Chen MJ, Su KH & Tsai WP (2007) Competitive tension: The awareness-motivation-capability perspective. *Academy of Management Journal*, 50: 101-118.
- Chen MJ (2009) Competitive Dynamics Research: An insider's odyssey. *Asia Pacific Journal of Management*, 26, 5-25.
- Chen MJ, Smith KG & Grimm CM (1992) Action characteristics as predictors of competitive responses. *Management Science* 38: 439-455.
- Chen MJ (1996) Competitor analysis and interfirm rivalry: Toward a theoretical integration. *Academy of Management Review*, 21:100-134.
- Chen MJ & MacMillan IC (1992) Nonreponse and delayed response to competitive moves: the roles of competitor dependence and action irreversibility. *Academy of Management Journal*, 35: 539-570.
- D'Aveni RA (1998) *Hypercompetition: Managing the dynamics of strategic maneuvering*. New York: Free Press.
- Day GS & Reibstein DJ (2005) Wharton on Dynamic Competitive Strategy, New York: John Wiley & Sons.
- Eddy A & Saunders G (1980) New product announcements and stock prices. *Decision Sciences*, 11. 90-97.
- Fang JM (2003) *Competitive Advantage*. Taipei, future (in Chinese).
- Fang JM & Zhong SR (2008) *Strategic Management*, Taipei: Future Limited. (in Chinese).
- Ferrier WJ (2001) Navigating the Competitive Landscape: The Drivers and Consequences of Competitive Aggressiveness. *Academy of Management Journal*, 44, 858-877.
- Ferrier WJ & Lee H (2002) Strategic Aggressiveness, Variation, And Surprise: How The Sequential Pattern Of Competitive Rivalry Influences Stock Market Returns. *Journal of Managerial Issues*,

14, 162.

- Ferrier WJ, Smith KG & Grimm CM (1999) The Role of Competitive Action in Market Share Erosion and Industry Dethronement: A Study of Industry Leaders and Challengers. *Academy of Management Journal*, 42, 372-388.
- Grimm CM, Lee H. & Smith KG (2005) *Strategy as Action: Competitive Dynamics and Competitive Advantage*. Oxford University Press: Oxford, U.K.
- Harrigan KR (1980) *Strategies for Declining Businesses*. Lexington Books, Lexington, MA.
- Lee, H., Smith, K. G., Grimm, C. M., & Schomburg, A. 2000. Timing, order and durability of new product advantages with imitation. *Strategic Management Journal*, 21, 23-30.
- Lin JS (2010) Spend Only Seven Months to Kick Down HTC. *Business Week*, 1204 (2010.12.15 - 2010.12 .20): 75.
- Jacobson R (1992) The Austrian school of strategy. *The Academy of Management Review*, 17: 782-807.
- Kerin RA, Varadarajan PR & Peterson RA (1992) First-mover advantage: A synthesis, conceptual framework, and research propositions. *Journal of Marketing*, 56:33-52.
- Hambrick DC, Cho TS & Chen MJ (1996) The influence of top management team heterogeneity on firms competitive moves. *Administrative Science Quarterly*, 41:659-684.
- MacCrimmon K (1993) Do Firm Strategies Exist?. *Strategic Management Journal*, 14: 113-130.
- McWilliams A & Siegel D (1997) Event Studies in Management Research: Theoretical and Empirical Issues. *Academy of Management Journal*. 40:626-657.
- Miller D & Chen MJ (1996) The simplicity of competitive repertoires: an empirical analysis. *Strategic Management Journal*, 17: 419-440.
- Mintzberg H & Waters JA (1985) Of strategies, deliberate and emergent. *Strategic Management Journal*, 6, 257-272.
- Nelson R & Winter SG (1982) *An evolutionary theory of economic change*. Harvard University Press, Cambridge, MA.
- Porac J & Thomas H (1990) Taxonomic mental models in competitor definition. *Academy of management Review*, 15: 224-240
- Porter ME (1980) *Competitive strategy: Techniques for analyzing industries and competitors*. New York: Free Press.
- Porter ME (1985) *Competitive Advantage*, Free Press, New York.
- Porter ME (1990) *The Competitive Advantage of Nations*. Free Press, New York.
- Ramaprasad A & Stone W (1992) The Temporal Dimension of Strategy. *Time and Society*, 1: 359-377.
- Smart mobile phone industry consumer survey analysis in China in 2010 (2010) *Research in China Center* (in Chinese).
- Sabherwal R & Robey D (1993) The Empirical Taxonomy of Implementation Processes Based on Sequences of Events in Information System Development. *Organization Science*, 4: 548-576.
- Schumpeter J A (1950) *Capitalism, socialism, and democracy* (3rd. Ed.). Harper, NewYork.
- Smith KG, Grimm CM, Gannon MJ & Chen MJ (1991) Organizational information-processing,

- competitive responses, and performance in the United States domestic airline industry. *Academy of Management Journal*, 34:60-85.
- Smith KG, Grimm CM & Gannon MJ (1992) Dynamics of competitive strategy. Newbury Park, CA: Sage.
- Studenmund AH (2011) Using Econometrics: A Practical Guide (6ed). Boston: Addison-Wesley.
- Tsaih YC & Lin GH (2005) The study of consumer's choice behavior for multi-functional cellular telephone. The 3th management thinking and practice Conference Proceedings, 229-246 (in Chinese).
- Van de Ven A (1992) Suggestions for Studying Strategy Processes: A Research Note. *Strategic Management Journal*, 13: 169-188.
- Weigelt K & Camerer C (1988) Reputation and corporate strategy. *Strategic Management Journal*, 9: 443-454.
- Williams SD (2007) Gaining and losing market share and returns: A competitive dynamics model. *Journal of Strategic Marketing*, 15: 139-148.
- Young G, Smith K & Grimm C (1996) Austrian and industrial organization perspectives on firm-level competitive activity and performance. *Organization Science*, 7: 243-254.
- Zhao PJ (2006) Consider the consumer demand for mobile consumer market to grasp opportunities for Information Industry. Institute for Information Industry (MIC), Trend View. *A New Communication*, 69 (in Chinese).