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STRATEGIC MANAGEMENT PRODUCT DECISIONS (SMPDs) AND SHAREHOLDERS WEALTH: EVIDENCE FROM PRODUCT DESIGN AWARDS

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Abstract

Conducting industry-specific research in terms of product design award announcements is scanty in extant literature. Moreover, it has been established that emphasizing design in product development teams contributes to new product success. Thus, this research empirically examines the economic impact that winning a product design award as a proxy for successful strategic management product decisions (SMPDs) has on firms in the computer, electronic and communication industry (CECI). Through event study approach, we adopt the market model to estimate the abnormal returns generated from product design award announcements. The results suggest that winning product design awards yield positive market reaction as the market value of firms in CECI is increased by 1.06 on the average over a three-day event period. The findings also indicate that smaller firms experienced more positive market reaction than larger firms. Moreover, the reaction is more significantly positive for first time win of product design award than multiple wins. The study recommendations managers to conduct periodic product design audit - assess the vital areas of the firm such as brand, product and service development, work practices and customer communication and then determine the key roles design plays in them.

Keywords: Shareholders wealth, design award, product design, strategic management product decisions (SMPDs)

INTRODUCTION

Managers of organizations formulate and execute strategic decisions in several aspects of the organizations including finance, human resource management, major capital expenditure, joint ventures, acquisitions, research and developments as well as product related decisions. Nevertheless, (Otuedon, 2016) asserts that decisions relating to the product or object of business of the organization is arguably the most crucial. The failure of product related decisions will plunge the firm into distress position irrespective of the success of other strategic decisions. Thus, such actions relating to the product or object of business of an organization are known as strategic management product decisions (SMPDs). The devastating effects of failure of SMPDs on the firm underscore the need for managers to formulate relevant and effective SMPDs which must not be taken and implemented in isolation but within the context of the overall corporate strategy of the organization.

Some of the SMPDs formulated and implemented by firms include packaging, branding, product deletion, product recall, introduction of a new product and product design. Irrespective of the many SMPDs taken by management, a key SMPD that ensures the success of a new product introduced is product design. This assertion is supported by (Ende et al., 2010) as they postulate that emphasizing design and including designers in product development teams contributes to new product success. Product design is a multi-disciplinary process which usually involves market and technological research, concept design, prototype development, final product development and testing as well as post production refinement (Murray, 2005). Murray, (2005) further highlights that product design does not usually imply the utilization of new technologies to create novel products but entails the refinement or upgrading of existing designs, to improve functionality, performance or appeal.

According to (UKEssays, 2013), the objective of a good product design is to satisfy the customer by meeting their actual needs or expectation. This therefore enhances the competitiveness of the organization; product design can therefore be seen as starting and ending with the customer. Slack et al., (2013) further state that good design also helps business connect strongly with their customers by anticipating their real needs, this in turn gives them the ability to set themselves apart in increasingly tough markets. Apart from achieving competitive advantage through product design, the financial performance of the firm will be enhanced as investment in design may yield some returns. For instance, in the UK, studies of the return of investment in design have been carried out by the Design Innovation Group of Open University and Manchester Institute of Science and Technology. One study showed that ‘Design Conscious Firms’ had a 3% higher return on capital, 1% higher profit margin, 28% higher

turnover growth and a 7% higher capital growth than a representative sample (Walsh et al., 1992).

While product design is generally considered to be important to the success of a product, it is also critical to consider the influence of design upon product price. Product design affects the cost of production through the choice and use of materials and how the product is assembled. Product design also influences after-sales maintenance and running costs (which is more important for some types of products such as heating systems) (Walsh et al., 1992). Therefore, the product should be produced using high-quality, low-cost materials and methods since one of the goals of product design is to lower the cost of manufacture for competitive advantage (Murray, 2005). Apart from the direct benefits, there are indirect benefits which accrue to the firms for taking SMPDs like product design. Amongst such indirect benefits is winning of product design award by firms involved product design engagements. This form of recognition consists of judgments by independent third parties regarding a product's design superiority (Boyd & Kannan, 2018). Winning product design awards can be thought of as 'signals' to outsiders about otherwise hardly observable qualities about the winning firm (Basuroy et al.,2006; Connelly et al., 2011). Therefore, the announcement of firms winning product design awards is a mechanism to communicate to various stakeholders including customers about the existence of effective product design capabilities as part of SMPDs taken by managers of the firms. Extant literature indicate that investors value the signaling of awards in areas such as quality improvement, human resources management or effective use of information technology, suggesting a revised/positive evaluation of financial returns for these firms (Hendricks & Singhal, 1996; Arthur & Cook, 2009). Thus, the announcement of firms winning design awards is expected to trigger stock market reaction.

However, there exist scanty studies on how firm performance is affected by successful implementation of SMPDs with respect to effective product design. One of the few studies which examined the impact of announcements of product design awards on stock market reaction was conducted by (Xia et al., 2016).The study was based on data from 264 announcements of design awards given to commercialized products between 1998 and 2011. The main focus of the study was not industry-specific as it established statistically significant positive stock market reactions across all the sample used in the study. However, some industries experience rapid and frequent product designs more than others. Therefore, it will be statistically unbiased to conduct an industry-specific study to investigate into the signaling value of the information contained in the announcements of winning design awards. Consequently, the authors of this paper conduct an industry-specific research with computer, electronic and communication industry (CECI) as the focus.

The CECI is characterized by rapid technological advances and has grown faster than most other industries over the past several decades. The rapid pace of innovation in the CECI makes for a constant demand for newer and faster products and applications. This demand puts a greater emphasis on R&D than is typical in most manufacturing operations. The product design process includes not only the initial design, but also development work, which ensures that the product functions properly and can be manufactured as inexpensively as possible (MyPlan, 2014). Furthermore, CECI contributes significantly to the global gross domestic product. For instance, according to a 1993 study by the World Bank, the output of the CECI was expected to reach about $1.3 trillion and account for roughly 4% of world gross domestic product and 14% of value added in manufacturing by the year 2000.Additionally, the value added in manufacturing by the CECI is growing at about 6% annually, versus about 3.8% across all manufacturing industries (Buckler, 2006). These irrefutable evidence about CECI as the industry with the most rampant product designs justify the authors' choice of the industry as the focus of this research. Therefore, this study generally aims at investigating empirically how the stock market is impacted by winning product design awards as a proxy for effective formulation and implementation of SMPDs.

The results of this paper could be a mechanism of portraying credible and validated evidence about the characteristics, features, and performance of the uniquely designed good or service that consumers demand. Moreover, a positive stock market reaction from winning product design awards will be an opportunity for those distinctive award-winning products to command premium pricing. The remainder of this paper is structured as follows: the next section discusses signaling theory. Hypotheses and data collection are captured under sections 3 and 4 respectively. Section 5 presents the data collection procedure. The results of the study are covered in section 6 while the conclusion of the research is presented in section 7.

SIGNALING THEORY

Signaling theory was propounded to explain the interpretations and reactions of decision-makers to events where information is both incomplete and asymmetrically distributed among parties to a transaction (Bergh & Gibbons, 2011). This theory is developed on the basis that one firm, such as a seller, possess complete information while external parties, such as buyers and investors, have to take decisions based on what the firm is willing to share (Nelson, 1970). This knowledge disparity between a seller and a buyer creates information asymmetry in a variety of organizational and business contexts (Bergh & Gibbons, 2011). According to (Spence, 2002), signaling theory is basically concerned with reducing the information asymmetry between the two parties. (Bergh & Gibbons, 2011) argue that one mechanism for buyers to mitigate against

their risks is to identify observable and alterable characteristics known as signals that affect the conditional probability of the seller's performance. (Spence, 2002) defines a signal as an activity or attribute that, by design or accident, alters the beliefs or conveys information to others.

Therefore, signaling theory should describe the types of information which is important for taking investment decision. Signaling theory posits that the signal sender (signaler) engages in purposeful behavior to communicate information that reduces information asymmetry in a positive light for the firm (Connelly et al., 2011). For example, a startup firm may add a high-profile executive to their board to signal managerial competency (Certo, 2003). However, signaling theory also applies to situations in which the signaler did not intend to engage in signaling behavior, but the firm's actions had the net effect of reducing information asymmetry in a manner that may or may not have been positive for the firm (Zhang & Wiersema, 2009). Thus, firms send both active and passive signals, and whether purposeful or not, valuable information is embedded in the strategies, tactics, and behaviors pursued by all firms (Anderson & McMullen, 2012). Such information is subject to interpretation and parsing by other market actors. This is particularly true in the financial markets, where investors actively seek and interpret the signals sent by publicly traded firms for information on the firm's underlying value proposition, strategies, competitiveness, and managerial competencies, which in turn are key inputs to market valuation (Certo et al., 2001; Certo, 2003; Taj, 2016).

HYPOTHESES

Stock Market Reaction to Winning Product Design Awards

Signaling theory suggests that markets react to good and bad signals, as such signals are perceived as indicators of potential returns (Hassaan, 2016). According to (Chan, 2003), some studies show that stock prices appear to drift after important corporate events for up to several months. These corporate events include firms winning awards like CEO Stock Option Awards (Lie, 2005), Quality awards (Bu & Tian, 2012) and Academy Awards (Maltsbarger, 2011) from the state (government) or private organizations. The announcements of these awards, according to (Maltsbarger, 2011; Bu & Tian, 2012) have an impact on the stock prices of the winning firms and therefore sends signals to investors to form the basis of their investment decisions. Previous studies have established a favorable stock market reaction due to the announcements of firms winning various awards in different domains (Balasubramanian et al., 2005; Gemser et al., 2008; Arthur & Cook, 2009).

In the light of this argument, the announcements of firms winning product design awards send signals to the public about success of SMPDs as a result of effective product design; hence could influence investors' decision and trigger stock market reaction. Therefore, building

on the signaling theory and also consistent with other studies which focused on the signaling function fulfilled by awards (Basuroy et al., 2006; Restuccia et al., 2016), the first hypothesis of this study is formulated as:

H_1: The stock market will react positively to announcements of product design awards.

How Stock Market Reaction is influenced by Firm Characteristics

Apart from the general stock market reaction covered by hypothesis 1, the magnitude or extent of the reaction is influenced by certain factors within or outside the firm. Thus, this research considers how the market reaction from product design awards announcements is moderated by firm characteristics such as firm size and first-time winner.

Firm Size

The size of a firm is a primary factor in determining the profitability and market value of a firm due to economies of scale which can be found in the traditional neo-classical view of the firm (Surajit & Saxena, 2009). It reveals that, contrary to smaller firms, good product designs can be executed on much lower costs by larger firms (Mule et al., 2015). In accordance with this concept, a positive relationship between corporate size and profitability and market value is expected (Tangen, 2003). Therefore, expectations from stakeholders are higher for larger to engage in rampant product designs than smaller firms. As such, smaller firms winning product design awards will send stronger signal and bigger surprise to the public than larger firms. In view of this, the stock market reaction for smaller firms is expected to be more favorable than bigger firms for winning product design awards. The second hypothesis is set on this premise and formulated as:

H_2: The stock market reaction to winning product design awards will be more positive for smaller firms than larger firms.

First-Time Winner

According to (Akkoc & Ozkan, 2013), Uncertain Information Hypothesis (UIH) asserts that uncertainty and risk will increase in financial markets following the release of unexpected information. The heightened uncertainty surrounding the release of unexpected information will cause more surprises to the stock market which will trigger greater stock market reaction. Conversely, the less of a surprise posed by an event to investors means a lower stock market reaction. Winning product design award for the first time will more surprising to existing and potential customers, investors and the stock market as a whole. This will enable the stakeholders to learn about the effective product design systems instituted by the winning firms.

However, as the stakeholders become increasingly aware about a firm's previous competences of developing good product designs through repeated wins, the market will be less surprised for the firm to be awarded product design award again, leading to a lower stock market reaction. Hence, the third hypothesis is set as:

H_3: The market reaction to winning the first product design award will be more positive than winning again.

RESEARCH METHDOLOGY

Data Collection

Dow Jones Factiva database was to generate the product design awards winners. The data collected covered a period from 2000-2018. The choice of this data collection time period is based on the assumption that the longer the data collection time period, the more relevant data likely to be generated from the Dow Jones Factiva Database for a robust and comprehensive research. Moreover, unlike the past century, the 21st century has been witnessing frequent and rampant product designs particularly in CECI; aimed at meeting the continually changing and sophisticated societal demands (OECD, 1998, 2000). Therefore, the authors deem it as very informative and insightful to conduct empirical studies into the firm value of winning product design awards due to such rapid product designs in the 21st century. The key words used in the searches include but not limited to design, product, product design, win and award. The searches were limited to four authoritative media outlets namely Business Wire, PR Newswire, Wall Street Journal and Dow Jones Newswire. The final sample for this study included only firms with announcements of winning product design awards irrespective of the particular year the product was introduced onto the market. That notwithstanding, announcements that appear in non-daily publications were excluded from the sample when it was difficult to determine the actual date the announcement about the award winner was first publicized. The announcements with the earliest publication dates were included in the sample with respect to duplicate announcements. The initial sample consists of 317 announcements of firms trading on three stock exchanges namely New York Stock Exchange (NYSE), the American Stock Exchange (AMEX) or the NASDAQ exchange. The final sample gathered for the study eliminated firms with insufficient stock prices from the Center for Research in Security Prices (CSRP). Thus, 234 announcements with 142 distinct firms constituted the sample of this study. The following are some of the announcements of firms that won product design awards:

i. LAUSANNE, Switzerland & NEWARK, Calif., April 03, 2017 -(BUSINESS WIRE)-Today Logitech (SIX: LOGN) (NASDAQ: LOGI) announced that it won nine RedDot 2017 Product Design Awards. This is the fifth consecutive year that RedDot has recognized

Logitech for excellence in product design. This year's total wins ties Logitech's company record set last year and includes a prestigious "Best of the Best" Red Dot Product Design Award in Computer and Information Technology for the Logitech K780Multi-Device Wireless Keyboard, the top Red Dot Award for groundbreaking design reserved for the best product in each category.

ii. SANTA CLARA, Calif., Dec. 16, 2011 /PRNewswire/ - Marvell (Nasdaq: MRVL), a worldwide leader in integrated silicon solutions, today announced it won a 2011 Best Electronic Design Award for its recently-announced ITU-T G.hn compliant transceiver chipset. Hosted annually by Electronic Design magazine, staff editors select winners in fifteen categories spanning technology, products and standards. Marvell won the Best Wired Product category.

The yearly distribution of 234 sample announcements is presented in Table 1. Moreover, the statistics for sample firms based on the closest fiscal year completed before or after winning the first product design award are highlighted in Table 2. According to Table 1, 35% of the announcements were made during the period 2000-2008.The remaining announcements which constitute greater part (57%) were made during the period 2009-2018. This period experiencing greater number of product design award announcements account for the fact that the CECI has witnessed an unprecedented growth in product designs in the last few decades (Dhanda & Peters, 2005).

Table 1: Yearly distribution of the 234 sample announcements

Year	Number	Percentage (%)
Panel A: Distribution of sample by year of winning product design award		
2000	7	2.99
2001	6	2.56
2002	10	4.27
2003	8	3.42
2004	6	2.56
2005	8	3.42
2006	10	4.27
2007	15	6.41
2008	12	5.13
2009	18	7.69

Table 1...

2010	11	4.70
2011	13	5.56
2012	17	7.26
2013	12	5.13
2014	8	3.42
2015	17	7.26
2016	14	5.98
2017	19	8.12
2018	23	9.83
Total	**234**	**100**

Table 2: Description Statistics for the 234 announcements of winning product design awards

	Mean	Median	Std. Dev.	Maximum	Minimum
Total Assets (USD million)	29,552.13	4,616.35	73,443.14	551,249.40	11.89
Sales (USD million)	18,013.87	4,345.81	42,846.33	175,577.40	1.53
Market Value (USD million)	29,005.61	2,281.36	48,691.32	302,515.29	15.41
R/D (USD million)	1,637.83	378.52	2,210.86	19,795.94	0.95

Model Specification

This study adopted the event study methodology. This methodology introduced by (Fama et al., 1969) has been used extensively in finance research to measure investor's reaction towards a range of events like elections, stock splits, mergers and acquisitions announcements (Wong & Hooy, 2016). Conceptually, event study analyses differentiate between the returns that would have been expected if the analyzed event would not have taken place (normal returns) and the returns that were caused by the respective event (abnormal returns). The different analytic techniques for estimating abnormal returns differ with respect to the model used for predicting the normal returns around the event date. According to (Johnston, 2007), there must be three important pieces of information necessary to conduct an event study – the names of stock-listed firms, the event dates in relation to the announcement of interest, and the relevant stock prices.

Johnston, (2007) further presents a summary of 5 key steps to conducting event study analyses as follows:

Step 1: Identification of the event of interest

The first step in conducting an event study is to define the event of interest and determine the event date as well as the period over which stock prices of the firms involved in the event will be examined, herein referred to as event window. The event window is the number of trading days preceding and following the event date that are considered necessary to capture both the leakage, if any, and the time needed for the data to effectively reach the marketplace (Osuala et al., 2018). An event window is typically denoted by [−x, +y], where x is the number of days before the announcement day and y is the number of days after the announcement day, and the announcement day is typically denoted as "day 0" (Konchitchki & O'Leary, 2011).This study adopted a 3-day (-1, 0, +1) as the short event window period consistent with the study of (Small et al., 2007). The announcements of firms winning product design awards as a proxy for successful implementation of SMPDs is the event of interest for this study. The activities for each trading day on the stock exchanges chosen for this study end on 4:00 PM East Standard Time (EST). For product design awards announcements made before 4:00 PM EST, the announcement calendar day is Day 0 in event time, the next trading day is Day +1, and the trading day preceding the announcement day is Day -1, etc. With regard to product design awards announcements made after 4:00 PM EST, the announcement calendar day is Day -1 in event time, the next trading day is Day 0, and the trading day preceding the announcement day is Day -2, etc. (Li & Mu, 2017).

Step 2: Definition of the event criteria

The second step is to determine variables which will be examined in the study. The nature of the event of interest will determine the variables to be used for the study. However, event studies often examine variables such as firm size, industry type, and investment amount. That notwithstanding, the inclusion of the variables must be justified by sound theoretical rationale and empirical studies. The variables used in this study include are firm size and first-time winner.

Step 3: Calculation of normal and abnormal returns

To measure the impact of an event on shareholder value, the difference between a firm's normal everyday returns and the abnormal returns experienced around the event date are calculated. This figure is achieved by computing the daily (or cumulative) abnormal returns accrued during the event window minus the expected normal returns as if no such event had occurred. The normal returns and the abnormal returns are estimated through estimation window and event window respectively.

Step 4: Estimation of the normal performance model

While the event window used to calculate the abnormal returns focuses on the days when information related to the event is most likely to be released, the estimation window used to calculate the normal performance model, on the other hand, focuses on "normal" trading days, generally a period well in advance of information about the event being released. An estimation period of 200 trading days which begins on Day -210 have been used to estimate the expected returns in this research. The estimation period requires firms included in the sample to have a minimum of 40 return observations. The length of estimation period is based on the postulation by (Armitage, 1995) that when handling with daily studies an estimation period of 100-300 days is sufficient for satisfactory assessment of the parameters in statistical pricing models. The deadline of the estimated period will be two weeks before the announcement date (10 trading days). Thus, [-210, -11] is the estimation window considered for this study.

Step 5: Statistical calculations and hypothesis testing

Having determined the parameters for estimating the normal performance model, the abnormal returns are calculated and tested for significance. To explore the data further, abnormal returns can be aggregated over time for an individual stock and also across firms and over time. Findings are presented as mean abnormal returns and mean cumulative abnormal returns expressed in percentages and direction of change (positive or negative). Mean and median abnormal returns are tested for statistical significance using t-test and the Wilcoxon sign ranked test respectively. Test statistics in event studies are quite sensitive to outliers. As such, we use the binomial sign test to test for the effect of outliers on the abnormal returns.

Selection of model for estimating expected returns

This study employs the market model where expected return on security *i* at day *t* is presumed to be equal to the return on the market portfolio. The reason for using this model is because it has been proven to yield valid results (Wong & Hooy, 2016). The market model is expressed as:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad (1)$$

Where

R_{it} = realized rate of return of the *i*-th security during period *t*,

R_{mt} = rate of return on the equally-weighted market index(*m*) at period *t*,

ε_{it} = error term for stock *i*on Day *t*.

α_i = intercept of the relationship for stock *i*,

β_i = slope of the relationship for stock i with the market return

$\beta_i R_{mt}$ = portion of the return for stock *i* that is due to market-wide movements and the error term

The calculation of the abnormal returns

The abnormal return on a distinct day within the event window represents the difference between the actual stock return (R_{it})on that day and the normal return, which is predicted based on two inputs; the typical relationship between the firm's stock and its reference index (expressed by the $\alpha$and βparameters), and the actual reference market's return (R_{mt}).

$$AR_{it} = R_{it} - \left(\hat{\alpha}_i + \hat{\beta}_{it} R_{mt}\right) = R_{it} - \hat{\alpha}_i - \hat{\beta}_{it} R_{mt} \quad (2)$$

The abnormal returns for individual security,AR_{it}, is aggregated and averaged across all the observations expressed as:

$$\overline{AR}_t = \sum_{i=1}^{N} \frac{AR_{it}}{N} \quad (3)$$

Where, N is the number of sample observations on Day *t*.

To measure the total impact of an event over a particular period of time (termed the 'event window'), one can add up individual abnormal returns to create a 'cumulative abnormal return'. Therefore, the cumulative abnormal return over a given time period is the sum of the daily mean abnormal returns which is expressed as:

$$CAR(t_1, t_2) = \sum_{t=t_1}^{t=t_2} \overline{AR}_t \quad (4)$$

In order to test the statistical significance of the daily mean abnormal return of Eq. (3), a standardized abnormal return should be calculated as:

$$AR_{it}^{s} = \frac{AR_{it}}{S_{\varepsilon i}} \quad (5)$$

Significant Test of Abnormal Return

The test statistic,TS_t, for any Day *t* is given by:

$$TS_t = \sum_{i=1}^{N} \frac{AR_{it}^{s}}{\sqrt{N}} \quad (6)$$

The multiple day test statistics, TS_c, is given by:

$$TS_c = \sum_{i=1}^{N} \frac{\left(\sum_{t=t_1}^{t=t_2} AR_{it}\right) / \sqrt{\sum_{t=t_1}^{t=t_2} S_{\varepsilon i}^2}}{\sqrt{N}} \quad (7)$$

Other two non-parametric tests were used in this study namely Wilcoxon signed rank test and binomial sign test. The Wilcoxon signed rank test is used to verify whether the median abnormal return is statistically significant than 0, with the binomial sign test to verify whether the percentage of the abnormal return is statistically significant than 50% during the period. The essence of the two non-parametric tests is to check the influence of outliers on the results of the study. It has been hypothesized that product design awards can only have a positive stock market reaction; as such all reported p-values are one-tailed.

RESULTS

Events Study Results

Table 3 presents the results of the study in terms of abnormal returns, both cumulative abnormal return (CAR) and mean abnormal return (AR) associated with the announcement firms winning product design awards within three-day event window. For three-day event window, the abnormal return is estimated for the day immediately preceding the day of the announcements (Day-1) to determine the possibility of information leakage (Xia et al., 2016). The abnormal return on the day of the announcement (Day0) is also examined purposely to determine whether the economic impact of the product design award announcements is immediately captured by the stock market. Moreover, in order to cater for the likelihood of delayed stock market reaction, abnormal return is estimated for the trading day immediately after the day of announcement (Day+1).

The abnormal return for day -1 is positive and significant (AR = 0.25, t-statistics = 1.43). Median abnormal returns (0.21) and the percentage of positive AR (52.80%) for Day-1 are all statistically significant at 5% and 1% levels respectively. On the day of announcement (Day0), the results of the study discover significant positive abnormal returns (AR= 0.44, t-statistics = 2.38). The median abnormal return is also positive and significant at the 5% level (0.23, z-statistics = 2.42). A significant percentage (56.76%) of the sample experienced positive market returns onDay0 which suggests that the results are not influenced by outliers. The significant positive returns on Day 0 indicates that investors and the general public view product design award announcements positively and as value-creating, hence react immediately when the announcements were publicized. The mean (median) abnormal returns for Day+1 of 0.37(0.26) are all significantly differently different from zero with 54.32% of the sample experienced positive abnormal returns.

Over the three-day event period (-1, 0 +1), the mean (median) abnormal returns of 1.06 (0.31) are significantly different from zero at the 1% level. Significant percentage of the sample (58.07%) experienced positive market reaction over the period, which indicates that positive abnormal returns are not influenced by few extreme values. The results of the market model indicate that the market responds positively to the announcements of firms in CECI winning product design awards as a proxy for effective implementation of SMPDs. Hence, we accept hypothesis H_1.The positive stock market reaction established in this study is in line with the conclusions of other studies which investigated into the stock market reaction to other awards announcements (Balasubramanian et al., 2005; Gemser et al., 2008; Arthur & Cook, 2009).

Table 3: Market Model Abnormal Returns for 234Product Design Awards

	Day -1	Day 0	Day +1	Days-1,0 and +1 (CAR)
Mean abnormal return (%)	0.25	0.44	0.37	1.06
t-statistic	1.43*	2.38**	2.45**	3.35***
Median abnormal return (%)	0.21	0.23	0.26	0.31
Wilcoxon signed-rank Z-statistic	1.74**	2.42**	2.61***	4.01***
Percentage of abnormal returns positive	52.80	56.76	54.32	58.07
Binomial sign test Z-statistic	2.56***	2.78***	1.95**	2.04**
Sample size	234	234	234	234

*, **, and *** denote statistically significant at the 10%, 5% and 1% levels respectively for Mean abnormal return (t-statistics) and median abnormal returns (Wilcoxon sign-ranked test) respectively.

*, ** and *** represent 10%, 5% and 1% significantly higher than 50% as in the case of Binomial sign test for the percentage of positive abnormal returns. All tests are one-tailed.

Cross-Sectional Analysis Results

Cross-sectional regression analysis is performed to ascertain whether the direction and magnitude of abnormal returns associated with product design awards announcements are moderated by firm-specific characteristics. Firm-specific variables as hypothesized in Hypotheses H_2 and H_3 are firm size (SIZE) and first-time winner (FTW). In addition to the hypothesized variables, the control variables chosen for this study are firm profitability and research & development. Profitability (PROFITABILITY) is known to impact the ability of firms to undertake more product designs as firms with higher profitability will the capacity to commit more resources to engage in frequent product designs (Dedolph, 2014). We also control for research & development (R/D) represented by R/Dintensity. The increasingly demand for newer and faster products and applications in the CECI puts a greater emphasis on R/D to achieve competitive advantage as well as enhanced financial performance of firms (Shen et al., 2017).Therefore, we control for R/Dintensity in order to mitigate any potential bias against firms with low R/D capacities.

The following regression model is used to test hypotheses H_2 and H_3:

$$CAR_i = \beta_0 + \beta_1 SIZE_i + \beta_2 FTW_i + \beta_3 PROFITABILITY_i + \beta_4 R/Dintensity_i + \varepsilon_i \quad (8)$$

Where; CAR_i is the cumulative three-day (-1,0, +1) abnormal stock return for firm *i*, and ε_i is the error term.

$SIZE_i$ is the size of firm *i* which is computed as the natural logarithm of total assets value (Ba et al., 2013). FTW is an indicator variable that assumes a value of 1 if a firm wins its first product design award and 0 otherwise. PROFITABILITY is estimated as the ratio of operating income before depreciation to sales (Hendricks & Singhal, 2005). R/Dintensity is calculated as the ratio of R/D expenditure to total sales (Xia et al., 2016).

Pearson pairwise correlation analyses between the study variables is conducted in order to check for the possibility of multi-collinearity among the variables. According to Table 4, the highest correlation coefficient is 0.511, which is between profitability (PROFITABILITY) and firm size (SIZE). A correlation coefficient of less than 0.8 suggest that multi-collinearity is not an issue of concern in a study(Gujarati, 2004). Furthermore, the variance inflation factor amongst the independent variables was calculated to serve as further check for the presence of multi-collinearity. Highest VIF was 2.47 which suggests the absence of multi-collinearity among the study variables. According to(Kennedy, 1998),VIF of less than 10 indicate that multi-collinearity is not a problem in the study.

The regression results are presented in Table 5. The explanatory variables without the control variables are presented under Model 1. However, both the explanatory and control variables are incorporated together under Model 2.The results under Model 2 are reported since the results are qualitatively the same under the two models. According to Model 2 in Table 5, the coefficient of firm size (SIZE) is negative and significant (-0.079; t-statistics = -2.603).This implies that the stock market reacts more positively to product design awards won by smaller firms than larger firms. As such, the results support hypothesis H_2. Winning a product design award for the first time is positively related to the abnormal returns. Thus, the coefficient of FTW is positive and significant (0.068; t-statistics = 2.281). The implication is that winning product design award for the first time is perceived to be more value-enhancing by shareholders than multiple wins. We had argued that anytime a firm wins an award, it provides information about the product design capabilities of the firm to investors and the general public; therefore, winning product design award repeatedly will be less surprising. This will trigger less stock market reaction from investors. Hence, winning product design award for the first time is more positive than multiple wins. Thus, we accept hypothesis H_3. With regard to the control variables, Table 5 also portrays an insignificant relationship for both profitability and research & development.

The F-statistics of 4.2 for Model 2 is statistically significant at the 1%, indicating a good fit of the regression model. The R^2(0.342) and adjusted R^2(0.296) are comparatively stronger with respect to other cross-sectional regression models used in related studies on stock market reaction to new information or events (Chen, 2005; Ba et al., 2013).

Table 4: Pearson Correlation Results

	CAR_i	SIZE	FWT	PROFITABILITY	R/Dintensity
CAR_i	1				
SIZE	0.325**	1			
FTW	0.451**	0.042	1		
PROFITABILITY	0.158	0.511	0.183*	1	
R/Dintensity	0.232	0.045	0.019	0.283	1

*, and ** denote significance at the 10% and 5% level respectively

Table 5: Regression results on the effect of firm characteristics on abnormal returns (CAR_i)

Model 1			Model 2		VIF
	Coefficient	t-statistics	Coefficient	t-statistics	
SIZE	-0.051***	-2.811	-0.079***	-2.603	1.35
FTW	0.066**	1.940	0.068**	2.281	2.47
PROFITABILITY			0.025	0.712	2.20
R/Dintensity			0.064	1.255	1.19
Constant	0.072***	3.135	0.128***	3.167	
F-statistics	3.361***	3.489	4.190***	3.604	
R^2	0.275		0.342		
Adjusted R^2	0.198		0.296		

** and *** denote significance at the 5% and 1% level respectively.

CONCLUSION

This paper investigates the market reaction on the announcements of product design awards as a proxy for successful implementation of SMPDs in CECI. Using the market model, the study establishes that abnormal return does exist in short term period surrounding the event date. Specifically, the announcements of firms winning product design awards yield positive stock market reaction as the market value of the firm is increased by 1.06 on the average due to the announcements. The positive reaction is an indication that product design awards announcements is greeted favorably by investors and the general public. The results of this research indicate that the stock market reaction for smaller firms that won product design awards is stronger than larger firms although larger firms are involved in more product design engagements than smaller firms. Moreover, the reaction is more significantly positive for winning product design award for the first time than multiple times.

The significant favorable reaction established by this study is consistent with the results of other studies which investigated into the market reaction to announcements of other awards: CEO Stock Option Awards (Yermack, 1997), Quality Awards (Hendricks & Singhal, 1996) and Innovation Awards (Nicolau & Santa-María, 2013). However, some studies conducted by (Maltsbarger, 2011) - Academy Awards; (Tippins & Kunkel, 2006) - Advertising Awards; and (Li & Mu, 2017) - Sustainability Awards concluded either positive but not significant or negative stock market reactions to the announcements of the respective award events investigated into. This research enriches the body of literature at the strategic management-finance interface as it provides empirical evidence about how firm value is affected by strategic decisions. Moreover, the focus of this research on CECI bridges the gap in literature with regard to existing scanty industry-specific studies.

The positive signal to the general public caused by winning product design awards as a proxy for effective implementation of SMPDs has the tendency to increase the customer base of the firm. Customers are often willing to pay more for well-designed products that can offer them benefits such as greater usability, increased functionality and improved aesthetics. A managerial implication of our study is that it entreats managers to have a paradigm shift in their perspectives with respect to third-party recognition for excellence in product design. A survey reported by (Sung et al., 2010) cited in (Boyd & Kannan, 2018) highlights that managers view third-party recognition to have little or no financial value on shareholders wealth.

However, the results of our study symbolize the need for managers to set an award-winning objective integrated into the overall objective of the firm. Such an award-winning objective will enable managers to allocate more resources and serious attention to product design processes and systems. Thus, this research recommends that it is critical for firms to engage or hire good and strong product design managers to oversee the accomplishment of such important objective. Finally, in order to achieve the award-winning objective, it is suggested that managers of firms should conduct periodic product design audit – assess the vital areas of the firm such as brand, product and service development, work practices and customer communication and then determine the key roles design plays in them.

Based on the chosen variables, event window and industry as well as the results generated, there are intriguing avenues for future research. First, this research focused on CECI. Thus, future research can be conducted to examine stock market reaction to product design award announcements in other industries. Second, the event window (-1, 0, +1) used is a short-term period and therefore a longer event window can be used in a future long-term study. Lastly, investment in the stock market is always characterized by risk and return.

However, this study concentrated on the return aspect of the two constituents of investment. Consequently, it would be very informative for future research to be conducted to include risk in order to examine how the abnormal return generated from product design award announcements is affected by risk of investments. Such risk-return relationship to be involved in one study would be an indication of adopting a holistic approach with regard to the two constituents of investments (risk-return).

REFERENCES

Akkoc, S., & Ozkan, N. (2013). An Empirical Investigation of the Uncertain Information Hypothesis: Evidence From Borsa Istanbul. Journal of BRSA Banking and Financial Markets, 7(2), 101–119. Retrieved from http://www.bddk.org.tr/WebSitesi/turkce/Raporlar/BDDK_Dergi/126035.pdf

Anderson, B. S., & McMullen, J. S. (2012). Does the market reward entrepreneurial strategies? Frontiers of Entrepreneurship Research, 32(17), 1–16. Retrieved from https://digitalknowledge.babson.edu/cgi/viewcontent.cgi?article=2565&context=fer

Armitage, S. (1995). Event Study Methods and Evidence on Their Performance. Journal of Economic Surveys, 9(1), 25–52. https://doi.org/10.1111/j.1467-6419.1995.tb00109.x

Arthur, M. M., & Cook, A. (2009). Shareholder Returns for a Catalyst Award. Group and Organization Management,34(4), 432–448. https://doi.org/10.1177/1059601108331219

Ba, S., Lisic, L. L., Liu, Q., & Stallaert, J. (2013). Stock Market Reaction to Green Vehicle Innovation. Production and Operations Management, 22(4), 976–990. https://doi.org/10.1111/j.1937-5956.2012.01387.x

Balasubramanian, S. K., Mathur, I., & Thakur, R. (2005). The Impact of High-Quality Firm Achievements on Shareholder Value: Focus on Malcolm Baldrige and J. D. Power and Associates Awards. Journal of the Academy of Marketing Science, 33(4), 413–422. https://doi.org/10.1177/0092070305277691

Basuroy, S., Desai, K. K., & Talukdar, D. (2006). An Empirical Investigation of Signaling in the Motion Picture Industry. Journal of Marketing Research, 43(2), 287–295. https://doi.org/10.1509/jmkr.43.2.287

Bergh, D. D., & Gibbons, P. (2011). The Stock Market Reaction to the Hiring of Management Consultants: A Signalling Theory Approach. Journal of Management Studies, 48(3), 544–567. https://doi.org/10.1111/j.1467-6486.2010.00957.x

Boyd, D. E., & Kannan, P. K. (2018). (When) Does Third-Party Recognition for Design Excellence Affect Financial Performance in Business-to-Business Markets? Journal of Marketing, 82(3), 108–123. https://doi.org/10.1509/jm.15.0150

Bu, X., & Tian, R. G. (2012). Quality Award and Market Performance : An Empirical Investigation about Chinese Stock Market. Journal of Applied Business and Economics, 13(3), 25–35. Retrieved from http://www.na-businesspress.com/JABE/BuX_Web13_3_.pdf

Buckler, G. (2006). Electronic Industry. Retrieved January 21, 2019, from https://www.thecanadianencyclopedia.ca/en/article/electronics-industry

Certo, S. T. (2003). Influencing initial public offering investors with prestige: signaling with board structures. Academy OfManagement Review, 28(3), 432–446. https://doi.org/10.2307/30040731

Certo, S. T., Daily, C. M., & Dalton, D. R. (2001). Signaling firm value through board structure: an investigation of initial public offerings. Entrepreneurship Theory and Practice, 26(2), 33–50. https://doi.org/10.1177/104225870102600202

Chan, W. C. (2003). Stock price reaction to news and no-news: Drift and reversal after headlines. Journal of Financial Economics, 70(2), 223–260. https://doi.org/10.1016/S0304-405X(03)00146-6

Chen, S., Ho, K. W., & Ik, K. H. (2005). The Wealth Effect of New Product Introductions on Industry Rivals. The Journal of Business, 78(3), 969–996. https://doi.org/10.1086/429650

Connelly, B. L., Certo, S. T., Ireland, R. D., & Reutzel, C. R. (2011). Signaling Theory: A Review and Assessment. Journal of Management, 37(1), 39–67. https://doi.org/10.1177/0149206310388419

Dedolph, F. M. (2014). Design for Profitability – a Model for Developing More Profitable Products. Retrieved January 31, 2019, from https://www.pnsqc.org/design-profitability-model-developing-profitable-products/

Dhanda, K. K., & Peters, A. A. (2005). Reverse Logistics in the Computer Industry. International Journal of Computers, Systems and Signals, 6(2), 57–67. Retrieved from https://pdfs.semanticscholar.org/b287/7364fa26bad1d3a5ce2fc0f0754c52eefe34.pdf

Ende, J. van den, Candi, M., & Gemser, G. (2010). How design can improve company performance. RSM Insight, 4–6. Retrieved from https://repub.eur.nl/pub/40049/RSMInsightHowDesignCan_2010.pdf

Fama, E., Fisher, L., Jensen, M., & Roll, R. (1969). The Adjustment Of Stock Prices To New Information. International Economic Review, 10(1), 1–21. https://doi.org/10.2307/2525569

Gemser, G., Leenders, M. A. A. M., & Wijnberg, N. M. (2008). Why Some Awards Are More Effective Signals of Quality Than Others: A Study of Movie Awards. Journal of Management, 34(1), 25–54. https://doi.org/10.1177/0149206307309258

Gujarati, D. N. (2004). Basic econometrics (4th ed.). New York, USA: Tata McGraw-Hill Companies.

Hassaan, M. (2016). Sustainability Reporting in Transitional Reporting. In R. C. Das (Ed.), Handbook of Research on Global Indicators of Economic and Political Convergence (pp. 184–205). IGI Global, Hersley PA, USA.

Hendricks, K. B., & Singhal, V. R. (1996). Quality Awards and the Market Value of the Firm: An Empirical Investigation. Management Science, 42(3), 415–436. https://doi.org/10.1287/mnsc.42.3.415

Hendricks, K. B., & Singhal, V. R. (2005). Association between supply chain glitches and operating performance. Management Science, 51(5), 695–711. https://doi.org/10.1287/mnsc.1040.0353

Johnston, A. M. (2007). A Review of the Application of Event Studies in Marketing. Academy of Marketing Science Review, 4, 1–31. Retrieved from https://www.researchgate.net/publication/43479414_A_Review_of_the_Application_of_Event_Studies_in_Marketing

Kennedy, P. (1998). Guide to Econometrics (4th ed.). The MIT Press, Cambridge, MA.

Konchitchki, Y., & O'Leary, D. E. (2011). Event study methodologies in information systems research. International Journal of Accounting Information Systems, 12(2), 99–115. https://doi.org/10.1016/j.accinf.2011.01.002

Li, D., & Mu, Y. (2017). Sustainability awards and the market value of the firm: An empirical investigation. In 14th International Conference on Services Systems and Services Management (pp. 1–6). IEEE. https://doi.org/10.1109/ICSSSM.2017.7996138

Lie, E. (2005). On the Timing of CEO Stock Option Awards. Management Science, 51(5), 802–812. https://doi.org/10.1287/mnsc.1050.0365

Maltsbarger, K. M. (2011). Does an Academy Award affect Stock Return? CMC Senior Theses, Claremont McKenna College. Retrieved from http://scholarship.claremont.edu/cmc_theses/185

Mule, R. K., Mukras, M. S., & Nzioka, O. M. (2015). Corporate Size, Profitability and Market Value: an Econometric Panel Analysis of Listed Firms in Kenya. European Scientific Journal, 11(13), 376–396. Retrieved from https://eujournal.org/index.php/esj/article/viewFile/5659/5485

Murray, T. (2005). A Conceptual Examination of Product Design, Appropriate Technology and Environmental Impact. Retrieved January 21, 2019, from http://www.ruadesign.org/pdf/productdesign.pdf

MyPlan. (2014). Computer & Electronic Product Manufacturing. Retrieved January 21, 2019, from https://www.myplan.com/careers/industries/computer-and-electronic-product-manufacturing/industry-outlook-nature-of-the-industry-08.06.html

Nelson, P. (1970). Information and consumer behavior. Journal of Political Economy, 78, 311–329. https://doi.org/10.1086/259630

Nicolau, J. L., & Santa-María, M. J. (2013). Communicating excellence in innovation. Economics Letters, 118(1), 87–90. https://doi.org/10.1016/j.econlet.2012.09.025

OECD. (1998). 21st Century Technologies. In People, Nature and Technology: Sustainable Societies in the 21st Century (pp. 1–173). the OECD Forum for the Future. Retrieved from https://www.oecd.org/futures/35391210.pdf

OECD. (2000). The Creative Society of the 21st Century. In People, Nature and Technology: Sustainable Societies in the 21st Century (pp. 1–197). the OECD Forum for the Future. Retrieved from http://www.oecd.org/futures/35391171.pdf

Osuala, A. E., Onoh, U. A., & Nwansi, G. U. (2018). Presidential Election Results and Stock Market Performance: Evidence From Nigeria. Applied Economics and Finance, 5(2), 117–124. https://doi.org/10.11114/aef.v5i2.3016

Otuedon, M. U. (2016). the Role of Creativity in the Market Segmentation Process : the Benefits of Having an Excellent Global Brand Positioning. International Journal of Economics, Commerce and Management, IV(2), 295–314. Retrieved from http://ijecm.co.uk/wp-content/uploads/2016/02/4216.pdf

Restuccia, M., de Brentani, U., & Legoux, R. (2016). The effect of channel awards on company value. Retrieved January 23, 2019, from http://sro.sussex.ac.uk/id/eprint/63654

Shen, K. Y., Yan, M. R., & Tzeng, G. H. (2017). Exploring R&D influences on financial performance for business sustainability considering dual profitability objectives. Sustainability (Switzerland), 9(11). https://doi.org/10.3390/su9111964

Slack, N., Brandon-Jones, A., & Johnston, R. (2013). Operations Management (7th ed.). Pearson Education Limited, United Kingdom.

Small, K., Ionici, O., & Zhu, H. (2007). Size Does Matter: An Examination of the Economic Impact of Sarbanes-Oxley. Review of Business, 27, 47–55.

Spence, M. (2002). Signaling in retrospect and the informational structure of markets. American Economic Review, 92(3), 434–459. Retrieved from https://www.jstor.org/stable/3083350

Sung, W. O., Nam, K.-Y., & Chung, K.-W. (2010). Strategic Use of International Product Design Award Schemes. Design Management Journal, 5(1), 72–86. https://doi.org/10.1111/j.1948-7177.2010.00016

Surajit, B., & Saxena, A. (2009). Does the Firm Size Matter? An Empirical Enquiry into the performance of Indian Manufacturing Firms. Retrieved January 29, 2019, from https://mpra.ub.uni-muenchen.de/13029/1/MPRA_paper_13029.pdf

Taj, S. A. (2016). Application of signaling theory in management research: Addressing major gaps in theory. European Management Journal, 34(4), 338–348. https://doi.org/10.1016/j.emj.2016.02.001

Tangen, S. (2003). An overview of frequently used performance measures. International Journal of Productivity and Performance Management, 52(7), 347–354. https://doi.org/10.1108/00438020310502651

Tippins, M. J., & Kunkel, R. A. (2006). Winning a Clio advertising award and its relationship to firm profitability. Journal of Marketing Communications, 12(1), 1–14. https://doi.org/10.1080/13527260500247942

UKEssays. (2013). Importance Of Good Product Design Marketing Essay. Retrieved January 19, 2019, from https://www.ukessays.com/essays/marketing/importance-of-good-product-design-marketing-essay.php?vref=1

Walsh, V., Roy, R., Bruce, M., & Potter, S. (1992). Winning by Design: Technology, Product Design and International Competitiveness. Blackwell, Oxford.

Wong, W. Y., & Hooy, C. W. (2016). The impact of election on stock market returns of government-owned banks: The case of Indonesia, Malaysia and Thailand. Asian Journal of Business and Accounting, 9(1), 31–58. Retrieved from https://ajba.um.edu.my/index.php/AJBA/article/view/2725

Xia, Y., Singhal, V. R., & Zhang, G. P. (2016). Product design awards and the market value of the firm. Production and Operations Management, 25(6), 1038–1055. https://doi.org/10.1111/poms.12525

Yermack, D. (1997). Announcements, Good Timing: CEO Stock Option Awards and Company News. Journal of Finance, 52(2), 449–476. https://doi.org/10.1111/j.1540-6261.1997.tb04809.x

Zhang, Y., & Wiersema, M. F. (2009). Stock market reaction to CEO certification: the signaling role of CEO background. Strategic Management Journal, 30(7), 693–710. https://doi.org/10.1002/smj.772