Disruptive Information and the Cost of Equity Finance of Small Firms : Moderating of CEO Succession Mechanism

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Abstract

The present paper examined the implementation of radio frequency identification (RFID) as a new platform for developing dynamic capabilities and competencies that enable family businesses to assimilate and respond to unprecedented changes and to reduce the cost of capital finance. In family businesses, the implementation of innovative and advanced technology may be perceived negatively by some entrepreneurs. There is insufficient empirical evidence to support a full understanding of the impact of disruptive information technology on the family firm's financing costs and the related risk. Understanding of the disruptive innovation effects has valuable implications during the family firms' succession. The paper tested a sample of 146 listed family businesses in the London Stock Exchange that adopted RFID innovative technology. The findings showed that the UK family firms, which employed the disruptive innovation technology, achieved a better financial performance through enhanced share returns in the short term as well as in the long term. Besides, the listed family firms in the service industry achieved a significant reduction in the equity cost of capital in the long term. During the CEO succession period, the investor of family businesses recognized the benefits of adopting RFID on their supply chain operations.

Keywords : **disruptive innovation, family business risk, CEO succession**

JEL Classification : G4, O1, O2, O3

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Applying new IT innovation in a business unit presents a new opportunity for major growth. Engaging new technology in the firm develops dynamic capabilities and competencies that can handle unprecedented market changes and captivate new management knowledge (Raisch & Tushman, 2016). However, in family businesses, it may be perceived negatively by some entrepreneurs. Some family businesses experienced uncertain and risky disruptive IT technology innovation that might have a long-term influence on their firms' performance. Family businesses might encounter operating problems while adopting disruptive IT innovation in generational succession and transitions (Bauweraerts, 2016).

The literature on the financial aspects of the family business has overlooked the concerns related to how family businesses manage the impact of adopting disruptive IT innovation on financing capital structure in small and medium enterprises (Maloni, Hiatt, & Astrachan, 2017). There are an impressive number of previous studies (for example, Leonidou, Christodoulides, & Thwaites, 2016) conducted to ascertain financial performance and

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capability in achieving higher profitability and cost reduction (Leonidou et al., 2016). The positive impacts of disruption of IT technology are associated with greater succession environmental changes, more proactive transition strategy, and closer CEO family and non - family members' ties during succession (Leonidou et al., 2016). The short-term event studies asserted that the adoption of IT innovation increases the stock returns and volume. The CEOs' investment decisions in IT innovation in integrated supply chains can increase firm profitability and decrease family business risk at the margins for the next generation of owners (Leonidou et al., 2016).

Managing a family business during succession and transition is one of the primary challenges. Previous studies investigated how and why the owners of a family business selected particular forms of financing capital during succession and transition. Besides, they examined the various successor characteristics during that period. Other literature developed a conceptual framework that investigated the reasons behind an owner's intent to use debt and equity for succession financing. Minichilli, Nordqvist, Corbetta, and Amore (2014) stated that extant literature on family business finance has overlooked the context through which a family firm implements an innovative IT infrastructure which, in turn, might help in the post-succession performance. The CEO succession mechanisms depend upon the specific IT innovation context in which they take place.

The relationship between the adoption of disruptive IT innovation contextual influences and the CEO of family-controlled firms' financial decisions has developed into two main dimensions. The first one is that the CEO succession's emotional and social effects are sensitive to the disruptive IT information during the succession and transition processes. The second dimension is concerned with the capital market responses to the family firms that adopt disruptive IT innovations with a lower equity risk premium (Minichilli et al., 2014).

CEO succession is emotionally demanding in the need of the balance between a family business priority, long CEO tenures, and a strong identification with the family business rather than non-family business. Minichilli et al. (2014) presented a better financial contextualized framework to study the financial performance of CEO transitions called as the 'socio-emotional wealth' (SEW). Entrepreneurs consider the SEW while evaluating their financial decisions, including the effect of changing of CEO on maintaining their SEW and their financial returns (Labelle, Hafsi, Francoeur, & Ben Amar, 2015). In addition, they are concerned to protect the influence of their SEW endowment on the relationship between CEO succession mechanisms and financial performance (Minichilli et al., 2014).

There are different succession mechanisms that determine the CEO succession period that consider both financial and non-financial goals. Following some previous studies, there are three main CEO succession mechanisms that encompass relay succession, a 'horse race' among potential candidates of the family businesses and CEOs, and hiring other candidates from outside the firm (Minichilli et al., 2014).

RFID as a Supply Chain Innovation Process Management

In 2003, disruptive nature of radio frequency identification (RFID) was not implemented in manufacturing fields until Walmart launched a mandate requiring its top 100 suppliers to adopt radio frequency identification (RFID) tags on the cases or pallets of shipments (Lui, Ngai, & Lo 2016). RFID changes the working structure and operation processes intensely including order/product tracking, inventory control, and warehousing management. RFID is considered as a disruptive technology innovation that revolutionizes supply chain management processes (Chemoiwo & Karanja, 2016 ; Fan, Tao, Deng, & Li, 2015 ; Lui et al., 2016).

The previous studies assumed that RFID meets two main disruptive technology innovation criteria (Lui et al., 2016). Firstly, RFID incorporates significant architectural changes in supply chain and logistics operations of the adopting firms. Secondly, during the implementation stage, RFID could create several radical services (Bauweraerts, 2016 ; Cho & Chan, 2015). It takes around two to three years to get the investment returns of adopting RFID, and previous studies used accounting-based measures and market-based measures to study the

impact of RFID adoption on family firm value. Researchers (Labelle et al., 2015 ; Lui et al., 2016 ; Raisch & Tushman, 2016) asserted that the impact of RFID on the financing cost of equity capital during CEO succession in the changing period was neglected by the family business performance studies (Bauweraerts, 2016 ; Lui et al., 2016 ; Leonidou et al., 2016). Therefore, the present study conducts a profound investigation of the impact of disruptive technology innovation on financing costs of equity and the methods used in order to reduce this financing cost that might have an important competitive implication on family firms during the CEO succession time.

Succession Equity Cost of Finance in Family Businesses

One of the most imperative events in the family businesses' life time is the CEO succession. CEO succession is a radical business change that affects the family businesses' market value, their financial performance, and their survival in the future. It is very crucial for family business members to seek for financing their equity through transaction costs during successions to prevent any further negative consequences of succession on business. Insufficient financial structure could lead to obstruct family firm's future growth (Lui et al., 2016 ; Maloni et al., 2017 ; Minichilli et al., 2014).

Previous studies examined the relationship between IT disruptive innovations and the financial outcomes of family businesses succession. Current researchers have found that disruptive information technology has a positive impact on achieving higher profitability rate and revenue growth as well as cost reduction (Neirotti & Raguseo, 2017). Zhu (2004) found a positive interaction effect between IT infrastructure and e-commerce financial outcomes and cost reduction. His research suggested that with large environmental changes and closer CEO/CIO ties, the investment of IT infrastructure has a positive impact on financial performance. Lui et al. (2016) found that the market responded effectively to enterprise resource planning (ERP) investments' announcements and the business innovative IT investments which increased market returns of small and medium enterprises (SME).

A recent study examined the impact of IT investments on business risk and found that IT investments increased business returns, which is suitable for boundary strategies of firm diversification and vertical integration in supply chain (Acharya, Drechsler, & Schnabl, 2014). They recommended that the positive impacts on the business diversity can moderate the effects of IT on financial performance that results in diminishing business systematic risk.

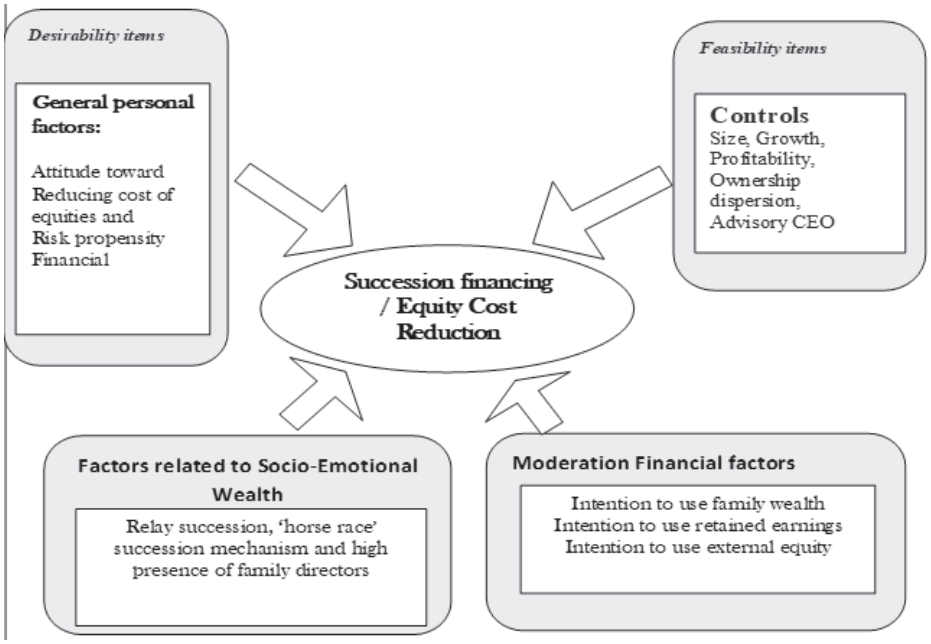
Disruptive Innovations on the Cost of Equity

The present study examines a substantive approach using a long-term event study methodology to investigate the impact of disruptive information technology on the cost of equity finance during CEO succession. The study highlights the importance of disruptive innovation on reducing cost of equity capital and business risk.

The following factors demonstrate the significance of the study. Firstly, the family firm market value is determined by its future cash flows and internal rate of returns (IRR) based on the cost of equity capital. If the firm risk portfolio has been improved by its disruptive information technology, the capital market is going to lower the firm cost of capital and then the overall financial performance of the family firm (Lui et al., 2016 ; Maloni et al., 2017 ; Minichilli et al., 2014).

Secondly, the investors' rate of returns is determined by the firm cost of capital as a long-term investment decision. Thirdly, the previous studies have suggested that CEO succession mechanisms could influence the cost of equity finance and the overall financial performance (Lui et al., 2016). Kar, Padhi, and Samantarai (2016) explored the scope of disruptive and reverse innovation in emerging-market context and economic value creation for a sustainable competitive advantage by companies in the service sector.

Figure 1. Research Conceptual Framework: Succession Financing of Family Businesses



Source: Adapted from Koropp, Grichnika, and Gugax (2013), p. 98

Conceptual Framework for the Research

The Figure 1 shows the conceptual framework for this study. This study considers the context of disruptive innovations technology and provides a deeper understanding of the impact of disruptive information technology on reducing the costs of equity finance which might lead to competitive insinuations for family businesses. To this end, the study estimates the impact of supply chain disruptive information technology on the cost of equity capital and business risk through the moderating effect of CEO succession variable using longitudinal objective data (Cho & Chan, 2015).

The present study applies a long-term event study analysis to estimate the abnormal changes in the cost of equity capital during the succession of CEO period. We use radio frequency identification (RFID) as the example of disruptive technology innovation for supply chain management processes (Cho & Chan, 2015 ; Koropp, Grichnika, & Gugax, 2013 ; Lui et al., 2016). The study examines the impacts of disruptive IT innovation on the adopters and non-adopters' family firms by using hierarchical regression analysis to test how CEO succession impacts the magnitude and direction of the abnormal cost of equity finance of the family firms (Cho & Chan, 2015 ; Levenburg, Schwarz, & Motwani, 2005).

Hypotheses Development

(1) Disruptive Innovation Impacts the Cost of Equity : A business finances its total assets by using equity (such as shared capital) or by debts (e.g. short or/and long-term loans). By using the equity option, the firm expects returns from the investment of business shares (Dhaliwal, Judd, Serfling, & Shaikh, 2016 ; Uddin, 2015).

The previous research on equity markets argued that the family firms that adopted disruptive innovations like RFID may reduce their cost of equity capital through two main mechanisms. The first mechanism is concerned

with increasing the investor base and the reduction of market systematic risk through diversification of financing sources. The second mechanism is related to the role of disruptive technology in providing adopters' firms with substantial performance enhancement (Lui et al., 2016). For instance, RFID technology improves the performance of automotive operations which avoid manpower manual handling and then, human error. Such improvements will reduce operating costs as well as systematic risk afterwards (Levenburg et al., 2005).

Furthermore, during the period of implementing changes, small and medium enterprises are more or less vulnerable to handle the competitive pressure and to properly manage the business, specifically in highly dynamic markets (Koropp et al., 2013 ; Labelle et al., 2015 ; Leonidou et al., 2016). Both studies carried out by Grunow and Piramuthu (2013) and Fan et al. (2015) asserted that the trading and industrial reports recorded significant increase in sales volumes for the family businesses that used item-level RFID tagging in retail supply chains operation.

Therefore, in case of those family businesses that adopt disruptive innovation through using RFID technology can reduce the systematic risk of the firm through diversity of capital funding, which leads to stabilize the future cash flows and achieve low cost of equity. Hence, we propose the following hypothesis :

↳ **Hypothesis H1 :** Family firms that adopt disruptive innovation technology can significantly reduce the cost of equity and then risk of finance.

(2) The Moderating Effect of CEO Succession

(i) CEO Succession : The board of directors plays a key role in protecting the SEW of family business owners. It can affect the strategic changes such as CEO successions from governance show ground till the financial performance at the end (Gomez -Mejia, Cruz, Berrone, & Castro, 2011). The present research argues that the more is the involvement of family members in the board of directors team, the more concerns may be raised of SEW protection outcomes. It may alleviate the disturbance of CEO succession in family firm's performance by emphasizing on SEW with the risk of the existence of family board of directors. On the other hand, they are willing to reserve SEW legacy through increasing performance hazards that represent a potential opportunity to improve financial performance of the family businesses (Abadie 2005 ; Gomez-Mejia et al., 2011). It is argued that family firms that conform to the CEO succession are legitimate and are expected to lower their equity cost of finance and are able to sustain enhanced financial performance (Lui et al., 2016).

The present paper highlights the dark edge of the SEW concerns of family businesses governance or the negative impact of CEO succession in family businesses. Considering the negative effect of the CEO succession on family firm's financial performance, empirical research studies offered some important mechanisms which have a positive impact on post-succession business financial performance (Minichilli et al., 2014). These mechanisms have been approved as relevant in the family business context. The CEO mechanisms can help in settle the balance between reducing cost of equity, risk considerations, and protecting SEW that are particularly relevant in the family business context. Those CEO mechanisms include "'relay succession,' annotations and 'horse race' among internal CEO candidates" (p. 1153 ; Minichilli et al., 2014) . The present paper uses the CEO succession mechanism as the moderator variable while examining the impact of IT disruptive innovation on equity cost and family business risk.

(ii) 'Relay Succession' as a CEO Mechanism of Succession : In both family and non-family businesses, CEO succession period starts with a proper identification of a successor in advance. Therefore, an incumbent CEO will start to work side-by-side with the well-defined successor till the selected incumbent CEO becomes familiar with the previous CEO's values and culture. This is very crucial for a smooth transition of the CEO position and the

endowment of the family's SEW. This procedure is defined as “relay succession.” Relay succession is very important to support the new CEO's liberty of action and give the CEO more freedom to focus on enhancing financial performance through choosing the sources of financing equity with low cost of capital (Cho & Chan, 2015 ; Gomez-Mejia et al., 2011 ; Lui et al., 2016). Family firms that adopt disruptive innovation technology help successors to do the best during succession period and facilitate an effective and more trustful response of stock market towards the changes in the CEO family member of the firm adopting innovative technology.

↳ **Hypothesis H2 :** Family firms with high 'relay succession' will reduce the equity cost of capital upon adoption of disruptive technology innovations.

(iii) 'Horse Race' Succession : When more than one successor is available, the firm tends to wait until the time of actual succession to select a new CEO. This creates a certain type of competition described as a 'horse race' among internal contenders to select the incumbent CEO or family owners. Potential candidates are informed that they will be groomed and their progress will be observed. The horse race will enhance the post- succession in terms of making “extraordinary levels of performance” (Friedman & Olk, 1995, p. 148). It will also raise the opportunity to understand requirements and expectations. Family firms that adopt the disruptive IT innovation will have the opportunity to enhance the 'horse race' succession mechanism.

↳ **Hypothesis H3 :** Family firms with high ‘horse race’ succession mechanism can reduce the equity financing cost of capital upon adoption of disruptive technology innovations.

Methodology

The present study employs a practical approach using a long-term event study methodology to investigate the impact of disruptive information technology on the family owned firms' financial performance including cost of equity finance and the associated risk during CEO succession. Event study methodology takes a forward-looking way while expecting the value that the firm will gain as a result of a business action after exposing this action to the public. The measurement of this value is associated with the increase of the cash flows that are projected because of the firm action after discounting the current period (the time of publicizing the action). Compared to other financial performance metrics such as ROI and profits, event study allows forward looking and it is available at high frequencies that makes it easy to separate the created value of the event from the firm’s total performance.

(1) Processing of Data Collection : In the present study, the event study methods have been employed to test abnormal operating performance of the family businesses that has been achieved by a specific event. The study focuses on service family firms listed on the London Stock Exchange market in the FTSE Small Cap list (telecommunication, travel agents, leisure and support services) that adopted RFID in their supply chain processing systems. With the keyword of RFID and RF-ID or "radio frequency identification," we searched for the listed family businesses that adopted RFID considering the announcements from FTSE Smallcap for 2006 through 2016. We reviewed accurately the announcements and verified any ambiguous cases to make sure that the coding of the announcement was correct. The study verified cases of accouchements that took place within the 5-year confusing window lasting from 2-years before the RFID adoption announcement (the event) to 3 years after the RFID adoption announcement (the event).

(2) Sampling : The present research uses data collected from 108 respondents by Bose, Lui, and Ngai (2011) and data collected from 128 respondents by Jeong and Lu (2008) within a time period of 10 years, that is, from

2006 - 2016. Therefore, we ensure completeness of the current research sample size of the RFID investment announcements (Bose et al., 2011 ; Jeong & Lu, 2008). Besides, the present study uses cross-checked collected news from other public sources also (like Yahoo finance and Google news of the London Stock Exchange Market). Finally, the paper collected 234 publicly listed family firms that adopted RFID technology. The paper collected CEO succession data from EXECUCOMP of Family Firm listed data of stock exchange and financial performance data and stock data from Data Stream Thomson Reuters from 2006- 2016. The date collected was "to be dated at least two years prior to RFID adoption to match a control firm for data analysis" (Lui et al., 2016, p.350).

Analysis and Results

(1) Control Firms : Following the previous studies, the present research applies a propensity score matching to select the research control firms to ensure the direct comparisons between adopter and non-adopter characteristics (propensity scores) as presented in the Table 1. In this way, we can reduce any remaining selection bias that may arise during the analysis (d'Agostino, 1998).

The study implements a logistic regression of the indicator variable in which '1' indicates the adopters and '0' refers to the non-adopters. These predicting factors are R&D expenses, firm size, ROA (operating profit before interest and taxes / over total assets), sales growth (annual sales growth rate), financial slack (current assets over total assets), SGA intensity (sales and general administrative cost over sales), leverage (debt over total assets,

Table 1. Propensity Score Diagnosis

Independent Variable	Pre-match	Post-match
Firm size	1.69(0.01)**	0.80(0.01)**
Financial slack	4.17(0.03)**	1.70 (0.49)
ROA	2.08(0.02)**	0.49(0.70)
Succession	2.64(0.00)***	0.91 (0.43)
Sales growth	1.44(0.00)***	0.33 (0.64)
Relay race	-1.90(0.00)	-0.58(0.46)
Horse race	-7.31(0.00)	1.59(0.71)
Overall cost of capital	7.17(0.19)	4.74(0.41)
Cost of debt capital	-0.15(0.85)	-0.73(0.27)
Cost of equity capital	-0.67(0.05)*	0.01 (0.98)
Sample	-6.88(0.22)	-6.95(0.34)
Control	-6.09(0.32)	1.40 (0.82)
Cox and Snell *R* square	154	156
Nagelkerke *R* square	679.100	56.43
Log-likelihood	811	159
Hosmer and Lemeshow	16.00	11.87
test chi-square	28.42	15.76
Propensity Score	**9.60(*p*- value = 0.53)**	**5.76 (*p* - value = 89)**

Note: Unstandardized regression coefficients in the table show as the *p*-value in parentheses. a Logarithm transformed.
* $p < 0.1$; two-tailed tests.
** $p < 0.05$; two-tailed tests.
*** $p < 0.01$, two-tailed tests.

labour productivity (operating income over number of employees), and inventory days (365 over inventory turnover). The analysis also includes the cost of capital structure (the cost of equity capital, cost of debt capital, interest expense over the sum of long-term and short-term debt) (d'Agostino, 1998 ; Lui et al., 2016). The study estimates the cost of equity capital as the expected investor returns from the firm's equity, calculated with the CAPM :

$$r_E = r_F + \beta_E (r_M - r_F)$$

where, r_F is the risk-free rate and is equivalent to the 10-years UK listed companies' treasury bond rate. Beta (β_E) is the firm's systematic risk and is measured as the covariance of the market's return with the individual company's common stock returns divided by the market's variance.

$$Pr(RFID_{it}) = a_0(industry) f_{t-2}(b_1 Firmsize_{it-2}) b_2 ROA_{it-2}(b_3 Financial\ \ slack_{it-2}) b_4 SGAintensity_{it-2} (7Sales\ growth_{it-2}(3Leverage_{it-2}) (5Labour\ productivity_{it-2}) (4R\&D\ intensity_{it-2}) (b_8 Cost\ of\ capital_{it-2}) e_{it} (b_8 Cost\ of\ debtcapital_{it-2} b_7 Cost\ of\ equity\ capital_{it-2})$$

where, *t* is the adopting year, *Pr (RFIDit)* is the probability of *i*th firm's *RFID* adoption in year *t*. The *Pr (RFIDit)* is measured as $rWACC = (E/(D + E))rE + (D/(D + E))rD\ (1 - T)$; where, *E* = market value of the firm's equity; *D* = market value of the firm's debt; *rE* = the firm's cost of equity capital ; *rD* = the firm's cost of debt capital; and *T* = the firm's rate of corporate taxation.

We use the base year (*t* - 2) to match each family firm that adopted RFID into a control firm of each industry with the nearest propensity score for that year. In the sample, 146 sample family firms were successfully matched with the same industry.

In Table 2, the post-match model presents that the matching procedure is successful. We find that the coefficient of most variables experiences is insignificantly decreased in magnitude between adopter and matched non-adopter. However, firm size coefficient of firms is significant because RFID - adopting family firms are mainly in the big size firms .

(2) Difference - in -Differences (DiD) Models and CEO Succession Characteristics : The paper tests the hypotheses by using difference-in-differences (DiD) models. DiD models have been recently applied because the model can identify in details the CEO succession characteristics on the family firm performance while captivating the general effect of common shares (Minichilli et al., 2014). We built 'a dummy variable for CEO succession' equals to 1 in the succession year onwards and 0 for the year before the succession before extending the model for multiple treatments. For instance, relay succession and horse race mechanisms are = 1 from the year of a relay succession and horse race mechanisms onwards, and = 0 for pre-succession period as well as for non-relay successions and non-horse race mechanisms. This variable isolates the impact of relay succession on firms' performance after controlling for the general effect of CEO succession, common shocks, and time-invariant differences between firms in each succession group and non-succession firms (via firm fixed effects) (Abadie, 2005 ; Minichill et al., 2014).

(3) Abnormal Changes in Family Firms' Cost of Equity : The paper tests the current hypotheses and examines the moderating effect of CEO succession on the relationship between adopting disruptive innovation and the family firms' cost of equity reduction. The results of the present research cover a sample period of 5 years (starts from year *t* - 2 through *t* + 3). The findings of the study conclude that there is a negative effect of the adoption of disruptive innovation technology on the cost of family firms' equity capital. The abnormal changes in the cost of equity capital for family firms is shown in the Table 2. *N* is the research sample size ; size varies based on the

Table 2. The Post-Match Model

Variable	Model 1 : Base model	Model 2: SEW model	Model 3: Coercive adoption model
Intercept	5.18 (0.30)	5.68 (0.24)	4.43 (0.35)
CEO age	0.00 (0.07)	0.00 (0.10)	0.00 (0.17)
CEO gender	-0.02 (0.42)	0.02 (0.46)	-0.02 (0.51)
CEO duality	-0.02 (0.06)*	-0.01 (0.15)	0.01 (0.26)
CEO base salary	0.00 (0.85)	0.00 (0.36)	0.00 (0.56)
Firm previous cost of equity capital	-0.06 (0.73)	-0.06 (0.73)	-0.18 (0.32)
Firm size	0.01 (0.24)	0.01 (0.29)	0.01 (0.18)
ROE	-0.00 (0.59)	0.00 (0.84)	0.00 (0.91)
Tobins' Q	0.00 (0.53)	0.00 (0.35)	0.00 (0.27)
Financial slack	0.08 (0.05)*	0.06 (0.09)*	0.08 (0.04)**
Main succession characteristics			
and sew moderator	-0.17 (0.18)	-0.14 (0.27)	-0.14 (0.25)
Relay succession	-0.01 (0.72)	-0.02 (0.34)	-0.03 (0.23)
Industry clock speed	-0.01 (0.15)	0.02 (0.06)*	-0.02 (0.03) **
Board family ratio	-0.03 (0.02)**	0.03 (0.03)**	-0.03 (0.05)**
Horse race	0.01 (0.23)	0.02 (0.11)	0.01 (0.17)
Adoption year	-0.00 (0.29)	-0.00 (0.23)	0.00 (0.35)
Interactions Relay succession *			
board family ratio		-0.00 (0.01)**	0.00 (0.04)**
Horse race * board family ratio			-0.02 (0.04)**
Model *F* value	1.84**	2.23**	2.44***
R-square (%)	25.86	31.36	34.97
Adjusted *R*-square (%)	11.78	17.28	20.62
R-square change (%)	25.86	5.50	3.62
F change	1.84**	6.25**	4.28**

different event periods as longitudinal data were sometimes unavailable and we need to match size of the family businesses with the research control variable. It can be inferred from the Table 2 that the cost of equity finance has been reduced by -1.14% in the period (t - 2 to t - 1; $p < 0.05$) in the second piloting stage of analysis. The cost of capital of the research sample of the 3rd period shows that the cumulative effects in the cost of equity capital are - 0.68%, - 0.61% with a significance level of $p < 0.05$. Therefore, the results reveal that H1 has been accepted.

(4) Hierarchical Regression Analysis : We, in the present research, use hierarchical regression analysis (HRA) (Table 3) to examine the influence of CEO relay and horse race CEO succession mechanisms on reducing the abnormal cost of equity capital of family businesses. The analysis reveals that H2 is accepted through this study. To test H2 and H3, the study uses SEW protection, relay and horse race succession mechanisms. We assumed that firms use relay and horse race succession mechanisms during succession but this resulted in negative. This ensures the protection of the family firm SEW and results in diminishing of finance cost of equity capital.

As demonstrated in the Table 3 and for the purpose of the analysis, the research has created a dummy variable which is labelled coercive adoption and coded as 1 for RFID-family firms' adopters and as 0 for non-RFID-family

Table 3. The Impact of Relay CEO Succession Using Hierarchical Regression Analysis (HRA)

Time Period	*N*	Abnormal	Time Period	*N*	Abnormal	Time Period
Yearly abnormal change						
t - 3 to *t* - 2	146	0.12*	-0.11**	0.77	0.99	0.56
t - 2 to *t* - 1	139 -0.78	-1.14	0.08	0.02	0.01	
t - 1 to *t*	130	0.23	0.23	0.52	0.38	0.43
t to *t* + 1	118 -0.33	-0.17	0.25	0.56	0.78	
t + 1 to *t* + 2	108	-0.18	0.08	0.56	0.66	0.77
t + 2 to *t* + 3	95	-0.39	-0.18	0.17	0.36	0.41
Cumulative Abnormal Change						
t - 2 to *t* + 1	118 -0.66	-0.68*	0.08**	0.04	0.03	
t - 2 to *t* + 2	108	-0.95**	-0.61**	0.02	0.02	0.04
t - 2 to *t* + 3	95	-0.91**	-1.18**	0.04	0.03	0.07

Note: *N* = 95; *t* is the year of RFID adoption; based on the data in year *t* - 2 ; unstandardized regression coefficient is shown with the *p*-value . *a* in logarithm.
* $p < 0.1$; two-tailed tests.
** $p < 0.05$; two-tailed tests.
*** $p < 0.01$; two-tailed tests.

firms' adopters. The present research concludes that financial performance was improved in family firms where their CEOs used horse race succession mechanisms.

Discussion and Conclusion

This paper investigates the relationship between disruptive innovation by adopting RFID and the reduction of financing the equity cost moderating the CEO succession period using relay race and horse race as succession mechanisms. The research uses a sample of 146 family businesses which adopted RFID innovative technology and were listed on the London Stock Exchange.

The findings elucidate that the UK family firms that implemented a disruptive innovation technology achieved a better financial performance through enhanced share returns in both short and long terms. Furthermore, these listed family firms in the services industry achieved a significant reduction in the cost of equity of capital in the long term. During the CEO succession period, the investors of family businesses realized the benefits of adopting RFID on the supply chain management processes. We further examined the moderation of CEO succession mechanisms (relay and horse races) during succession periods and the role of disruptive information technology and innovations on family firms' financial performance and also on declining the cost of equity capital.

In considering social and economics wealth (SEW) perspective that are testified by previous research (Minichilli et al., 2014 ; Lui et al., 2016), the present work confirms that CEO succession and non-succession firms employing both CEO mechanisms (relay and horse races) succeeded in diminishing the cost of equity to finance their capital and these findings are in congruence with the findings of the previous studies (Abernathy & Clark, 1985 ; Minichilli et al., 2014 ; Lui et al., 2016) in funding the capital during succession periods. The results indicate that equity market perceives that financial alignment helps reduce agency costs by motivating managers to embrace the interests of shareholders. Similarly, the findings show that firms conforming to customer mandate received lower cost of equity capital.

Managerial Implications

The results of the present study contribute to practitioners in the field of small and medium businesses in the following aspects: Firstly, entrepreneurial leaders should understand carefully the candidates' mechanism of succession in light of the family's SEW. They should choose such mechanisms that maximize both firm's and family's utility. Secondly, the present study sends a clear message of adopting disruptive IT to family firms' entrepreneurs as equity finance is the most important and significant financing cost in their businesses. Thirdly, family firms should consider a higher ratio of incentive-based pay for CEO compensation to obtain lower cost of equity capital.

Limitations of the Study and Recommendations for Future Research

In the present research, the authors reveal some limitations. First, the study only included private service industry family businesses that are listed on the London Stock Exchange market .Therefore, the results may be irrelevant to firms in the countries outside the UK market, the manufacturing industry, or non-listed publicity firms or even non-family businesses. Secondly, this research only included sample firms that announced succession mechanisms of relay and horse. The findings of this study might vary if other firms were considered including those which adopted RFID without succession or firms that might have other investment decisions.

Future studies might consider sample firms across other regions to investigate other contextual factors such as organizational culture and corporate governance, which may affect the impact of disruptive information technology on the cost of capital finance.

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