# The effect of combinative strategies oriented towards efficiency and resilience in information technology consulting services firms

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## Abstract

The relationship between lean and risk management on operational efficiency and resilience, respectively, has been studied separately or as competing. This paper intends to reconcile these relationships as strategically combined to increase operational efficiency and resilience concurrently. Specifically, we explore the combinative relationship between lean and risk management on operational efficiency and resilience and the moderating roles of risk management in the relationship between lean and operational efficiency; of lean management in the relationship between risk and resilience; of competitive intensity on lean management and operational efficiency; and, of uncertainty in the relationship between risk management and resilience.

**Keywords:** Efficiency, Resilience, Combinative strategy

**Introduction**

One of the most challenging dilemmas in management is how firms deal with and respond to contradictory scenarios and market demands. Burns and Stalker (1961) suggest that firms regularly respond to different environmental demands. In the same vein, Skinner (1969) introduced the concept of trade-offs in operation strategy into the operations management literature. The literature has progressed along two strands (Pagell et al., 2015). The first focuses on investigating whether those trade-offs or competing market demands exist. This strand of the literature is more prevalent in the operations management community. The second explores how firms respond to those competing demands. In this strand, research has focused on ambivalence (different perspectives about the same object or individual, Ashforth et al., 2014) and paradox (Smith and Lewis, 2011) and ambidexterity (Brikinshaw and Gupta, 2013) related to the tension created due to competing demands. The authors used these terms to define overlapping activities, strategies and management at the individual or organizational level (Ashforth et al., 2014; Smith and Lewis, 2011).

This research contributes to the abovementioned literature by answering the following question related to the organization but analyzing the firm at the operational and management levels: How are managers responding to potentially competing demands between operational efficiency and resilience. This study focuses not only on how firms organize but also on how they adapt their operations.

**Theoretical framework and hypothesis**

This study applies contingency perspective of the Resource-Based View (RBV) in order to understand how firms gain efficiency and resilience. RBV argues that firms consist of bundles of strategic resources and capabilities that are combined to achieve competitive advantage (Barney, 1991; Grant, 1991). The RBV contingency perspective argues that internal and external factors will influence the management of a firm and suggests that firms must adapt depending on the environment in which they exist. According to the RBV logic, operational efficiency and resilience can be understood as performance outcomes, and lean and risk management can be seen as capabilities that lead to the improvement of performance. Our theoretical model shown in Figure 1 links firm's capabilities with performance outcomes.

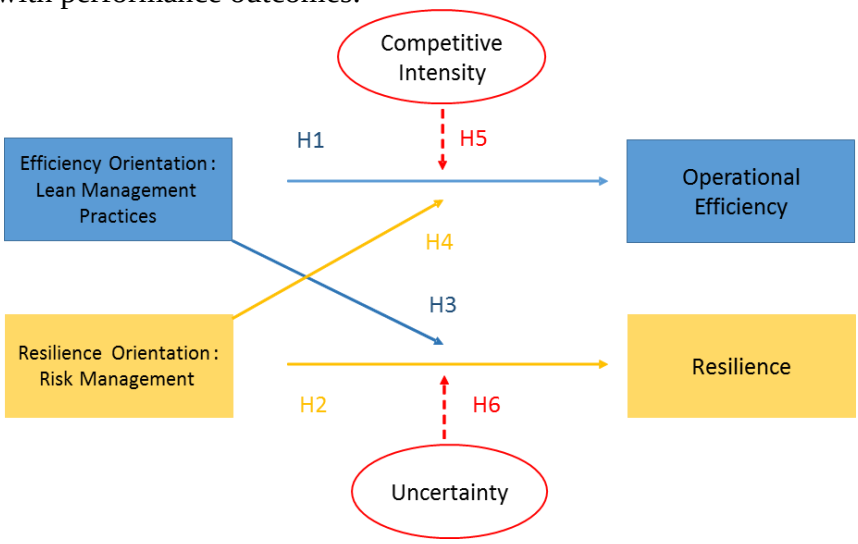


*Figure 1 — Theoretical model and hypothesis*

*Lean management and operational efficiency*

Operational efficiency is defined as the optimal use of resources subject to time and budget constraints and technology in order to maximize benefits. Lean management practices are generally shown to be associated with high performance in the literature of manufacturing (Sakakibara et al., 1997). Empirical studies interested in the impact of lean implementation on operational performance focused mostly on one or two dimensions of lean, often JIT or TQM. Research has shown that JIT practices improved operational performance more than TQM practices (Sakakibara et al., 1997).

**Hypothesis 1**. Efficiency orientation through lean management practices is positively associated with operational efficiency in a firm.

*Risk management and resilience*

From the RBV perspective, resources should be bundled into capabilities that must be effectively leveraged to create or protect value (Sirmon et al., 2008). Previous studies have emphasized the notion of value protection in order to study resilience of a firm (Brandon-Jones, 2014). We follow Wieland and Wallenburg (2012) and define resilience as a strategic orientation with two dimensions: "agility", which points to the reaction ability, and "robustness", which requires proactive anticipation of change prior to occurrence. Within a context of disruption risks, the resilience capacity of a firm will depend on how well a risk management infrastructure has been developed: an established risk management department where business continuity plans are prepared and implemented based on key performance indicators and formal security procedures

embedded in an information system that is constantly updated. Based on this reasoning, the following is hypothesized:

**Hypothesis 2**. Resilience orientation through risk management is positively associated with resilience in a firm.

*The combinative strategy: operational efficiency and resilience*

From the RBV perspective, there is a requirement for the resources to be bundled into capabilities required by the organization, in the sense that holding valuable resources is not a sufficient condition to improve performance. Research on operational efficiency and resilience remarks that they pursue contradictory objectives and generate trade-offs since they compete for valuable resources within the firm. We intend to go beyond the point of view that a firm takes the pursuit of both goals as contradictory and state, instead, that they are complementary when strategically combined to achieve a better performance.

On one hand, lean management contributes to resilience in two ways. First, lean practices implement low cost activities that save resources, allowing to allocate resources to risk management. Second, lean practices establish a good characterization of the production system. This characterization allows firms to deep dive a given point of the production process in order to rapidly respond and to accommodate to the new setting of the environment in case an unexpected event occurs. In this sense, the fact that lean management practices are seeking efficiency supports the idea that disruptive events should be tackled rapidly and the potential cost minimized.

**Hypothesis 3**. Lean Management Practices are a moderator in the relationship between risk management and resilience.

On the other hand, risk management contributes to efficiency in a very natural way enhancing lean management practices. The main purpose of all planning in connection with risk management is to be prepared in this highly competitive and dynamic world to unexpected disruptive events. Intrinsically, risk management is incorporating the objective of operational efficiency: recovery should be fast and at low cost. These two characteristics describe the operational efficiency of a firm.

**Hypothesis 4**. Risk management is a moderator in the relationship between lean management practices and operational efficiency

*Moderating Roles of Competitive Intensity and Uncertainty*

The dynamic and very competitive environment poses challenges and gives new opportunities for firms to gain operational efficiency. In that sense, there are moderator effects of environmental conditions on the relationship between lean management practices and operational efficiency (Rauch et al., 2009). In terms of the model, we theorize that Competitive Intensity has a negative effect on the relationship between lean practices and efficiency. A higher level of competitive intensity diminishes the possible positive impact of lean management practices on operational efficiency (stated in Hypothesis 1), whereas an environment with lower levels of competitive intensity allows a greater impact of lean management on efficiency.

**Hypothesis 5:** Competitive Intensity is a moderator in the relationship between lean management practices and operational efficiency.

The importance of uncertainty is related to the vulnerability of firms in the face of uncertain events not handled correctly. Disruptions imply a level of turbulence and uncertainty in the firm's processes that damage its resilience degree and, lastly, its risk management practices (Kim, Chen, & Linderman, 2015). In our model, Uncertainty affects the relationship between Risk Management and Resilience negatively.

Uncertainty can also weaken the possible positive effect of Risk Management on Resilience.

**Hypothesis 6**. Uncertainty moderates the association between risk management and firm's resilience.

## Methods

The main unit of analysis for this research is the project. We selected projects from the database of a global consulting and information technology company. To collect information regarding the development of the project, we conducted a self-administered internet-based survey. The survey was distributed between March and May 2017 to senior project leaders and market managers involved in projects. Our population was composed of 744 projects —that is, 1488 targeted respondents— that started and concluded in the last three years, randomly selected from the IT company database. We excluded projects with annual revenues below 200,000 euros. The data collection process resulted in 230 usable responses, for a total response rate of 15.5%. We received answers from both sources for 74 projects. After removing projects with incomplete information, we retained 54 usable paired responses, that is, 108 paired answers of 230 total responses. The response rate for market manager and project leader respondents was 14.7% and 16.3%, respectively.

### *Common Method Variance and Non-Response Bias*

According to Podsakoff et al. (2003), the two ways to control for method biases are through the design of the studies procedures and statistical controls. We incorporate procedural remedies by allowing anonymity and confidentiality. We also used statistical controls to discard the possibility of biases by performing a Harman's single-factor test. The confirmatory factor analysis on the data reported by market managers revealed five distinct factors with eigenvalues above 1.0 that explained 70.9% of the variance. The first factor accounted for only 30.1% of the variance, indicating that common method bias is minimized in our study. Similarly, the factor analysis performed on the project managers' data showed that seven distinct factors with eigenvalues above 1.0 accounted for 70.5% of the variance, and the first factor explained only 27.5% of the variance. These results suggest that common method bias would not be a concern for our analysis. Finally, we examined non-response bias by comparing the responses of early and late respondents. We compared means of the scale items via t-tests between the first and the last third of responses. No significant differences (p .05) were found, suggesting that non-response bias is not present in the data and that participating projects represented the population from which they were drawn.

### *Measures*

Indicators were all measured using a five-point Likert scale, where higher values indicated stronger agreement with the questions (1 = strongly disagree; 5 = strongly agree for all scales). We performed exploratory factor analysis using principal component analysis to develop the measures for the theorized constructs. The Keyser-Meyer-Olkin (KMO) measures of sample adequacy for each scale were above the recommended value of 0.6 (except for the construct for Uncertainty KMO=0.5). These results suggest that factor analysis is likely to provide reliable factors. Convergent validity and reliability were assessed using factor loadings and Cronbach's alpha values, respectively. All factor loadings were above 0.5, suggesting high convergence, and the reliability of the constructed scales measured by Cronbach's alpha also achieved satisfactory levels.

*Operational Efficiency* captures the capability of a firm to enhance the quality of products and services by optimizing resources subject to time and budget constraints. Efficiency was measured with three items that have been used traditionally: cost, quality and fast delivery. The analysis of these items provided single-factor solutions that explained 83.2% and 82.9% of the variance using project leader responses and market manager responses, respectively. Following Wieland and Wallenburg (2012), we measure *Resilience* considering two dimensions: agility and robustness. The resulting construct for resilience explained 81.1% and 86.0% of the variance for the project leaders and managers dataset, respectively. *Lean Management Practices* values the degree to which enhancing productivity and quality practices are implemented, along with cost and time reduction processes. Following previous studies (Shah & T. Ward, 2003), we measured Lean Management Practices focusing on three items: total quality management (TQM), continuous improvement (CI) and just-in-time (JIT) practices — which are conceptually, theoretically and empirically well established— adapted to IT services providers). The construct for Lean Management Practices explains about 72% of the variance using both the project leader and market manager data. *Risk Management* values the degree to which risk management infrastructure helps confront disruption. In order to measure this construct, we followed various authors (Ambulkar et al., 2015; Revilla and Sáenz, 2017) and asked managers to indicate the extent to which the project (i) considers KPI indicators to monitor risks, (ii) uses IT systems in order to manage, and (iii) counts on contingency plans in order to face previously identified disruptive situations. The principal component analysis for *Risk Management* provided a construct that explained 68.9% and 73.1% using the project leader and market manager dataset, respectively. *Competitive Intensity* values the degree of competition in the environment in which the projects is carried out. We construct a scale for Competitive Intensity that considers the beliefs of the respondents with regards to (i) the degree of competition in the market, (ii) entry barriers, and (iii) the differentiation of the product or service. The principal component analysis for *Competitive Intensity* provided a solution that explained 50.7% and 70.1% of the variance using the leader and the manager dataset, respectively. Lastly, *Uncertainty* indicates the degree to which the implementation of the project is subject to sources of instability and unknown factors. We measure a three-item scale that considers environmental uncertainty, market turbulence and technological turbulence. The analysis of these items provided a solution that explained 65.2% and 67.1% of the variance using each dataset.

We controlled for industry sector in order to partial out the influence of industry-specific effects on operational efficiency and firm resilience. We included industry dummies that represent projects in seven different industries. The omitted sector was that represented by "public administration".

**Analysis and results**

To test the hypotheses, we run ordinary least square regressions (OLS) using the dataset from market managers and project leaders separately. The model for Operational Efficiency (1) and Resilience (2) are the following:

$$E_i = \alpha_0 + \alpha_1 L_i + \alpha_2 D_i \mathrm{L_i} + \alpha_3 S_i \mathrm{L_i} + x_i' \beta_E + \epsilon_{Ei} \quad (1)$$

$$R_i = \beta_0 + \beta_1 D_i + \beta_2 D_i L_i + \beta_3 U_i \mathrm{D_i} + x_i' \beta_R + \epsilon_{Ri} \quad (2)$$

The variable identifiers are as follows: E=operational efficiency, R=resilience, L=lean management, D=risk management, U=uncertainty, and S=competitive intensity.

Tables 1 and 2 report the results from the regression analysis with Efficiency and Resilience as the dependent variables, respectively. Control variables were entered as a block in Model 1, followed by the main variables in Model 2. Multiplicative terms were added later to examine the hypothesized interactions (Model 3). Model 2 captures the factors that were hypothesized to have a direct impact on a firm's efficiency (Table 1). Hypothesis 1 states that Lean Management is positively associated with Efficiency. Results obtained from the project leaders' survey support this hypothesis ($\alpha_1 = .25, p < .01$) (see Table 1 Model 2). The results from the regression using data from market managers' responses also show a positive association, although at a lower statistical significance ($\alpha_1 = .14, p < .1$). The prediction that risk management contributes to efficiency is supported. And the results from the regression using market managers' data strongly support the prediction that an increase of competition intensity enhances improvements in efficiency, as the corresponding regression coefficient was significant in the expected direction. This result suggests a competitive environment, which exerts more pressure on the firm creates new opportunities to gain efficiency.

Model 3 introduces the moderator effects of Risk Management practices, Competitive Intensity and Lean Management Practices on Operational Efficiency (see Table 3 model 3). The model fit increased both for the leaders and managers regression (R-square change of 0.11 and 0.04, respectively) when the multiplicative terms are added to the equation. Hypothesis 4 states that Risk management contributes to Operational Efficiency by enhancing Lean Management practices, but no evidence was found for this moderation. The results from Model 3 using the project leaders' data present a small negative effect of risk management in the relationship between Lean Management and efficiency ($\alpha_2 = -.04\,, p < .01$). Hypothesis 5, which suggests that Competitive Intensity is a moderator in the relationship between lean management and efficiency, was supported. There was a strong negative correlation between competitive intensity and the lean management and efficiency association in the model that uses project leaders data ($\alpha_3 = -.23\,, p < .1$) and, with a higher statistical significance, in the model that uses market managers data ($\alpha_3 = -.36\,, p < .01$). The results support the prediction that the positive impact of lean management on efficiency would be diminished under higher levels of competitive intensity.

Regarding the model for Resilience, results show that lean practices was positively related to Resilience. Hence, the prediction that lean practices contribute to resilience was supported. Hypothesis 2's prediction found support using market managers data ($\beta_1 = 0.17\,, p < .05$) and project leaders data ($\beta_1 = 0.25\,, p < .1$). The findings suggest that the resilience capacity of a firm does depend on how well a risk management infrastructure has been developed. Hypothesis 3, which predicts a positive effect of lean practices in the relationship between Risk Management and Resilience, found support ($\beta_2 = 0.3\,, p < .05$). These findings suggest that lean management contributes to resilience of a firm, directly and through risk management. Finally, the results regarding the moderator effects of uncertainty support Hypothesis 6 ($\beta_3 = -.20\,, p < .01$). The results show that the positive effect of risk management practices on resilience is weaker if uncertainty is high, and stronger if uncertainty is moderate.

**Table 1.** Regression analysis examining the effects of Lean Management Practices, Risk Management Practices, Competitive Intensity on Operational Efficiency.

| | Operational Efficiency | | | | | |
|---|---|---|---|---|---|---|
| | Market manager | | | Project leader | | |
| Variables | Model 1 | Model 2 | Model 3 | Model 1 | Model 2 | Model 3 |
| Control | | | | | | |
| Energy and Utilities | -0.14 | -0.19** | -0.11 | 0.11*** | 0.04* | 0.16** |
| | (.) | (0.06) | (0.12) | (0.00) | (0.02) | (0.04) |
| Financial Services | -0.34*** | -0.18** | -0.10* | -0.05 | 0.22*** | 0.19*** |
| | (0.00) | (0.05) | (0.04) | (.) | (0.02) | (0.03) |
| Industry and Consumption | -0.79*** | -0.60*** | -0.54*** | -0.10*** | 0.17*** | 0.16*** |
| | (0.07) | (0.09) | (0.09) | (0.00) | (0.02) | (0.03) |
| Latam | -0.59** | -0.37*** | -0.19* | -0.15 | -0.22 | -0.34* |
| | (0.15) | (0.05) | (0.08) | (0.26) | (0.13) | (0.13) |
| Media | 0.19 | 0.67*** | 0.96*** | 0.44 | 0.54*** | 0.50*** |
| | (.) | (0.08) | (0.09) | (.) | (0.02) | (0.01) |
| Electoral Processes | -0.42*** | 0.06 | 0.35** | -0.30*** | 0.08* | 0.08* |
| | (0.00) | (0.08) | (0.09) | (0.00) | (0.04) | (0.04) |
| Non Latam | 1.12 | -0.18 | 0.05 | -0.37 | -0.21*** | -0.14** |
| | (.) | (0.14) | (0.05) | (.) | (0.03) | (0.04) |
| Public Administration | -0.63*** | -0.47*** | -0.40*** | -0.24 | -0.18 | -0.17 |
| | (0.00) | (0.05) | (0.07) | (0.27) | (0.24) | (0.23) |
| Healthcare | -0.04*** | -0.11** | -0.02 | -0.05*** | 0.00 | -0.06** |
| | (0.00) | (0.03) | (0.05) | (0.00) | (0.01) | (0.02) |
| Insurance | 0.13*** | -0.10 | -0.03 | 0.02*** | -0.11*** | -0.19*** |
| | (0.00) | (0.05) | (0.04) | (0.00) | (0.02) | (0.02) |
| Telecommunications | -0.04 | 0.04 | 0.16 | 0.37 | 0.31 | 0.34 |
| | (0.22) | (0.25) | (0.25) | (0.26) | (0.21) | (0.26) |
| Lean Management Practices | | 0.14** | 0.63*** | | 0.25*** | 0.58*** |
| | | (0.05) | (0.02) | | (0.02) | (0.12) |
| Risk Management Practices | | 0.04** | 0.06 | | 0.08*** | 0.19*** |
| | | (0.01) | (0.03) | | (0.01) | (0.00) |
| Competitive Intensity | | 0.24*** | 0.68** | | -0.25** | 0.07 |
| | | (0.05) | (0.16) | | (0.08) | (0.09) |
| Risk Management x Lean Practices | | | -0.00 | | | -0.04*** |
| | | | (0.01) | | | (0.00) |
| Competitive Intensity x Lean Practices | | | -0.36*** | | | -0.23** |
| | | | (0.08) | | | (0.07) |
| Constant | 1.60 | 0.93*** | 0.23 | 0.99*** | 0.70*** | 0.22 |
| | (.) | (0.11) | (0.12) | (0.00) | (0.06) | (0.15) |
| Observations | 109 | 109 | 109 | 121 | 121 | 121 |
| R-squared | 0.10 | 0.24 | 0.28 | 0.07 | 0.47 | 0.58 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

**Table 2.** Regression analysis examining the effects of Lean Management Practices, Risk Management Practices and Uncertainty on Resilience.

| | Resilience | | | | | |
|---|---|---|---|---|---|---|
| | Market manager | | | Project leader | | |
| Variables | Model 1 | Model 2 | Model 3 | Model 1 | Model 2 | Model 3 |
| Control | | | | | | |
| Energy and Utilities | 0.72*** | 0.67** | 0.75** | -4.23 | -3.95*** | -4.06*** |
| | (0.00) | (0.20) | (0.18) | (.) | (0.08) | (0.11) |
| Financial Services | 0.03*** | 0.85** | 0.59** | -4.70 | -4.03*** | -4.13*** |
| | (0.00) | (0.20) | (0.14) | (.) | (0.15) | (0.16) |
| Industry and Consumption | 0.02 | 0.83** | 0.57* | -3.17 | -2.54*** | -2.70*** |
| | (0.13) | (0.24) | (0.23) | (.) | (0.15) | (0.15) |
| Latam | 0.51* | 1.26** | 0.89* | 4.30*** | -4.27*** | -4.47*** |
| | (0.20) | (0.42) | (0.34) | (0.15) | (0.02) | (0.05) |
| Media | -0.64*** | 0.45* | -0.01 | 2.38*** | 2.82*** | 2.52*** |
| | (0.00) | (0.17) | (0.13) | (0.00) | (0.14) | (0.12) |
| Electoral Processes | -0.98*** | 0.13 | -0.31 | -4.69 | -4.07*** | -4.24*** |
| | (0.00) | (0.17) | (0.14) | (.) | (0.17) | (0.17) |
| Non Latam | 13.89*** | 9.67*** | 7.01*** | -4.79 | -4.17*** | -4.26*** |
| | (0.00) | (0.14) | (0.08) | (.) | (0.14) | (0.16) |
| Public Administration | -0.12*** | 0.86*** | 0.47** | 4.90*** | -4.40*** | -4.47*** |
| | (0.00) | (0.14) | (0.12) | (0.12) | (0.13) | (0.16) |
| Healthcare | 0.98*** | 1.02*** | 0.14 | -3.79 | -3.48*** | -3.65*** |
| | (0.00) | (0.13) | (0.12) | (.) | (0.08) | (0.06) |
| Insurance | 1.77*** | 1.47*** | 1.17*** | -3.08 | -3.00*** | -2.79*** |
| | (0.00) | (0.17) | (0.14) | (.) | (0.07) | (0.05) |
| Telecommunications | 0.50 | 0.88** | 0.58 | -3.03*** | -2.95*** | -3.21*** |
| | (0.57) | (0.26) | (0.29) | (0.64) | (0.33) | (0.26) |
| Lean Management Practices | | 0.75** | 0.48** | | 0.51** | 0.54** |
| | | (0.16) | (0.13) | | (0.12) | (0.16) |
| Risk Management Practices | | 0.08* | 0.17** | | 0.00 | 0.25* |
| | | (0.03) | (0.04) | | (0.01) | (0.11) |
| Uncertainty | | 0.04 | 0.21 | | 0.11 | 0.40*** |
| | | (0.11) | (0.11) | | (0.07) | (0.08) |
| Risk Management x Lean Practices | | | 0.03** | | | 0.01 |
| | | | (0.01) | | | (0.01) |
| Uncertainty x Risk Management | | | -0.20*** | | | -0.28*** |
| | | | (0.01) | | | (0.05) |
| Constant | 1.48*** | -0.24 | 0.29 | 5.82 | 4.60*** | 4.37*** |
| | (0.00) | (0.27) | (0.25) | (.) | (0.25) | (0.38) |
| Observations | 109 | 109 | 109 | 121 | 121 | 121 |
| R-squared | 0.27 | 0.47 | 0.55 | 0.10 | 0.12 | 0.13 |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

## Discussion and implications

Lean management has been cited as a fundamental aspect in a firm's performance in terms of efficiency (Pagell et al, 2015). Similarly, risk management has been studied as a key organizational capability for the development of resilience in a firm (Bode,

Wagner, Petersen, & Ellram, 2011; Wieland & Wallenburg, 2012). Although previous research has addressed the complementarity between efficiency and resilience up to some extent, these strategic orientations have been traditionally viewed separately or as contradictory goals. In this sense, the existing literature offers only limited theoretical insights into how firms complement risk and lean management practices in order to improve both efficiency and resilience.

In this study, we address some of the limitations in the existing literature. First, following Wieland and Wallenburg (2012), this research applies the concept of resilience that captures the integration of agility and robustness. In this sense, we consider a broader and more powerful relationship between efficiency and resilience than that contained the concept of "leagility" (Shah & T. Ward, 2003). Second, while efficiency and resilience have been traditionally understood as opposing strategic orientations, we explore the complementarity between risk and lean management in order to improve operational performance.

Our research model proposes that in order to achieve resilience and efficiency, firms must be able to bundle lean and risk management capabilities. This is a starting point for firms to establish complementary strategies in order to enhance performance and not view efficiency and resilience as opposing orientations. For senior-level managers in the IT sector, in particular, our findings highlight the importance of monitoring risk with the use of KPI indicators, the use of IT systems and the development of contingency plans in order to cope with previously identified disruptions; as well as the efficiency-oriented practices considered for this study.

Another managerial implication results from finding that context plays a critical role in the improvement of resilience or efficiency in a firm. Specifically, we find that uncertainty and competitive intensity are moderators in the relationship between resilience and risk management and in the relationship between efficiency and lean management, respectively. Thus, in order to gather the benefits of developing a combinative strategy, managers must be aware of the organizational environment in which they operate, particularly with regard to uncertainty and competitive intensity.

**Conclusions**

Our goal with this research is to contribute to the literature on how managers respond to potentially competing demands between operational efficiency and resilience. We develop a model that links lean and risk management with efficiency and resilience. Our main objective was to explore how lean and risk management practices can be strategically bundled in order to improve both efficiency and resilience in a competitive and uncertain environment. In this study, we focus on the Information Technology sector using survey data on projects from the database of a global consulting and information technology company. Our theoretical arguments and empirical findings indicate that, on one hand, the implementation of lean management practices improve resilience in a firm by enhancing risk management practices. On the other hand, we find that efficiency orientation through lean practices contributes to risk management in improving the resilience of a firm. Thus, there is a positive effect of a combinative strategy between lean and risk management pursuing operational efficiency and resilience. These results imply that managers must not only be concerned with lean management but also with risk management practices to achieve efficiency. In the same way, managers should complement risk management with lean management practices to gain improvements in resilience. This research also assesses the competitive and changing environment in which firms perform, including competitive intensity and uncertainty as moderators in our models for efficiency and resilience, respectively. Our

results suggest that firms operating in highly competitive markets that seek to improve operational efficiency should put more emphasis on lean management practices, as the positive effect of lean management on efficiency is diminished by competitive intensity. Similarly, we find that the positive effect of risk management on resilience is weaker under uncertainty. Thus, firms operating in highly uncertain markets should put more emphasis in risk management practices in order to enhance resilience.

## References


Ambulkar, S., Blackhurst, J, and Grawe,S. (2015) "Firm's resilience to supply chain disruptions: Scale development and empirical examination." *Journal of Operations Management*, Vol. 33, pp.111-122.

Aragón-Correa, J. A. and Sharma, S. (2003). "A contingent resource-based view of proactive corporate environmental strategy". *Academy of Management Review*, Vol. 28 (1), pp. 71–88.

Ashforth, B.E., Rogers, K.M., Pratt, M.G. and Pradies, C., (2014). "Ambivalence in organizations: a multilevel approach". *Organiz. Sci.* Vol. 25, pp. 1453–1478.

Barney, J. (1991). "Firm resources and sustained competitive advantage". *Journal of Management*, Vol. 17 (1), pp. 99–120.

Birkinshaw, J., Gupta, K., (2013). "Clarifying the distinctive contribution of ambidexterity to the field of organization studies". *Acad. Manage. Perspect*. 27, 287–298.

Bode, C., Wagner, S.M., Petersen, K.J. and Ellram, L.M. (2011), "Understanding responses to supply chain disruptions: insights from information processing and resource dependence perspectives", *Academy of Management Journal*, Vol. 54 No. 4, pp. 833-56.

Brandon- Jones, E., Squire, B., Autry, C. and Petersen, K. (2014). "A Contingent Resource-Based Perspective of Supply Chain Resilience and Robustness". *Journal of Supply Chain Management*. Vol. 50.

Burns,T.E.,Stalker,G.M.(1961). *The management of innovation*. In: University of Illinois at Urbana Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship.

Grant, R. M. (1991). "The resource-based theory of competitive advantage: Implications for strategy formulation". California Management Review, Vol. 33 (3), pp. 114–135.

Kim, Y, Chen, YS & Linderman, K (2015), "'Supply network disruption and resilience: A network structural perspective", *Journal of Operations Management*, Vol. 33-34, pp. 43-59.

Pagell, M., Klassen, R., Johnston, D., Shevchenko, A. and Sharma, S. (2015), "Are Safety and Operational Effectiveness Contradictory Requirements: The Roles of Routines and Relational Coordination". *Journal of Operations Management*. Vol. 36 pp. 1- 14.

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., and Podsakoff, N. P. (2003). "Common method biases in behavioral research: A critical review of the literature and recommended remedies". *Journal of Applied Psychology*, Vol. 88, pp. 879–903.

Rauch A, Wiklund J, Lumpkin GT, Frese M (2009). "Entrepreneurial orientation and business performance: an assessment of past research and suggestions for the future". *Entrep. Theory Pract*.Vol. 33, pp.761-787.

Revilla, E. and Saenz, M. J., (2017) "The impact of risk management on the frequency of supply chain disruptions: A configurational approach", *International Journal of Operations & Production Management*, Vol. 37 Issue: 5, pp.557-576

Sakakibara, S., Flynn, B.B., Schroeder, R.G. and Morris, W.T., (1997). "The impact of just-in-time manufacturing and its infrastructure on manufacturing performance". *Management Science*, Vol. 43 (9), pp. 1246–1257.

Sirmon, D. G., Gove, S., and Hitt, M. A. (2008). "Resource management in dyadic competitive rivalry: The effects of resource bundling and deployment". *Academy of Management Journal*, Vol. 51(5), pp. 919–935.

Skinner, W., (1969). "Manufacturing—missing link in corporate strategy". *Harvard Business Review*. Vol. 47, pp. 136–145.

Shah, R., & Ward, P. T. (2003). "Lean manufacturing: Context, practice bundles, and performance". *Journal of Operations Management*, Vol. *21*(2), pp. 129-149.

Smith, W.K., Lewis, M.W., (2011). "Toward a theory of paradox: a dynamic equilibrium model of organizing". *Acad. Manage. Rev*. Vol. 36, pp. 381–403.

Wieland, A. and Wallenburg, C.M., (2012),"Dealing with supply chain risks", *International Journal of Physical Distribution & Logistics Management*, Vol. 42 Iss 10 pp. 887 – 905.