# Efficiency of Operations: Case Study of United Technologies Corporation

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**ABSTRACT**

*In this paper, efficiency of operations was examined for United Technologies which is a leading U.S.-based multinational corporation. Using both Johansen's cointegration and Granger's causality tests it is evident that efficient management of cost of goods sold is more important and if these expenses are managed well it could provide greater flexibility to United Technologies to bring about superior operating performance. For instance, if United Technologies deliberately increase SGA and RD expenses it would lead to higher future operating profitability.*

***Keywords:*** *Operating and financial efficiency; Cointegration; Granger's causality*

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## INTRODUCTION

Performance measurement is the “holy grail” in applied business research. Operations and supply chain managers are constantly confronted with the arduous but important task of measuring the effectiveness of their workforce and equipment in financial terms. With the rapid deployment of expensive technology in operations, this has taken even more heightened importance. Operations and supply chain managers are in a unique position to impact both the bottom line as well as the top lime of firms. Operations can enhance quality, variety, speed, reliability, and dependability to help enhance the revenues of the company. On the other hand, operations can also cut costs by effectively managing inventory, workforce, and equipment. This double-pronged effect of operations is expected to increase overall profitability of firms. However, investors and other stakeholders are looking at tangible ways to quantify the financial impact and efficiency of operations.

Firms that operate efficiently are expected to increase sales and profitability, if costs are contained by the management of these firms. One way these costs can be contained by firms is by the use of latest and cost-efficient technology in their production systems. Another way could be through more productive, innovative, and efficient use of their workforce. From the accounting figures, one of the most important cost drivers is the selling, general and administrative expenses (SGA) where increase (decrease) in these expenses can adversely (positively) impact operating earnings both in the short- and the long-term. Hence, SGA cost management can help reduce manufacturing costs that may result in higher profitability. Furthermore, there is strong interdependence between SGA expense and cost of goods sold and the efficient management of these costs can strike an optimal balance between these two cost drivers (Baumgarten et. Al. 2010). Other cost efficiency indicators could be enhancement of IT systems, reorganization of operational procedures, investment in research and development (RD) and enhancement of supporting departments. A contrary suggestion is that sometimes higher SGA expenses can have a positive impact on future profitability when these expenses are made towards acquiring intangible assets (Banker et. al. 2006 and 2011), provided there is enough latitude available from future reduction in the cost of goods sold. This may imply that there may be a deliberate attempt by the management of the firm to increase SGA expense for improving operating efficiency through better manufacturing processes to increase future profitability. In that event, higher SGA could be a positive indicator of firms' performance. Alternatively, higher unintended SGA expense for inefficient firms could reflect costs going out of control with adverse impact on future profitability. Examination of the operating and financial efficiency in the long-term can shed light on this topic. The metrics that are used to study efficiency can be obtained from the financial data and annual statements of publicly traded companies.

## LITERATURE REVIEW AND BACKGROUND

The chief objectives of most businesses are to increase market share, improve customer satisfaction, and enhance profitability. This set of related objectives is possible only with the help of managing activities that provide value. Porter (1985) and subsequently, many other authors, identified operations along with logistics, marketing, and sales/service as the primary value adding activities. Authors such as Friis et al. (2016), McPhee and Wheeler (2006) and Sakuramoto et al. (2019) have identified that managing these primary value adding activities will enhance the efficiency of their supply chains. There have been several streams of research and practice that have tried to quantify the relationship between operational efficiency and financial performance. Balanced Scorecard originally introduced more than two decades back by Kaplan and Norton (1996, 2001), showed companies a method of looking at the financial, customer, innovation, and operational metrics in a balanced way as opposed to focusing solely on financial measures. Ellinger et al. (2012) examined the relationship between operations and customer satisfaction as well as shareholder value. Bharadwaj (2015) examined the correlation between supply chain/operations competency and certain marketing and financial measures such as brand equity and stock prices. The Gartner Top 25 Supply Chain Management Companies list (2019) is based on operations and financial metrics such as inventory turns, return on assets, and revenue growth. Wisner et al. (2019) examines the impact of several operational performance metrics on that of financial measures. The SCOR model formulated by the professional organization APICS (2020) also examines the relationship between operational measures such as reliability, responsiveness and agility with financial metrics such as return on working capital, cash-to-cash cycle, and cost of goods sold.

Hussein and Davis (2018) showed how Cisco Systems, Inc. improved operational and financial efficiency using product ID rationalization. Cuthbertsonand Piotrowicz (2011) demonstrated that in order to understand performance measurement systems, one has to understand the context of the organization. They show that a case study approach helps in obtaining in-depth insights while losing the ability to generalize. The current article looks at operational efficiency in the case of a company that has been an industrial giant for over 100 years. United Technologies (UTC) is an American multinational conglomerate that is in the business of designing, manufacturing, and marketing elevators and escalators to aircraft engines and helicopters. Its most recent annual revenues were $66.5 billion, which was a 11.1% increase over the previous year (Market Line, 2019). We picked this company as an ideal company to study since: a) it is a conglomerate with a healthy balance of divisions and products: Carrier (heating, ventilation, and air-conditioning or HVAC equipment), Otis (elevators and escalators), Pratt and Whitney (aircraft engines), and Collins (helicopters); b) UTC serves a mix of global and American-based markets; c) it has some traditional businesses such as HVAC and elevators as well as some high-tech businesses such as aerospace; and d) the company is involved in the entire gamut of designing, manufacturing, selling, installing, and servicing a multitude of products worldwide. Some of the competitors of UTC are GE, Honeywell, Lockheed Martin, Boeing and Nortrop Grumman. A future study will be aimed at a competitive analysis of UTC with some of the industrial giants who are its competitors.

The next section details the methodology used in the study followed by the results, discussion, and conclusions.

## METHODOLOGY

The Bloomberg Terminal provides access to a variety of real-time and historical data for publicly traded companies. Bloomberg is deemed to be the most reliable and accurate source for financial data. The authors' university has a Bloomberg Financial Lab with access to Bloomberg Terminals using which the data was downloaded. The authors downloaded the income statements and balance sheets for each quarter for the years 2010 to 2019. For each quarter, metrics such as operating expenses, research and development expenses, selling and general administrative expenses, and operating income were gleaned.

This research uses the methodology developed by Johansen (1988). This method is preferred to alternatives since it enables testing for the presence of more than one cointegrating vector. The description that follows draws from Johansen (1988, 1991, 1994) and Johansen and Juselius (1990, 1991).

The Johansen method provides some distinct advantages. For example, identification of the number of cointegrating vectors is possible with the Johansen test. Such inferences are based on the number of significant eigenvalues. Also, according to Banerjee (1999) alternative Cointegration tests have low power as compared to Johansen's test. To check for stationarity arising from a linear combination of variables, the following AR representation for a vector VTS made up of n variables is used,

$$VTS_t = c + \sum_{i=1}^{s-1} \phi_i Q_{it} + \sum_{i=1}^{k} \pi_i VTS_{t-i} + \varepsilon_t \qquad (1)$$

where VTS is at most I(1), $Q_{it}$ are seasonal dummies (i.e., a vector of non-stochastic variables) and c is a constant. It is not necessary that all variables that make up VTS be I(1). To find cointegration in the system, only two variables in the system need be I(1). However, if only two time series are examined (bivariate representation) then both have to be I(1). If an error-correction term is appended, then:

$$\Delta VTS_t = c + \sum_{i=1}^{s-1} \phi_i Q_{it} + \sum_{i=1}^{k-1} \Gamma_I \Delta VTS_{t-i} + \Pi VTS_{t-k} + \varepsilon_t \qquad (2)$$

which is basically a vector representation of equation (1) with seasonal dummies added. All long-run information is contained in the levels terms, P$VTS_{t-k}$ , and short- run information in the differences $\Delta VTS_{t-i}$ . The above equation would have the same degree of integration on both sides only if 0=Π(the series are not cointegrated) $\Pi VTS_{t-k}$ , is (0), which infers cointegration. In order to test for cointegration, the validity of $H_1$(r), shown below, is tested as:

$$H_1(r)\ \Pi = \chi\beta' \qquad (3)$$

where b is a matrix of cointegrating vectors and g represents a matrix of error correction coefficients. The hypothesis $H_1$ (r) implies that the process $\Delta VTS_t$ is stationary, $VTS_t$ is nonstationary, and β' $VTS_t$ is stationary (Johansen, 1991). The Johansen method yields the Trace and the $\lambda_{max}$ statistics that enable determination of the number of cointegrating vectors.

## RESULTS

This research used the Johansen's cointegration methodology as an alternative framework for investigating equilibrium price adjustments for long-run relationships. According to Engle and Granger (1987), if a system of variables is cointegrated, their economic forces interact to bind these variables together in a long-run equilibrium relationship. In effect, it indicates the level of integration between operating efficiency indicators for United Technologies.

Quarterly data for sales, cost of goods sold (COGS), operating expenses (OExp), research and development (RD), Selling and General Administrative (SGA) expenses and operating income (OInc) for United Technologies Corporation were collected using Bloomberg as the source. The data covered the period from Second Quarter 2010 to Third Quarter 2019. The choice of these efficiency indicators included variables that suggest effectiveness of managerial control on costs and its impact on the operating profitability of United Technologies Corporation. For example, higher SGA expense can suggest lack of management control on costs with adverse effect on future profitability. However, contrary explanation could be the potential to create intangible assets through SGA expenditure. There may also be “cost stickiness” of SGA expenses as indicated by Anderson et al., 2007.

Autocorrelations in the time series was reviewed and eliminated. Testing for stationarity in each equity market index time series was accomplished using the Philips-Perron unit root test. The lag length for each time series was computed by minimizing the Akaike Information Criteria (AIC) values for the various efficiency indicators of United Technologies.

To eliminate autocorrelations in the time-series, the appropriate lag length is found using the Akaike information criterion (AIC). The lag length is selected by minimizing the AIC over different choices for the length of the lag. The values of AIC are formulated by computing the value of the equation *T log (RSS) +2 K*, where *K* is the number of regressors, *T* is the number of observations and *RSS* is the residual sum of squares. These results are shown in Table 1 where it becomes clear that the time series require a range of lags to correct for the presence of autocorrelation.

*Tests for Stationarity of Each Time Series Using the Philips-Perron (P&P) Test*

As noted in Table 1, the P&P tests suggest that all the time series for the various efficiency indicators of United Technologies are nonstationary without trend (i.e., non-rejection of $\alpha_1 = 0$), and in most instances with trend. This indicates the need for cointegrated methodologies (critical values at the 10% level are provided in the last row of Table 2). The time-series more often reject the presence of drift ($\alpha_0 = 0$) than trend ($\alpha_2 = 0$). Thus, the inclusion of a drift term may not be as important. While it is reassuring to note the non-rejection of non-stationarity, this is not altogether surprising since many other studies find non-stationarity in time series (Phillips and Perron, 1988, Brenner and Kroner, 1995, Doukas and Rahman, 1987).

Johansen Tests for Cointegration Rank for Systems (Efficiency Indicators of United Technologies)

The results for systems (composed of various efficiency indicators of United Technologies) using Johansen's method are presented in Table 2 & 3. Trace statistics are also reported. These are basically likelihood ratio tests where the null hypothes is $L_{r+1} = L_{r+2} = \ldots\ldots = L_P = 0$, indicating that the system has *p-r* unit roots, where *r* is the number of cointegrating vectors. The rank is then determined using a sequential approach starting with the hypothesis of *p* unit roots. If this is rejected, then the next hypothesis $L_2 = L_3 = \ldots\ldots = L_P = 0$ is tested and so on. For each system there can be at most n-1 cointegrating vectors (or common factors) that bind the assets in the system (n being the number of time-series in the system). For example, between sales and efficiency indicators and cost of goods sold and other indicators for oil price and equity indices, there can be at most 1 (2-1) common factor.

Cointegration between sales and operating efficiency indicators display one cointegrating vector for the following variables: COGS, SGA and OInc. No cointegration was found, however, for OExp and RD. Cointegration between COGS and other efficiency indicators provides similar results. In a system that includes all variables, there are two cointegrating vectors suggesting that there are two factors that binds these variables in the long-run.

In Tables 4 and 5, Granger Causality tests clearly indicate that causality flows from sales to cost of goods sold, operating expenses and research and development costs. However, bivariate causality exists between SGA versus sales and operating income and sales for United Technologies. It is noteworthy to observe that significance is much stronger with SGA expenses having a larger impact on the sales of United Technologies both in the short and long-term. Table 5 provides similar results when Granger causality tests are run between cost of goods sold and the other efficiency indicators. Results are even more significant as cost of goods sold Granger cause RD and SGA expenses. This implies that efficient management of cost of goods sold is more important, and, if these expenses are managed well it could provide greater flexibility to United Technologies to bring about superior operating performance. For instance, if United Technologies deliberately increase SGA and RD expenses it would lead to higher future operating profitability.

*Discussion of the Results*

Taken cumulatively, the results seem intuitive. While it is likely that the operating efficiency indicators for United Technologies Corporation are closely related, indicating how firms and their management can effectively control these expenses for higher future profitability. This case study uses the example of one of the most successful companies to illustrate how cost of goods sold can lead to superior operating performance.

Cointegration between assets suggests that their prices exhibit a long-run relationship with each other. Higher levels of cointegration, noted by the number of cointegrating vectors, suggest potential hedging candidates. Some of the cost drivers such as operating expenses do not have any effect on the cost efficiency for United Technologies. From the causality standpoint it is clear that causality flows from sales to cost of goods, selling, general and administrative expenses (SGA) and operating profitability. SGA expense, however, has a bivariate causality with sales indicating that this is one of the most important cost drivers for this firm. When causality tests are run between cost of goods sold and other efficiency indicators, for United Technologies, cost of goods sold in conjunction with SGA are the two most important efficiency determinants in order to achieve higher future profitability for this firm.

## CONCLUSION

This paper examines efficiency of the firms by illustrating a case study of United Technologies Corporation which is a premier American multinational conglomerate that is in the business of designing, manufacturing, and marketing elevators and escalators to aircraft engines to helicopters. Quarterly data for operating expenses, research and development expenses, selling and general administrative expenses, and operating income were obtained from Bloomberg for United Technologies Corporation to see how this successful and diversified company achieves operating efficiency. Using both Johansen's cointegration and Granger's causality tests, it is evident that efficient management of cost of goods sold is significantly important and if these expenses are managed well, it could provide greater flexibility to United Technologies to bring about superior operating performance. For instance, if United Technologies deliberately increase SGA and RD expenses it would lead to higher future operating profitability. Future research will examine if these results hold good with other companies in the industrial, aerospace, and defense manufacturing sectors.

## REFERENCES

i. Anderson, M., R. Banker, R Huang and S. Jankiraman (2007). Cost Behavior and Fundamental Analysis of SG&A Costs, *Journal of Accounting, Auditing and Finance*, 22, 1, 1-28.

ii. Anderson, M., R. Banker, R Huang and S. Jankiraman (2003). Are Selling, General and Administrative Costs “Sticky”? Journal of Accounting Research, 41, 1, 47-63.

iii. Akaike, H. (1973). Information Theory and the Extension of the Maximum Likelihood Principle, 2nd International Symposium on Information Theory, B.N. Petrov and F. Csaki, eds., Budapest.

iv. Banker, R., R. Huang and R. Natarajan (2006). Does SG&A Expenditure Creates a Long Lived Asset? *Working Paper.*

v. Banker, R., R. Huang and R. Natarajan (2011). Equity Incentives and Long-Term Value Created by SG&A Expenditure. *Contemporary Accounting Research*, 28, 3, 794-830.

vi. Bharadwaj, P. (2015), “The Success of Global Supply Chains: An Exploratory Analysis,” *Competition Forum*.

vii. Brenner, R. J. and K.F. Kroner. (1995). Arbitrage, Cointegration, And Testing TheUnbiasedness Hypothesis In Financial Markets.*Journal of Financial and Quantitative Analysis*, v30(1), 23-42.

viii. Cuthbertson, R. and Piotrowicz, W. (2011). “Performance Measurement Systems in Supply Chains.” International Journal of Productivity and Performance Management Vol. 60 No. 6, pp. 583-602.

ix. Doukas, J. and A. Rahman. (1987). Unit Roots Tests: Evidence From The Foreign Exchange Futures Market. *Journal of Financial and Quantitative Analysis*, v22(1), 101-108.

x. Ellinger, A., Shin, H., Magnus Northington, W., Adams, F., Hofman, D. and O’Marah, K. (2012), “The influence of supply chain management competency on customer satisfaction and shareholder value”, *Supply Chain Management*, Vol. 17 No. 3, pp. 249-262.

xi. Engle, R.F., and C. W. J. Granger. (1987). Co-integration and Error Correction: Representation, Estimation, and Testing. *Econometrica*, 55, 251-276.

xii. Friis, O., Holmgren, J. and Eskildsen, J. (2016), “A strategy model – better performance through improved strategy work”, *Journal of Modelling in Management*, Vol. 11 No. 3, pp. 742-762.

xiii. Hussein, J. and Davis, M. (2018). Improving Operational and Financial Efficiency with Product ID Rationalization—Cisco’s Experience. *Journal of Business Forecasting*. Spring, v37 (1), 4-10.

xiv. Johansen, S. and K. Juselius. (1992). Testing Structural Hypotheses In A Multivariate Cointegration Analysis Of The PPP And The UIP For UK. *Journal of Econometrics*, v53(1/2/3), 211-244.

xv. Kaplan, R.S. and Norton, D.P. (1996), *The Balanced Scorecard*, Harvard Business School Press, Boston, MA.

xvi. Kaplan, R.S. and Norton, D.P. (2001), *The Strategy-focused Organization*, Harvard Business School Press, Boston, MA.

xvii. MarketLine (2019). United Technologies Corporation: SWOT Analysis, Retrieved from www.marketline.com, 9/23/2019.

xviii. McPhee, W. and Wheeler, D. (2006), “Making the case for the added value chain”, *Strategy & Leadership*, Vol. 34 No. 4, pp. 39-46

xix. Perron. (1988). Testing for a Unit Root in Time Series Regression. *Biometrica*, , 75: 335-46.

xx. Porter, M. (1985), “Technology and Competitive Advantage,” *Journal of Business Strategy*, Vol. 5 No. 3, pp.

xxi. Sakuramoto, C., Di Serio, L. and Bittar, A. (2019), “Impact of supply chain on the competitiveness of the automotive industry,” *RAUSP Management Journal*, Vol. 54 No. 2, pp. 205-225.

xxii. Supply Chain Operations Reference Model (2020). Retrieved from https://www.apics.org/apics-for-business/frameworks/scor on 3/21/2020.

xxiii. Wisner, J.D., Tan, K. and Leong, G.K. (2019), “*Principles of Supply Chain Management: A Balanced Approach,*” | 5th Edition, Independence, KY: Cengage.

## ANNEXURES

***Table 1: Tests of Stationarity of Sales and Operating Efficiency Indicators for United Technologies Using Phillips Perron (PP) test.***

| Series | Nlags | No Trend $\alpha_1 = 0$ | Akaike Criterion (minimized ) |
|---|---|---|---|
| Sales and Operating Efficiency | | | |
| Sales | 4 | -0.55 | 16.29 |
| COGS | 3 | 0.67 | 16.25 |
| OExp | 0 | 2.35 | 13.59 |
| RD | 0 | -0.54 | 10.63 |
| SGA | 3 | 1.41 | 12.54 |
| OInc | 4 | -1.69 | 13.06 |
| Asymptotic Critical Values | -2.58 10% Level | -2.88 5% Level | -3.47 5% Level |

P&P is computed with a constant term. The tests are conducted with and without linear trend. The Unit Root tests are performed with the appropriate lag length. For each time series the lag length are estimated by minimizing the Akaike Information Criterion (AIC) values. T-Values (single hypothesis) and F-values (multiple hypotheses) for tests of various hypotheses concerning equation no trend and equation with trend are estimated. Note, $\alpha 1=0$ is the unit root test, $\alpha 0=0$ tests for constant (drift), and $\alpha 2=0$ tests for linear trend. Asymptotic critical values are from Phillips and Perron (1986). COGS (Cost of Goods sold), OExp (Operating Expenses), RD (Research and Development), OInv (Operating Income)

**Table 2: Long-Term Relationship between Sales versus Operating Efficiency Indicators for United Technologies Using Johansen's Cointegration Methodology**

| Group | r | Trace | Critical Value (%) | Prob. |
|---|---|---|---|---|
| Sales versus COGS | | | | |
| | 0 | 16.04** | 15.49 | 0.0414 |
| | 1 | 0.80 | 3.84 | 0.3721 |
| Sales versus OExp | 0 | 12.52 | 15.49 | 0.1339 |
| | 1 | 0.54 | 3.84 | 0.4640 |
| Sales versus RD | 0 | 10.50 | 15.49 | 0.2441 |
| | 1 | 0.50 | 3.84 | 0.4787 |
| Sales versus SGA | 0 | 19.69*** | 15.49 | 0.0100 |
| | 1 | 0.11 | 3.84 | 0.2763 |
| Sales versus OInc | 0 | 24.06*** | 15.49 | 0.0020 |
| | 1 | 1.18 | 3.84 | 0.7351 |
| Sales versus Efficiency Indicators | 0 | 85.33*** | 69.82 | 0.0018 |
| | 1 | 53.05** | 47.86 | 0.0150 |
| | 2 | 24.68 | 29.80 | 0.1731 |
| | 3 | 7.30 | 15.49 | 0.5432 |
| | 4 | 0.36 | 3.84 | 0.5492 |

The optimal lag length for Johansen cointegration model is obtained from an examination of the residual autocorrelation functions of the cointegrating regressions. Critical values for Johansen tests are taken from tables in Johansen and Juselius (1990) paper. The *** , **, * denotes significance levels of 1 percent, 5 percent, and 10 percent respectively.

***Table 3: Long-Term Relationship between COGS versus other Operating Efficiency Indicators for United Technologies Using Johansen's Cointegration Methodology***

| Group | r | Trace | Critical Value (%) | Prob. |
|---|---|---|---|---|
| COGS versus OExp | 0 | 11.93 | 15.49 | 0.1604 |
| | 1 | 0.15 | 3.84 | 0.7003 |
| COGS versus RD | 0 | 9.17 | 15.49 | 0.3496 |
| | 1 | 0.08 | 3.84 | 0.7746 |
| COGS versus SGA | 0 | 17.89** | 15.49 | 0.0214 |
| | 1 | 0.46 | 3.84 | 0.4980 |
| COGS versus OInc | 0 | 23.38*** | 15.49 | 0.0026 |
| | 1 | 0.42 | 3.84 | 0.5163 |

The optimal lag length for Johansen cointegration model is obtained from an examination of the residual autocorrelation functions of the cointegrating regressions. Critical values for Johansen tests are taken from tables in Johansen and Juselius (1990) paper. The *** , **, * denotes significance levels of 1 percent, 5 percent, and 10 percent respectively.

**Table 4: Pairwise Granger Causality Test between Sales and Efficiency Indicators for United Technologies**

| | F-Stats | Prob. |
|---|---|---|
| COGS does not Granger Cause Sales | 2.98* | 0.06 |
| Sales does not Granger Cause COGS | 1.12 | 0.34 |
| OExp does not Granger Cause Sales | 0.37 | 0.70 |
| Sales does not Granger Cause OExp | 3.46** | 0.04 |
| RD does not Granger Cause Sales | 1.17 | 0.32 |
| Sales does not Granger Cause RD | 2.58* | 0.09 |
| SGA does not Granger Cause Sales | 3.47** | 0.04 |
| Sales does not Granger Cause SGA | 2.69* | 0.08 |
| OInc does not Granger Cause Sales | 5.54*** | 0.00 |
| Sales does not Granger Cause OInc | 10.14*** | 0.00 |

*** , **, * denotes significance levels of 1 percent, 5 percent, and 10 percent respectively.

**Table 5: Pairwise Granger Causality Test between COGS and other Efficiency Indicators for United Technologies**

| | F-Stats | Prob. |
|---|---|---|
| OExp does not Granger Cause COGS | 0.33 | 0.72 |
| COGS does not Granger Cause OExp | 4.53** | 0.02 |
| RD does not Granger Cause COGS | 1.08 | 0.32 |
| COGS does not Granger Cause RD | 2.67* | 0.08 |
| SGA does not Granger Cause COGS | 1.47 | 0.25 |
| COGS does not Granger Cause SGA | 3.87** | 0.03 |
| OInc does not Granger Cause COGS | 2.87* | 0.07 |
| COGS does not Granger Cause OInc | 10.77*** | 0.00 |

*** , **, * denotes significance levels of 1 percent, 5 percent, and 10 percent respectively.