Mediation Testing in Marketing Analytics: Replication and Extension of Germann et al, (2013)

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Marketing analytics deployment mediates analytics culture and analytic skills on firm performance. Top management advocacy has implications on analytical culture, analytical skills, data and IT resources with significant and substantive results. Top management advocacy through analytical culture and marketing analytics deployment fully and partially mediates firm performance.

Keywords: marketing analytics, analytics culture, analytics skills, top management advocacy, mediation

INTRODUCTION

The purpose of this paper is to review Germann et al. 2013 paper titled "Performance implications of deploying marketing analytics" with a focus on mediation testing and replication as it is deemed necessary to illuminate the effects of mediation. In order to achieve these objectives, we present some background information first and then describe the research methodology, mediation hypotheses, findings and its implications and extensions.

The advent of information and communication technologies (ICT) and increasing connectivity has made data collection on consumer behavior more accessible. In such an environment marketing analytics, which Lilien (2011, p. 5) has defined as "technology-enabled and model-supported approach to harness customer and market data to enhance marketing decision making" has significant implications on the performance of a firm.

As the authors of the paper have elucidated increased networked business-to-customer (B2C) and business-to-business (B2B) transactions, available troves of data, more informed customers and fierce global competition, and the desired outcome on marketing expenditures to improve the profitability of the business concern has significantly increased.

However, there are two conflicting perspectives on the effectiveness of marketing analytics deployment. On one side, there are research findings that correlate deployment of marketing analytics with improved firm performance (McIntyre, 1982; Lodish et al., 1988; Hoch and Schkade, 1996, Kannan et al., 2009), and, on the other side, there are senior level executives with perspectives that render the implication of marketing analytics on firm performance to be marginal.

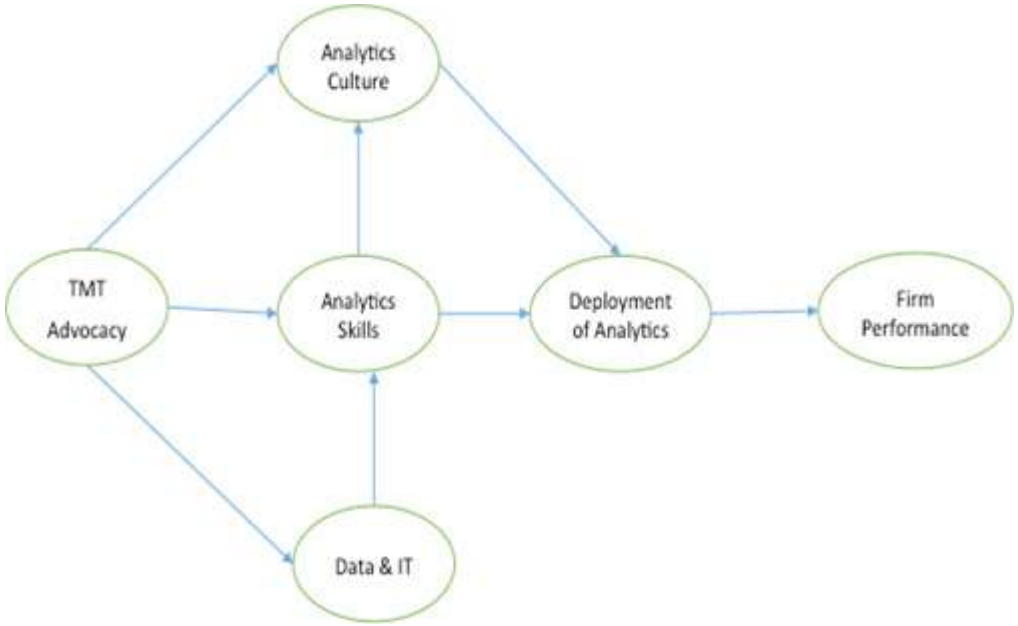
Furthermore, a McKinsey and Co. study has shown that out of 587 senior level executives of large international companies that participated in the study only 10% of these firms utilized marketing analytics regularly (McKinsey and Co., 2009).

However, there are many studies that that shows the specific benefits of sound marketing analytics deployment. Such examples includes Rhenaniaa mail order company that increase its customer base by 55% using marketing analytics (Elsner et al., 2004), Marriott Corporation which used marketing analytics to establish a profitable new chain of hotels; Courtyard Marriott (Wind et al., 1989), and National Academy Press which effectively developed variable pricing method for its digital products using marketing analytics (Kannan et al., 2009). In all the above mentioned cases marketing analytics were used to optimize product and/or service offering that increased customer satisfaction and improve the performance of the firm. Germann et al. (2013) has demonstrated significant and substantive improvement because of the deployment of marketing analytics for Fortune 1000 companies using subjective and objective measure for performance of a firm.

CONCEPTUAL FRAMEWORK

The conceptual framework of the research is depicted in Figure 1. The framework illustrates the precursor relationships of top management advocacy on marketing analytics deployment through analytics culture, analytics skills, and both data and IT resources. In turn, deployment of marketing analytics is related to firm performance. The underlying hypothesis is that top management advocacy is the necessary and essential condition for the development of analytical culture, analytical skills, and data and IT resources that underpin and support the effective deployment and utilization of marketing analytics (Hambrick, 2005).

FIGURE 1
CONCEPTUAL FRAMEWORK



HYPOTHESES - MEDIATION

Analytical culture that is supported by top management advocacy is essential in setting the norms of how things are done that enables decision makers to leverage insights extracted from marketing analytics (Deshpande et al., 1993).

Hypothesis 1: *Analytical culture mediate the impact of top management advocacy on the deployment of marketing analytics.*

Hypothesis 2: *Analytical culture mediate the impact of analytical skills on the deployment of marketing analytics.*

Analytical skills that are embedded with internal or partner capabilities helps a firm to deploy its marketing analytics more effectively as people are disposed to use the skillsets and methodologies they are proficient and comfortable with in accomplishing their tasks (Lounsbury, 2001).

Hypothesis 3: *Analytical skills mediate the impact of top management advocacy on the deployment of marketing analytics.*

Hypothesis 4: *Analytical skills mediate the impact of top management advocacy on analytical culture.*

Marketing analytics deployment that is defined as the "extent to which insights gained from marketing analytics guide and support marketing decision making within the firm has positive, impact on firm performance" by Germann et al., (2013, p. 115) works as a conduit of capturing the competitive advantages garnered by analytical culture, analytical skills, data and IT resources that are supported by strong top management advocacy.

Hypothesis 5: *Marketing analytics deployment mediates the impact of analytical culture on firm performance.*

Hypothesis 6: *Marketing analytics deployment mediates the impact of analytical skills on firm performance.*

Data and IT resources are two highly valuable assets that top management utilize to hasten effective marketing analytics deployment. These resources include database, computers, and communication technologies and shared platform (Ross et al., 1996).

The following hypotheses contain double mediation paths, where two mediators are involved in relating the IV to the DV.

Hypothesis 7: *Analytical culture and marketing analytics deployment mediate the impacts of top management advocacy on firm performance.*

Hypothesis 8: *Analytical skills and marketing analytics deployment mediate the impacts of top management advocacy on firm performance.*

Hypothesis 9: *Data and IT resources and analytic skills mediate the impacts of top management advocacy on marketing analytics deployment.*

Hypothesis 10: *Analytical culture and marketing analytics deployment mediate the impact of analytical skills on firm performance.*

Hypothesis 11: *Analytical skills and marketing analytics deployment mediate the impact of data and IT resources on firm performance.*

DATA AND RESEARCH METHOD

Measurement Scales

The authors of the article (Germann et al., 2013) have adapted existing scales and utilized scales they have rigorously developed and vetted in four rounds of testing.

Data Information

Data utilized in the research paper was from 212 completed surveys by senior executives of Fortune 1000 companies. As shown in Table 1, 37% of respondents were senior executive level with positions at executive VP or equivalent level with the balance having key decision-making responsibility across the organizational horizon.

TABLE 1
PROFILE OF SURVEY RESPONDENTS

Position	Paricipants	%
President, CEO	7	3.30%
EVP, Sr. VP, VP, CMO, CFO, COO	78	36.79%
[Sr.] Director, Exec. Director	65	30.66%
[Sr.] Marketing Director	47	22.17%
Other (Marketing Strategist, etc.)	15	7.08%
Total	212	100.00%

Measurement Scale Evaluation

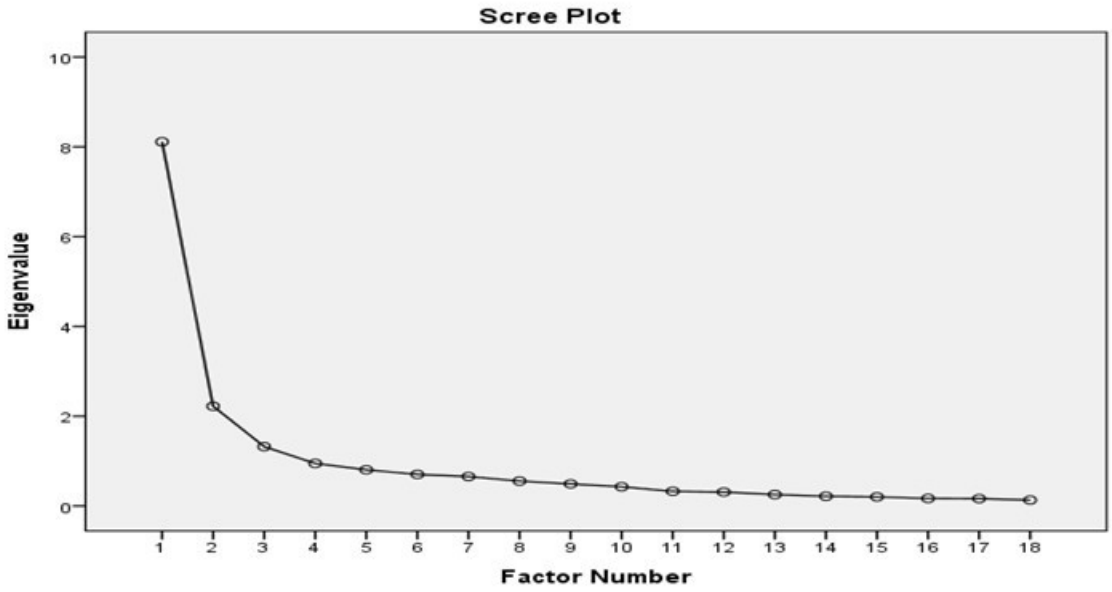
We evaluated the appropriateness of the measures using explanatory and confirmatory factor analyses. Using the full information data, the six factors solution explained 68.40% of the variance in the model with Chi-square = 77.74, df = 60, and p = 0.062 (slightly insignificant) and we further looked into reliability and validity issue to ensure the adequacy of the data in CFA. As shown in Table 2, the pattern matrix for the six factor solution indicates some cross loadings without suppressing loading factors and an instance of a negative loading factor. The scree plot for this configuration is presented in Figure 2.

TABLE 2
PATTERN MATRIX FOR SIX FACTORS SOLUTION

	Factor					
	1	2	3	4	5	6
tmt1		.109	**.589**			.169
tmt2	.257		**.788**			-.112
tmt3	.178		**.724**			
ac4	**.747**					.177
ac5	**.921**					
ac6	**.853**				-.145	
mas7	.122					**.848**
mas8	.193					**.659**
mas9	.280		.182			**.398**
dit10	.179	.224			**.287**	.154
dit11	-.174				**.822**	
dit12					**.831**	
doa13	.205			**.716**		
doa14	-.107			**.972**		
doa15	.444		.112	**.206**	.116	-.135
fp16	.164	**.542**	-.289	.122	.100	
fp17		**.887**	.125			
fp18		**.945**				

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalization.[a]
a. Rotation converged in 6 iterations.

FIGURE 2
SCREE PLOT FOR SIX FACTORS SOLUTION



Further investigation of alternative solutions revealed that 65.95% of the variance in the model is explained by the five factor solution, whereas, the seven factor solution explained 71.60% of the variance in the model. Pattern Matrices for these solutions are presented in Table 3 and 4 respectively.

TABLE 3
PATTERN MATRIX FOR FIVE FACTORS SOLUTION

	Factor				
	1	2	3	4	5
tmt1	.114	.116			**.507**
tmt2	.245				**.756**
tmt3	.219				**.682**
ac4	**.934**			-.105	
ac5	**.890**				
ac6	**.946**		-.207	-.123	
mas7	**.658**		.163	.148	
mas8	**.647**		.136	.177	
mas9	**.601**		.107		.128
dit10	.294	.223	**.313**		
dit11	-.187		**.876**		
dit12			**.801**		
doa13	.276			**.665**	
doa14				**1.010**	
doa15	.389			**.145**	.132
fp16		**.528**			-.252
fp17		**.889**			.105
fp18		**.947**			

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalization.[a]
a. Rotation converged in 6 iterations.

TABLE 4
PATTERN MATRIX FOR SEVEN FACTORS SOLUTIONS

	Factor						
	1	2	3	4	5	6	7
tmt1		**.610**	.115			.146	
tmt2		**.847**					.147
tmt3	.153	**.761**					
ac4	**.782**					.114	
ac5	**.729**						.158
ac6	**.983**					-.105	
mas7						**.923**	
mas8						**.811**	
mas9	.296	.170				**.396**	
dit10	.104		.217	-.111	**.256**	.225	
dit11	-.110	.106			**.863**		
dit12					**.801**		
doa13	.225			.601			
doa14				1.054			
doa15							**.903**
fp16	.103	-.283	**.534**				.113
fp17	-.109	.112	**.880**				
fp18			**.951**				

Extraction Method: Maximum Likelihood.
Rotation Method: Promax with Kaiser Normalization.[a]
a. Rotation converged in 7 iterations.

The pattern matrix for the six factors solution has double loadings and negative loading factors. These may be results of closely related items (as in the case of analytical culture and skills) and negative correlation between the factors and the items. Since CFA confirms that data fits the model well and convergent and discriminant validity is attained, the factors determined using theory are adequate to establish the relationship among the factors. One may further employ Thurstone's Simple Structure rules to simplify the pattern structure and achieve adequate solution. Our EFA looking into five and seven factor structure were initiated by the similarity of analytical culture and skills and further exploration to see the behavior of the items by observing their factor structure and communalities

Confirmatory factor analysis including independent and dependent variables indicated adequate fit to the data with CMIN/df = 1.689, CFI = 0.97, RMSEA = 0.057; 90% CI of [.043; .071]. Further investigation for construct reliability and validity following Bagozzi, Yi, and Phillips's recommendations (Bagozzi et al., 1991) demonstrated adequacy of the constructs. As it is shown in Table 5, CFA fit statistic for Germann et al., 2013 and the one the authors developed are comparable.

TABLE 5
CFA MODEL FIT STATISTIC COMPARISON

	Germann Et al., (2013)	Yohannes
χ^2		200.98
df		119
CFI	0.97	0.97
RMSEA	0.04	0.06
90%CI of RMSEA	[.03; .06]	[.043; .071]

Convergent validity was demonstrated with critical ratios (CR) greater than 0.7 and the corresponding average variance extracted (AVE) for all the constructs as shown in Table 6 with the smallest CR = 0.743. The maximum variances extracted (MSV) for all the constructs are less than the AVE, and the average shared variances (ASV) are less than AVE meeting discriminant validity requirement. The reliability of the constructs was confirmed with all Cronbach's alpha and CR being greater than 0.70 with the lowest values equal to 0.72 and 0.74 respectively.

TABLE 6
RELIABILITY AND VALIDITY OF CONSTRUCTS

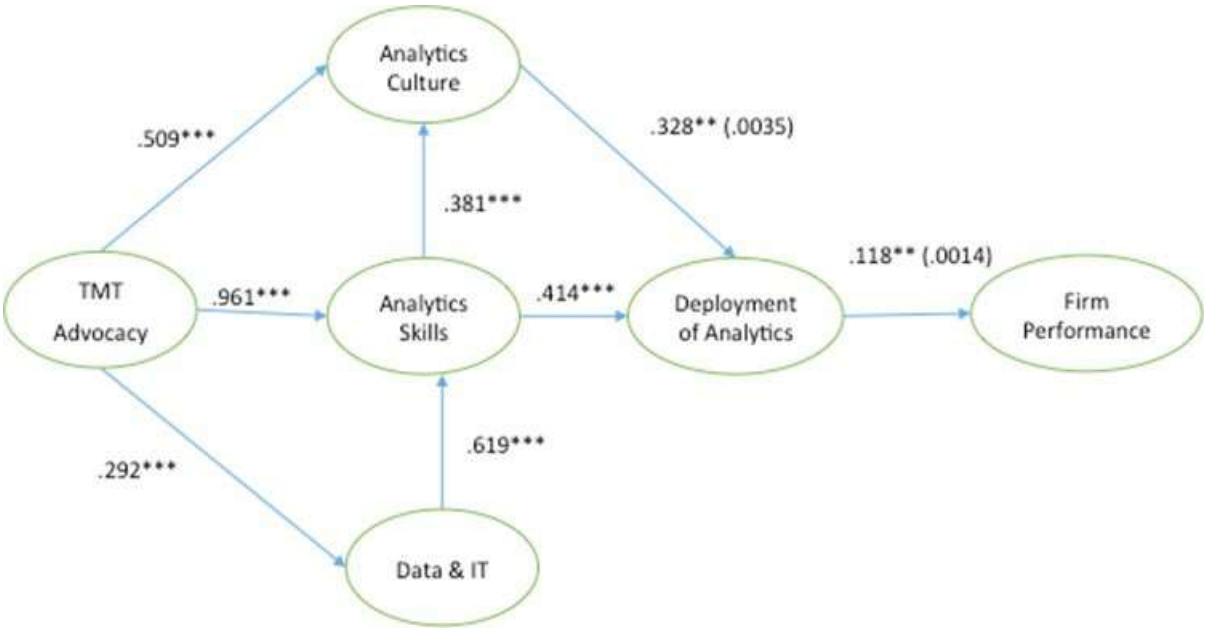
Convergent Validity		Discriminate Validity		Reliability	
CR > .7		MSV < AVE		α > .7	
CR > AVE		ASV < AVE		CR . >7	
	Cronbach α	CR	AVE	MSV	ASV
Deployment of Analytics	0.82	0.848	0.657	0.646	0.386
TMT Avocacy	0.84	0.853	0.663	0.657	0.406
Analytics Culture	0.87	0.872	0.695	0.751	0.433
Marketing Analytics Skills	0.90	0.890	0.730	0.751	0.494
Data & IT	0.72	0.743	0.500	0.346	0.202
Frim Performance	0.81	0.839	0.646	0.109	0.067

RESULTS

SEM Results

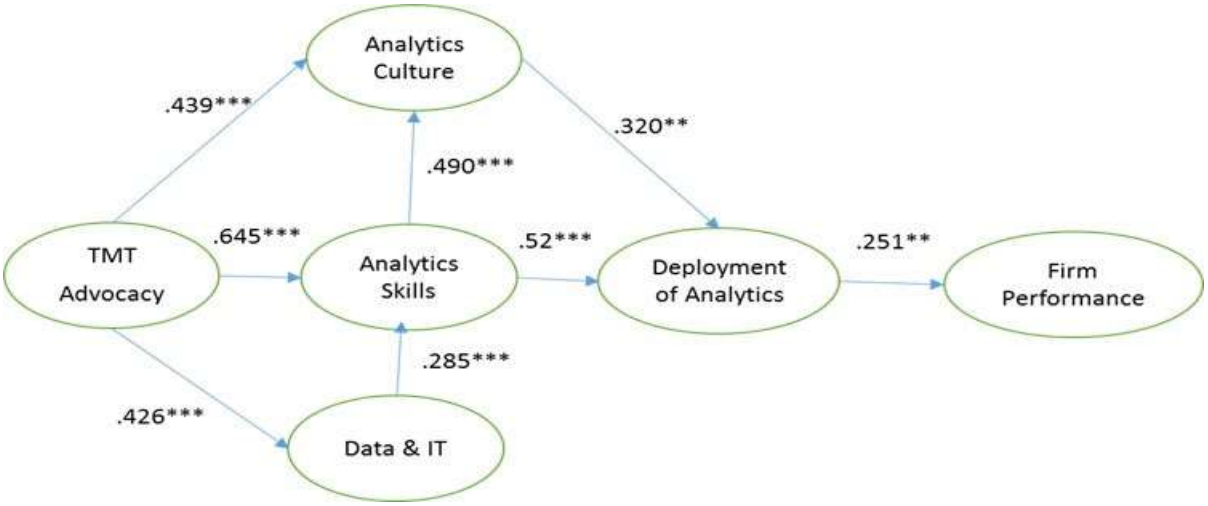
SEM results for the model utilizing full information item-level data without the interaction terms reveal a good model fit to the data with Chi-square = 1.829, $p < .0001$, CFI = 0.97, RMSEA = 0.05; 90% CI of RMSEA = [.05; .08]. As it is shown in Figure 3 and 4; the unstandardized and standardized values respectively, top management advocacy has significant and positive impacts on all three precursors constructs for successful marketing analytics deployment confirming the authors (Germann et al., 2013) hypotheses about TMT. Furthermore, as the authors have predicted enhanced marketing analytics deployment has a direct positive impact on firm performance ($\beta = .118$, $p < .01$). Increasing analytic skills of a firm's employees increases marketing analytics directly by providing them the skillset to make optimized marketing analytics based decisions ($\beta = .414$, $p < .001$), and enhances analytic cultural ($\beta = .381$, $p < .001$) norms that take a long time to change, while it indirectly impacts marketing analytics deployment via analytic culture ($\beta = .125$, $p < .01$).

FIGURE 3
SEM RESULTS (UNSTANDARDIZED BETA VALUES) FOR ITEM-LEVEL FULL INFORMATION DATA



*** p < .001, ** p < .01, * p < .05

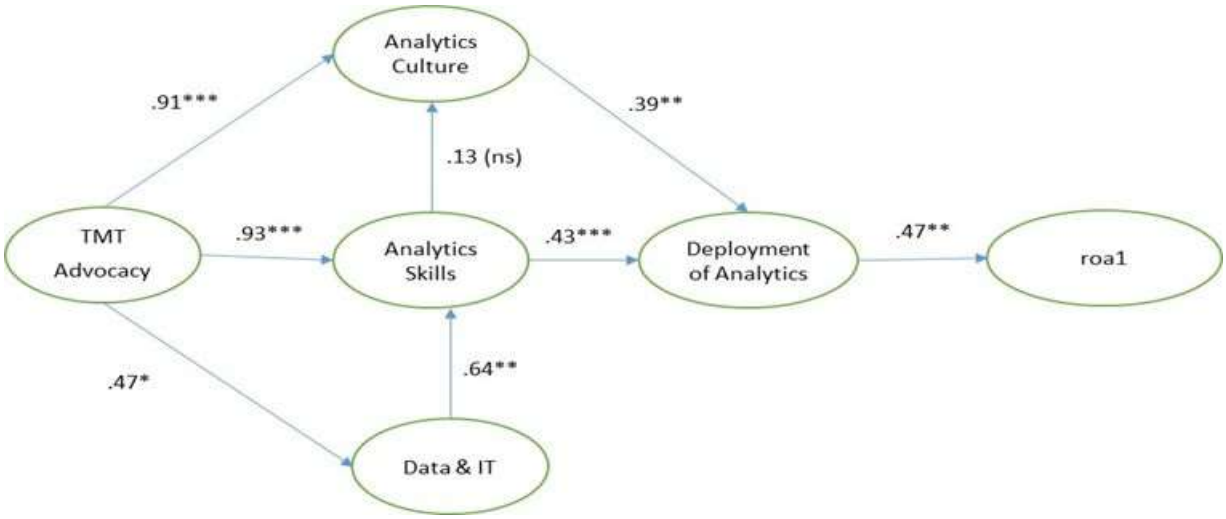
FIGURE 4
SEM RESULTS (STANDARDIZED BETA VALUES) FOR ITEM-LEVEL FULL INFORMATION DATA



*** p < .001, ** p < .01, * p < .05

Replications of SEM using objective data ROA at time 1 and time 2 yielded similar results as Germann et al., (2013) as shown in Figure 5 and 6 (unstandardized and standardized coefficients) at time 1, and respectively at time 2 as shown in Figure 7 and 8 for unstandardized and standardized coefficients respectively.

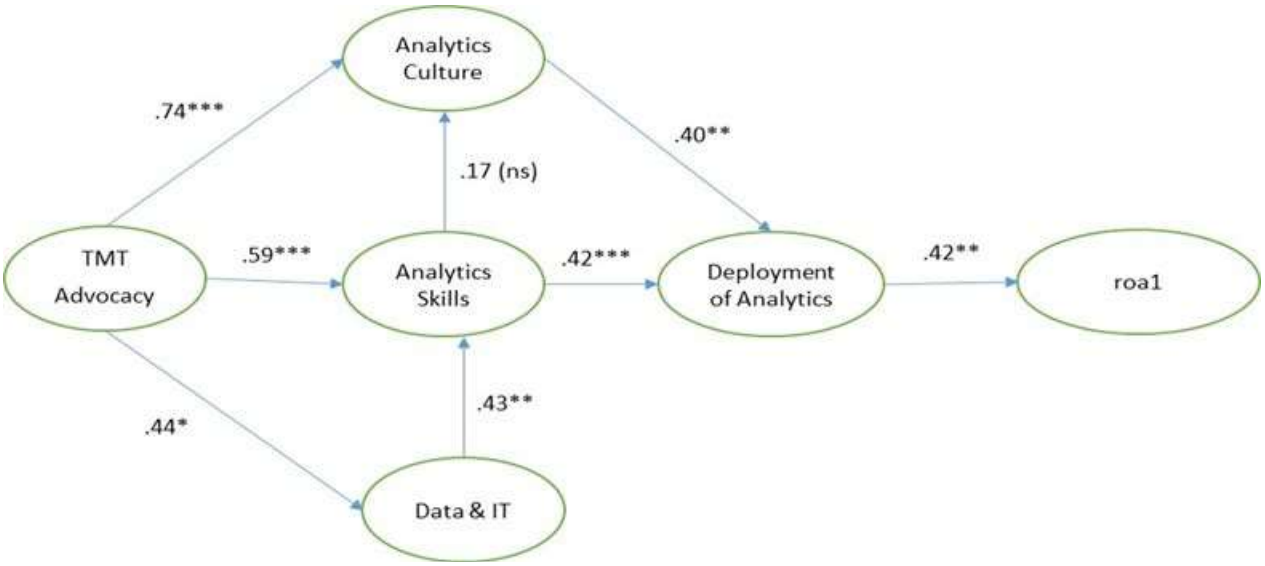
FIGURE 5
SEM USING OBJECTIVE MEASURE ROA AT TIME 1 (UNSTANDARDIZED COEFFICIENTS)



*** p < .001, ** p < .01, * p < .05

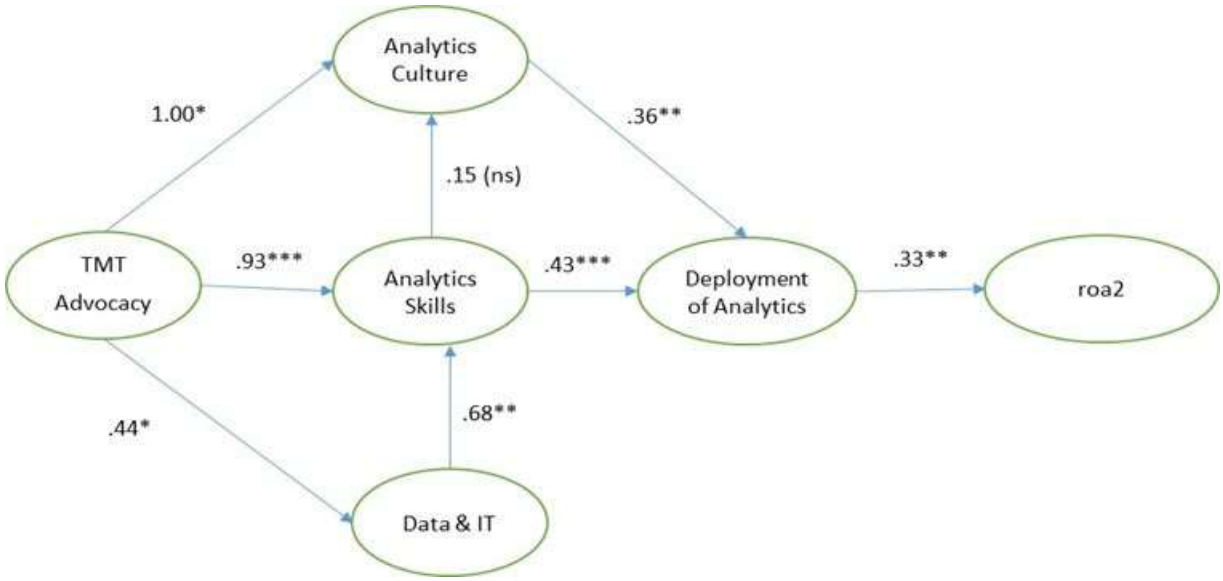
Chi-square = 139.22, df = 97, CFI = .932, TLI = .916, RMSEA = .091, 90% CI RMSEA = [.054; .123]

FIGURE 6
SEM USING OBJECTIVE MEASURE ROA AT TIME 1 (STANDARDIZED COEFFICIENTS)



*** p < .001, ** p < .01, * p < .05

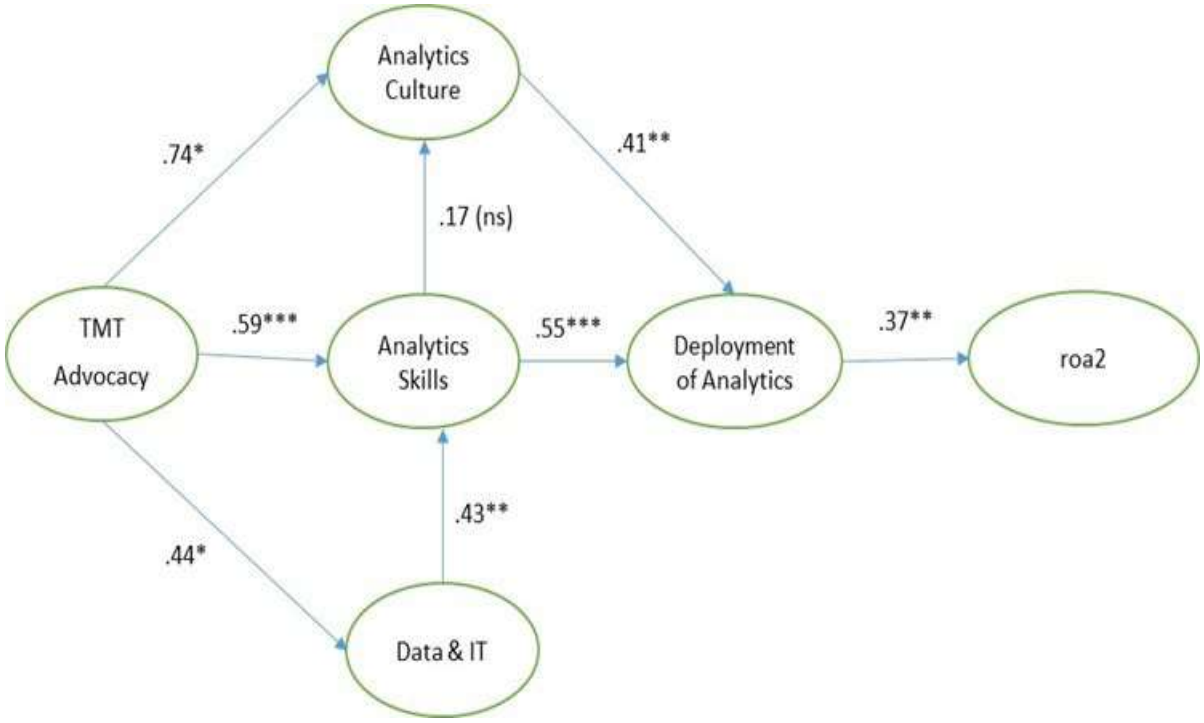
FIGURE 7
SEM USING OBJECTIVE MEASURE ROA AT TIME 2
(UNSTANDARDIZED COEFFICIENTS)



*** p < .001, ** p < .01, * p < .05

Chi-square = 139.22, df = 97, CFI = .932, TLI = .916, RMSEA = .091, 90% CI RMSEA = [.054; .123]

FIGURE 8
SEM USING OBJECTIVE MEASURE ROA AT TIME 2 (STANDARDIZED COEFFICIENTS



*** p < .001, ** p < .01, * p < .05

As it shown in Table 7 Germann's fit statistics are similar to the one we developed with maximum difference of 10.3%. (CFI for the full information SEM).

TABLE 7
SEM FIT STATISTICS

	Full Information SEM		SEM Using Objective ROA (Time		SEM Using Objective ROA (Time	
	Germann Et al., (2013)	Yohannes	Germann Et al., (2013)	Yohannes	Germann Et al., (2013)	Yohannes
χ^2	243	208.57	158.15	139.22	149.74	134.05
df	175	111		97		97
CFI	0.97	0.96	0.92	0.916	0.932	0.94
RMSEA	0.04	0.06	0.096	0.091	0.089	0.085
90%CI of RMSEA	[.03; .06]	[.05; .08]	[.068; .123]	[.054; .123]	[.060; .117]	[.045; .118]

Mediation Test Results

We tested mediation following Baron and Kenny's (1986) recommendations with cross check by Zhao's (Zhao et al., 2010) and Sobel test (http://quantpsy.org/sobel/sobel.htm).

As it is shown in Table 8, seven of the eleven hypotheses we proposed were fully supported, while the remaining four hypotheses were partially supported.

Analytical skills are the most effective partial mediator for the effects of top management advocacy on analytical culture (Hypothesis 4). This partial mediation has β1 (direct β without mediation) = 0.996, p < .001 and β2 (direct beta with mediation) = 0.509, p < .001 indicating high throughput of top

management advocacy in conditioning analytical culture via analytical skills partially supporting Hypothesis 4. In other words top management advocacy in advancing analytical skills helps to enhance the sticky analytical culture. Additionally analytical skills fully mediate the impact of top management advocacy on marketing analytics deployment (Hypothesis 3) with β1 = .568, p < .01 further demonstrating the nested mediating relationships.

TABLE 8
MEDIATION TEST RESULTS

Hypothesis	Path	Direct β w/o Med.	Direct β w/ Med.	Indirect Effects	Mediation Type Observed	Mediation Type (Zhao et al)	Sobel Test t ≥ 1.96, p < .05	Hypothesis supported?
1	tmt→ac→doa	.883 ***	.155 (ns).22	.167 (ns)	Full	Indirect-only	1.662 (ns) .096	Yes
2	mas→ac→doa	.641 ***	.415 ***	.125 **	Partial	Complementary	2.645 ** (.0081)	Partially
3	tmt→mas→doa	.568 ** (.001)	.152 (ns) .232	.398 ***	Full	Indirect-only	3.857 *** (.00011)	Yes
4	tmt→mas→ac	0.996 ***	.509 ***	.366 ***	Partial	Complementary	4.114 *** (.000039)	Partially
5	ac→doa→fp	.106 ** (.005)	.0285 (ns) .6322	.039 (ns)	Full	Indirect-only	1.409 (ns) .1588	Yes
6	mas→doa→fp	0.0975 ***	.07 (ns) .1541	.049 (ns)	Full	Indirect-only	1.41 (ns) .1585	Yes
7	tmt→ac→doa→fp	.113 ** (.003)	.064 (ns) .275	0.02 (ns)	Full	Indirect-only		Yes
8	tmt→mas→doa→fp	.133 ** (.003)	.132 ** (.003)	.047 (ns)	Partial	Complementary		Partially
9	tmt→dit→mas→doa	.584 ***	.1554 (ns) .2196	.075 (ns)	Full	Indirect-only		Yes
10	mas→ac→doa→fp	.0984 ***	.0730 (ns)	.015 (ns)	Full	Indirect-only		Yes
11	dit→mas→doa→fp	.2725 ***	.2157 **	.03 (ns)	Partial	Complementary		Partially

***$p < .001$, **$p < .01$, *$p < .05$

As Germann et al., (2013) have stated marketing analytics deployment partially mediates the impacts of analytical culture and analytical skills on firm performance (Hypotheses 5 and 6). Analytical culture seems to have a larger effect (larger beta; βac->doa->fp = 0.106, p < .01) on firm performance through marketing analytics deployment, when compared to the impacts of analytical skills on firm performance via marketing analytics deployment (direct β = 0.0975, < .001). This may be attributed to the stickiness of culture and its implication on the decision making process that affects the performance of the firm.

Furthermore, analytical culture fully mediates the effects of top management advocacy on marketing analytics deployment supporting Hypothesis 1 (direct β=.883, p<.001), while it partially mediates the impacts of analytical skills on the marketing analytics deployment Hypothesis 2 (direct β without mediation = .641, p<.001; direct β with mediation = .415, p<.001). Here there is complementary mediation (Zhao et al., 2010), where analytical skills have significant mediated and direct impact on marketing analytics deployment and enhance analytical culture due to the increased proficiency.

For the double mediated impacts of top management advocacy on firm performance through analytics culture and marketing analytics deployment (Hypothesis 7) and analytical skills and marketing analytics deployment (Hypothesis 8), the analysis results yield full and partial mediation respectively. Note that the beta coefficients for the latter mediation (β1 = .133, p<.01; β2 = .132, p<.01). However, when compared in total, the combination of analytical culture and marketing analytics deployment are more effective mediators of the impact of top management advocacy on firm performance. The coefficients and standard deviations for the double mediation paths were calculated following Williams's recommendations (Williams et al., 2008).

For the mediated impacts of top management advocacy on marketing analytics deployment the mediator combination of data and infrastructure resources, and analytical skills (Hypothesis 9) delivers full mediation with the second highest beta coefficient (β = .584, p<.001).

Further investigating double mediated effects on firm performance, analytical skills and marketing analytics provides the highest impact partial mediation (Hypothesis 11) with $\beta = .2725$, $p<0.001$; $\beta = 0.2157$, $p<.01$ that are both significant and substantial partial mediation. Whereas the double mediated impact of analytical skills on firm performance via analytical culture and marketing deployment is a full mediation with that is significant, but not substantive with $\beta = 0.0984$, and $p<0.001$ (10).

DISCUSSION OF RESULTS AND CONCLUSION

As it is observed in the results discussed above and summarized in Table 8, the most substantive and significant mediated impact on firm performance is observed for the impact of data and IT on firm performance by the double mediation by analytical skills and marketing analytical deployment (Hypothesis 11) with $\beta = 0.2725$ $p < 0.001$ for direct impact without mediation and $\beta = 2157$, $p < 0.01$ for direct impacts with mediation. This partial mediation seems to effectuate the potential of data and IT resources partially mediating via analytical skills that enhance the effective deployment of marketing analytics, and impacts firm performance.

Effective marketing analytics deployment has significant mediating implications on the performance of a firm as a single mediator as illustrated in hypotheses 5 and 6 ($\beta = 0.106$, $p < 0.01$; $\beta = .0975$, $p < 0.001$ respectively) and as part of double mediator as in the case of hypotheses 7, 8, 10 and 11 with the highest impact observed for hypothesis 11 with the beta value indicated above.

This impact was demonstrated when firm performance was calibrated using subjective measures. In our mediation analyses, we found marketing analytics deployment, analytical culture, analytical skills, and data and IT resources to be effective mediators across the eleven mediating paths we investigated.

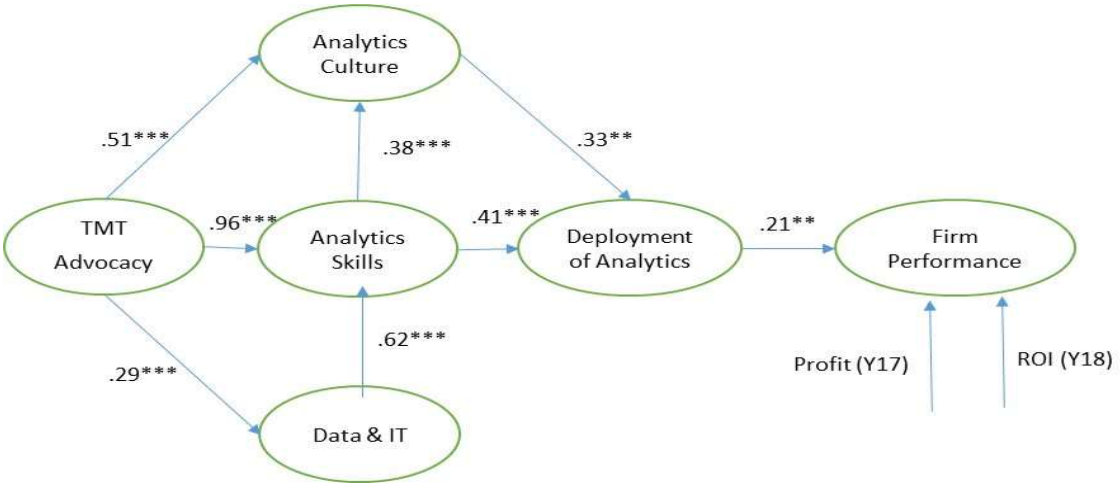
Furthermore, our analysis has indicated that top management advocacy in support of analytical culture and skills, data and IT resource is necessary and essential precondition for effective and impactful marketing analytics deployment that enhances the performance of the firm. The overall mediation hypotheses testing indicates that marketing analytics deployment mediates the impacts of analytical culture and analytical skills on firm performance with positive relationships. Both mediations are significant and substantive affecting the performance of the firm, when performance is measured with subjective and objective measures. Furthermore, the double mediated impact of top management advocacy via [analytical culture and marketing analytics deployment], and [analytical skills and marketing analytics deployment] are both significant and substantive with complementary mediation with the latter path. Hence, the results indicate the outcome of marketing analytics deployment is positive, improving the performance of the firm.

EXTENSIONS

Extension 1

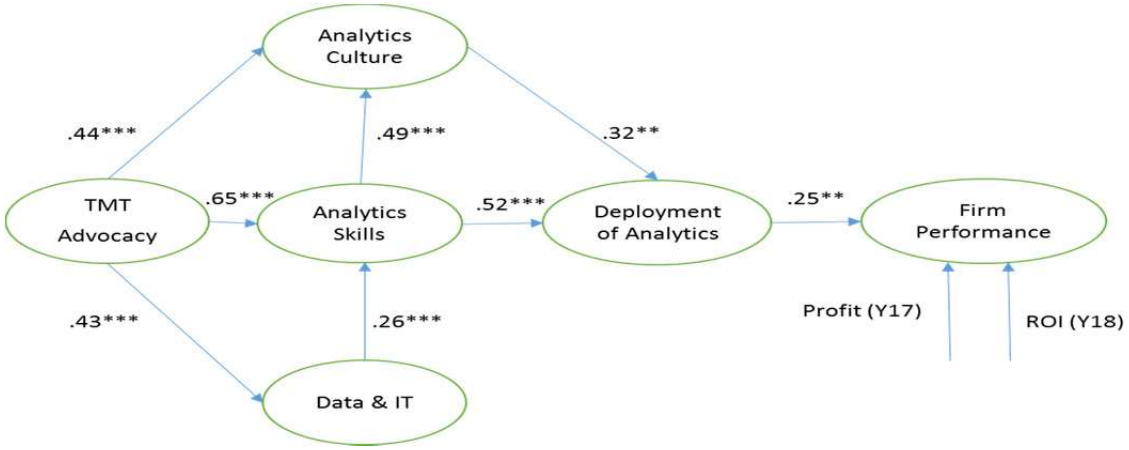
As an alternative model, we investigated the impact of measuring firm performance using profit (Y17) and return on investment (Y18). The rational for these choices is to determine the impact of marketing analytics deployment on effective measures that capture bottom line improvements of the firm. As it illustrated in Figures 9 and 10, while, improvement for the unstandardized impact of marketing analytics deployment on firm performance was observed ($\beta = 0.12$, $p < 0.01$ to $\beta = 0.21$, $p < 0.01$), no improvement was observed for the standardized coefficients. Further reviewing the model fit statistics, it was observed the model does fit that data well with $\chi2 = 208.58$, $p < .0000$, CFI = 0.959, TLI = 0.95, and RMSEA = 0.0645, 90% CI of RMSEA = [.051; .078].

FIGURE 9
UNSTANADARDIZED SEM RESULTS FOR FIRM PERFORMANCE MEASURED BY Y17 AND Y18



***p < .001, **p < .01, *p < .05

FIGURE 10
STANADARDIZED SEM RESULTS FOR FIRM PERFORMANCE MEASURED BY Y17 AND Y18



***p < .001, **p < .01, *p < .05

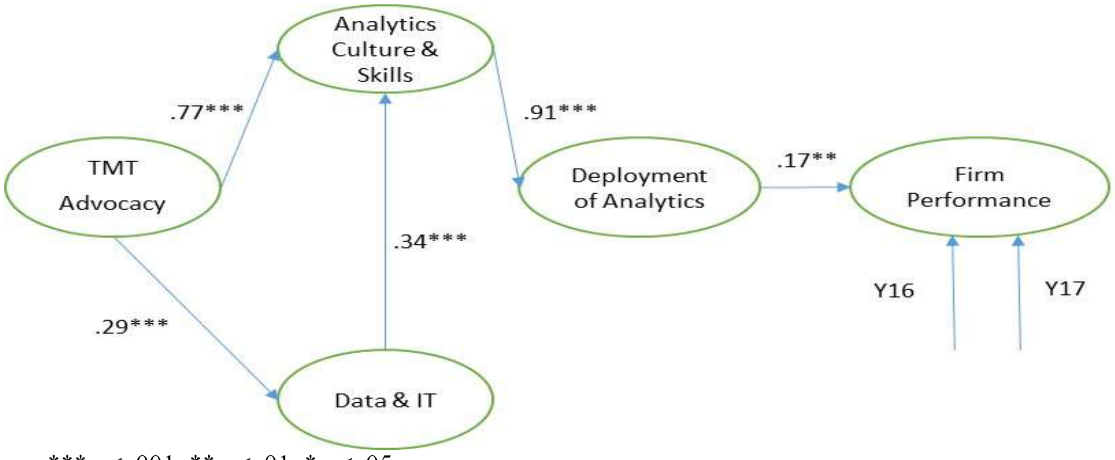
Chi-square difference test between the base SEM and extension 1 indicates that two SEM invariant. Hence, extension 1 does not provide a viable alternative.

Extension 2

Reviewing items 4 through 9 in Germann's paper (2013) indicates that analytical culture and analytical skills are similar in their structure and the utility they provide. Based on this assertion that is supported by EFA findings, the authors combined analytical culture and analytical skills into one construct. The analysis conducted using this configuration yields interesting results as shown in Figure 11 (unstandardized coefficients) and Figure 12 (standardized coefficients). First the model fit statistics with $\chi 2 = 299.91$, $p < .0000$, CFI = .92, TLI = .90, RMSEA = 0.088, 90% CI of RMSEA = [.076; .10] fits the

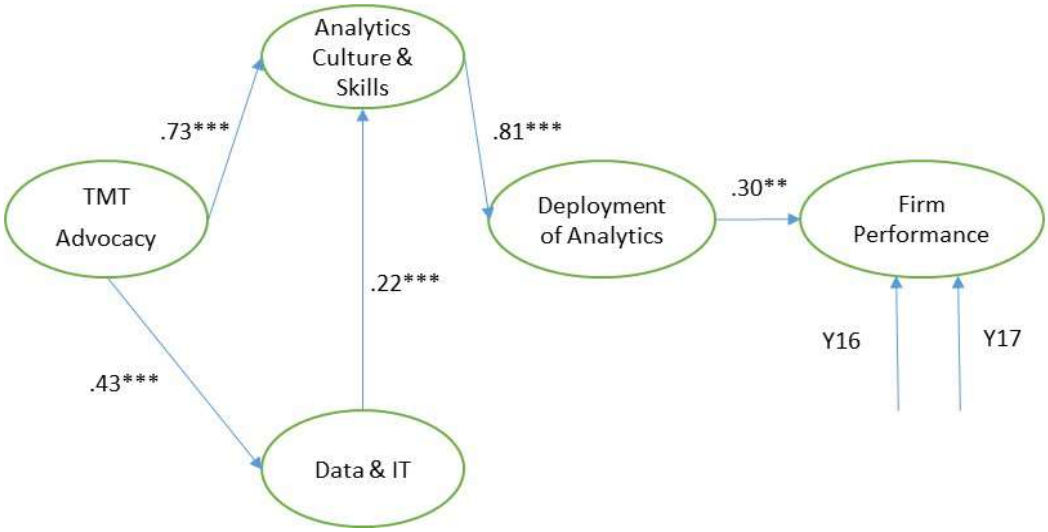
model reasonably. Furthermore, Chi-square difference test results of $\chi 2$ (3) = 91.34, p < .000 indicating difference between the baseline and extension two.

FIGURE 11
UNSTANADARDIZED SEM RESULTS FOR COMBINED ANALYTICAL CULTURE AND SKILLS FIRM PERFORMANCE MEASURED BY Y16 AND Y17



***p < .001, **p < .01, *p < .05

FIGURE 12
STANADARDIZED SEM RESULTS FOR COMBINED ANALYTICAL CULTURE AND SKILLS FIRM PERFORMANCE MEASURED BY Y16 AND Y17



***p < .001, **p < .01, *p < .05

The impact of marketing analytics deployment of firm performance measured by total sales growth and profit increased by 44% using unstandardized coefficients (β: 0.118 → 0.17) from baseline (Figure 3 → Figure 11), and 19.5% (β: 0.251 → 0.30 from baseline (Figure 4 → Figure 8). This model illustrates the enhanced implication of marketing analytics deployment on firm performance while indicating the necessary essential impact of top management advocacy on both analytical culture and skills and data and IT resources (β = .71, and 0.43; p < .001 respectively).

This model illustrates a useful tool kit for management to explore the potentials marketing analytics deployment to increase total sales and profit.

In conducting multi-level mediation, the authors learned that there are several perspectives in handling mediation test. While Baron and Kenny (1986) provide a foundational framework for categorizing mediation, Zhao et al. (2010) seem to provide a more nuanced approach. The Sobel test further provides a way of testing the significance of the mediation.

The mediation test we conducted confirms Germann et al. (2013) finding that marketing analytics deployment mediates the impact of analytical culture and analytical skills on firm performance that are significant and substantive. The mediation test further illustrates other mediating paths with significant and substantive impact on firm performance.

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