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Contributing Factors and Trends in the Usage of IT Outsourcing in Manufacturing and Service Sectors

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***Abstract* – The study projects long-term trends in the IT outsourcing in the manufacturing and service sectors of the United States. The findings suggest that the respondents perceive that there is approximately an equal usage of IT outsourcing in each of manufacturing and service sectors. Furthermore, the Desired Characteristics of Outsourcing – enabler of organisational flexibility, dynamics, and adaptability, redirection of resources, and increased control of operating costs – are positively related to the change in the requirement of IT outsourcing in the case of manufacturing. Meanwhile for the service sector, the Administrative Motivation for Outsourcing – lack of expertise, promising service offerings to subscribe, shrinkage in system life cycle – are positively associated with growth/no-growth in IT outsourcing.**

***Keywords* – IT outsourcing, IT offshoring, IT Management and Strategy, Optimum Investment on IT Resources, Predictive Models Trends in IT outsourcing.**

I. Introduction

The Information Technology fields have evolved rapidly over the past 30 years. In the early 1990s, the Microsoft Operating System and Intel processors made computers accessible to businesses and for personal use [1]. The advent of the Internet allowed information to be transferred to anywhere in the globe almost instantly. This spread of information across the globe contributed to globalization and the process of outsourcing.

The use of outsourcing has changed the way that many organisations build, operate and manage their business operations. Outsourcing can take the form of offshoring, where goods are obtained from a foreign supplier rather than from a supplier within the local economy. New outsourcing models such as cloud-sourcing, micro-sourcing, crowd-sourcing, and rural-sourcing have also emerged [2]. Cross-sourcing, which merges several forms of outsourcing, has also evolved as a way to match needs to resources that best fulfil those needs [3]. Organisations can focus on improving their core competencies and utilise outsourcing for competencies where they do not have specialised capabilities [4]. Outsourcing can be used to reduce capital expenditures, utilise the outsourcers' specialised capabilities and rapidly adapt to technological changes. Additionally, the ability to focus on core competencies allows a company to maintain a competitive advantage over rival and new competitors. Large companies, such as Apple and Nike, have utilised outsourcing for the manufacturing of their products for decades [4].

Organisations also use outsourcing for services that are not within their core competencies. Examples that most consumers are familiar with include telemarketing, customer service representatives [5], and software development [6]. The movement of these services allows companies to save money and create new jobs at the same time. In 2003, Delta moved their call centre to India and saved $ 25 million. They moved 1000 jobs to India but created 1200 jobs in the United States [5]. The globalization of the world economies has allowed outsourcing to be possible and the advantages it provides ensure that it will be prevalent in the near future.

II. Literature Review

Determining the factors that influence the adoption of IT outsourcing will help influential business leaders make an informed decision about outsourcing. The following literature review will provide an overview of the benefits, risks, motivation and desired characteristics related to outsourcing of information technology.

A. Benefits of Outsourcing.

Outsourcing information technology has been a trend over the past 50 years. During the advent of information systems (IS) in the 1980s, many organisations outsourced IS and saved up to 50 percent in their capital expenditures [7].

The first benefits to an organisation include the reduction in the cost associated with the service. The differential in labour cost between different regions and countries means that moving labour to a different location will have a different cost per hour. For example, just based on the cost of living, someone who makes $ 100 000 in San Francisco, CA would have the same standard of living as someone in Lincoln, NE making $ 51 000 [8]. The reduction of cost can be achieved by a specialised company that can leverage their expertise, management, the economies of scale as well as the labour differential.

The second benefit is the ability to simplify internal processes and to focus on core competencies [4]. Specialised areas like technology require highly trained and highly paid professionals [9]. The rapid rate of change in technology results in the need for constant training of these professionals. Organisations are often not able to quantify the appropriate

amount of technical training required for IT professionals. Training, maintaining and managing such professionals detracts from the core competencies of an organisation [10]. Additionally, an outsourced provider can provide such training to its employees and distribute that cost over all their customers. Thus, the outsourcer can create a cohort of specialised employees who are more productive and operate at a higher level of efficiency [11]. This shift can reduce overall training costs and simplify the management of technology.

The third benefit is an increase in satisfaction for the IT services. The internal satisfaction of the organisation's employees with the outsourced IT can be related to the level of service provided. Some of these benefits include the adoption of advanced technologies, consulting knowledge, quickness of repair, adoption of updated requirements, and improved Service Level Agreements (SLA) [12]. The organisation's customers can also perceive a higher quality interaction with IT services that are outsourced. Some of the benefits to customers include wider availability (such as 24/7 vs 9-5) [13], decreased cost, more tailored service and decreased response time [12].

Hypothesis H1: The "Benefits of Outsourcing" will lead to the increased usage of IT outsourcing in the next 5 years, both in the manufacturing and service sectors.

B. Risks of Outsourcing

The use of an outsourced IT presents several risks to businesses. Some of these risks are unexpected costs, vendor lock-in, quality control and legal issues.

There are a number of unexpected costs that can occur when switching to an outsourced provider. Examples include an increase in the cost for services, change in terms of service, scaling and hidden costs [14]. Additionally, the costs could increase if there is a delay in the delivery or poor quality. These could cause the organisation to spend more money to get a product or level of service that meets their needs.

The quality of the product may not match what is advertised. The quality control that organisations may be accustomed to may not be met by the outsourcer. The controls that an organisation is used to may not exist, it may not be fine-grained or it may cost more to implement such controls with an outsourced company [15].

Each country that is utilised in the IT outsourcing technology chain will introduce its own legal issues. When developing technology abroad, the Intellectual Property (IP) rights and protections of such development must be considered. The risk is that an organisation may lose control of patentable technology or the protection of trade secrets [16]. Additionally, the United States Munitions List maintains a list of export-controlled munitions, which includes "Information Security Systems and equipment, cryptographic devices [and] software" and "military cryptographic systems and equipment, including key management systems" [17]. Additional legal issues may include inventions created by employees, applications for inventions, copyright and commissioned works [16].

Hypothesis H2: The "Risk of Outsourcing" will lead to the decreased usage of IT outsourcing in the next 5 years, both in the manufacturing and service sectors.

C. Administrative Motivation

Administrators often make decisions on whether a given activity is something that is core to the organisation. This choice can lead administrators to decide whether they should keep this activity in-house or relegate it to another organisation. This can take the form of sub-contracting or full outsourcing. This can have multiple forms, including vertical integration, "make or buy," contractorization, and market testing [18]. As stated in the Benefits section, administrators often look at the benefits and use these to rationalise the use of an outsourcer. The reduced cost can free up capital that administrators can then use for other core competencies as well as providing more focus on core activities. Administrators can also leverage the flexibility that an outsourced relationship provides. If the organisation feels that an outsourcer is not providing a satisfactory level of service, then the switch to another outsourcer can be a rather speedy process. This adaptability allows an organisation to pivot to new IT technologies much more rapidly than if they are provided in-house [19].

Hypothesis H3: The "Administrative Motivation for the Outsourcing" will lead to the increased usage of IT outsourcing in the next 5 years, both in the manufacturing and service sectors.

D. Desired Characteristics of Outsourcing

The speed at which technology changes over the past two decades has been phenomenal. In the year 2000, computing consisted of desktop computers running in the Megahertz range and the Internet was in its infancy. By the year 2010, smartphones like the iPhone and tablets like the iPad had been introduced to the market. In 2010, only 20 % of people in the United States had a smart phone and by 2020, that number had risen to 72 % of Americans [20]. These rapid changes mean that technology becomes outdated more quickly than ever. Organisations do not want to invest capital in a resource that will quickly become obsolete. This includes both IT hardware and trained IT professionals [9]. By outsourcing, an organisation can achieve flexibility at reduced capital investment. Additional characteristics have been enumerated, including, reduced cost, specialised capability, 24/7 service, specialised service and decreased response time.

Hypothesis H4: The "Desired Characteristics of Outsourcing" will lead to the increased usage of IT outsourcing in the next five years, in both the manufacturing and service sectors.

The research aims at focusing on the trends in the IT outsourcing along with identification of drivers for the IT outsourcing. The potential research questions are:

1. What will the trends in IT outsourcing be in the manufacturing and service sectors in the United States?

2. Will there be usage of outsourcing for IT services in higher proportion compared to in-house IT services in each sector?
3. What are the contributing factors resulting in the above trends for each sector?

III. Methodology

The current study looks at the impact on outsourcing in manufacturing and service sectors in the United States to discover which attributes were important to decision makers in each sector in their determination of outsourcing utilisation and budget allocation. Further, this paper evaluates the contributed factors that drive the changes in planned IT investment in outsourcing as well as the planned changes in IT budget allocation.

TABLE I
Measurement of Sampling Adequacy Using KMO and Bartlett's Test of Sphericity

Kaiser-Meyer-Olkin Measure of Sampling Adequacy:		0.949
Bartlett's Test of Sphericity	Approx. Chi-Square	2284.806
	df	153
	Sig.	0.000

The analysis was performed in three stages. At the first stage, a questionnaire was developed to test the four hypotheses. The survey items were finalised using a face validity assessment process, which generated 29 questions (C1–C29) corresponding with factors that decision makers perceive to be important for the adoption of outsourcing.

During the second stage, the survey was given, and items ranked based on their average respondent scores. Following the guidelines suggested by [21], [22], a 6-page questionnaire was administered. To mitigate non-responses, no open-ended questions were used. The reader is referred to [23] for details on the first two stages as well as a profile of the responding firms and respondents.

A. Suitability of Respondent Data

Construct validity was also performed during the second stage to assess the suitability of respondents' data for the third stage (focusing on factor analysis). Test used included Kaiser-Meyer-Olkin (KMO) Measure of Sampling Accuracy [24], [25], Correlation Analysis [26], and Bartlett's Test of Sphericity [27]. SPSS version 23.0 was used for all data analysis conducted in this study. The KMO index is recommended when the cases to variable ratio are less than 1:5. The KMO index ranges from 0 to 1, with 0.5 considered suitable for factor analysis [28], [29]. When analysing the correlations of the items, only items with a correlation of 0.4 and above were retained for factor analysis [26]. All items were correlated with all other items at the level greater than 0.4 with 0.406 being the lowest correlation between any two items. The Bartlett's Test of Sphericity should be significant ($p < 0.05$) for factor analysis to be suitable [28], [29]. For the data used in this study, the KMO index is 0.949 and Bartlett's Test of Sphericity has a significance level $p < 0.001$ (Table I); therefore, the respondents' data are suitable for factor analysis.

B. Factor Analysis

The third stage was divided into two parts: (A) Exploration of data clusters/classifications using a principle component analysis to assess the feasibility of usage of various models which could be used for further analysis (now and in future), and (B) Exploratory factor analysis and confirmatory factor analysis (CFA) using a principle component analysis extraction method with varimax rotation for the development of model to prove the formulated hypotheses.

Exploration of data clusters/classifications (can be vaguely named as factors) using a principle component analysis to assess the feasibility of usage of various models in further analysis (now and in future). For the statistical/analytical techniques, we used the "R" programming language on various models during steps I and II (contains the components; type of industrial sectors – i.e., manufacturing and services; and firm sizes).

1. Stage 3. Part A. Principle Component Analysis

Using the regression model, four significant components were identified: PCA1, PCA2, PCA3, and PCA4. The difficulties in interpretation of these four components can be attributed to a lower sample size. Even though the loadings of the first four components were significant, the interpretation of the components was ambiguous.

In the regression model (outsourcing.new ~ outsourcing.old + industry + firm.size + outsourcing.pca1 + outsourcing.pca2 + outsourcing.pca3 + outsourcing.pca4, data = model1), the dependent variable is the expected budget allocation for IT outsourcing/offshoring (outsourcing.new); and independent variables include: Budget allocation for IT outsourcing/offshoring (outsourcing.old), Industry (service vs. manufacturing), Firm revenue (large vs. small and medium), and four principle components (~ 67 % variance) from the 29 measured items.

This full model is statistically significant with Multiple *R*-squared: 0.6873, Adjusted *R*-squared: 0.6917; *F*-statistic: 43.96 on 7 and 140 DF, *p*-value: < $2.2e^{-16}$ (Significant). Table II shows results in detail.

TABLE II
Statistical Significance of the Full Model

Coefficients					
	Estimate	**Std. Error**	***t*-value**	**Pr(>|t|)**	
(Intercept)	3.30846	1.37799	2.401	0.0177	*
outsourcing.old	0.77631	0.04878	15.915	$<2e^{-16}$	***
industryservice	1.10992	1.39571	−0.795	0.4278	
firm.sizesme	1.91395	1.43930	1.330	0.1858	
outsourcing.pca1	0.23737	0.16545	−1.435	0.1536	
outsourcing.pca2	1.06530	0.57434	−1.855	0.0657	
outsourcing.pca3	0.37205	0.68967	−0.539	0.5904	
outsourcing.pca4	0.11237	0.68603	−0.164	0.8701	
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1 Residual standard error: 8.181 on 140 degrees of freedom Multiple *R*-squared: 0.6873, Adjusted *R*-squared: 0.6717 *F*-statistic: 43.96 on 7 and 140 DF, *p*-value: < $2.2e^{-16}$					

TABLE III
ITEMS FACTORED INTO ROTATED COMPONENT MATRIX[A]

	Component			
	F1	**F2**	**F3**	**F4**
C5 Financial risks shared with outsourced vendor	**0.551**	0.198	0.280	0.461
C7 Allows firms to be more flexible, dynamic, and adaptable	0.277	0.243	0.146	**0.807**
C8 Redirection of resources	0.185	0.359	0.304	**0.770**
C9 Increased control of operating costs	0.404	0.163	0.399	**0.566**
C10 Increased availability of capital fund	**0.628**	0.468	0.305	0.194
C11 Cash infusion from sale of assets to outsourcers	**0.658**	0.445	0.319	0.046
C15 Improving customer satisfaction	**0.618**	0.443	0.090	0.225
C17 Higher resistance from employees – lower employee morale, potential for poor quality	0.282	**0.710**	0.395	0.254
C19 Relationship management with supplier	0.485	**0.685**	0.093	0.377
C20 Risks during transition	0.315	**0.774**	0.225	0.320
C22 Faster deployment cycle for software/quick time to market	**0.618**	0.353	0.178	0.372
C23 Global scale	**0.703**	0.387	0.197	0.209
C24 24-hour support and availability	**0.777**	0.251	0.275	0.233
C25 Improved quality of service	**0.721**	0.135	0.091	0.428
C26 Lack of experience in-house	0.182	0.221	**0.815**	0.268
C27 Offered services that otherwise could not subscribed	0.519	0.260	**0.635**	0.237
C28 Rapid change in business process cycle	**0.684**	0.205	0.427	0.301
C29 Shrinkage in system life cycle	0.633	0.238	**0.491**	0.239
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.				
Factor 1: Benefits of Outsourcing Factor 2: Risk of Outsourcing Factor 3: Administrative Motivation for the Outsourcing Factor 4: Desired Characteristics of Outsourcing				
[A] Rotation converged in 9 iterations.				

Based on the above analyses, it can be inferred that future trends (in 2021) in the allocation of IT budget in IT outsourcing/offshoring have significant association with the present (in 2016) allocation of budget in IT outsourcing/offshoring. Furthermore, the future trends (in 2021) in the allocation of IT budget in outsourcing/offshoring have also significant association with the components (PCA2), which were identified in the principle component analysis. Considering this aspect of lower sample size, we intend to further explore the usability of these methods for our future studies where we may have a higher sample size. We continued our analysis in Part B with exploratory factor analysis and confirmatory factor analysis (CFA) using a principle component analysis extraction method with varimax rotation for development of the model to prove the formulated hypotheses.

2. Stage 3. Part B. Exploratory Factor Analysis

In order to determine the number of factors for each construct, an eigenvalue greater than one rule is recommended for established instruments [30]. For an exploratory analysis, the selection of the number of factors is determined using both the underlying theory (to develop the instrument) and empirical results [31]. Four factors were used for a factor analysis to test the theory-based proposed model. Loadings greater than 0.40 in absolute value are suggested as the criterion for significant factor loadings [32] and all items loaded in excess of 0.4 (Table III). The items employed in this study to assess factors influencing the trend in IT outsourcing were 29 items of all samples in the manufacturing and service sectors of the United States. A principal component factor analysis with varimax rotation of the evaluation scale was conducted using 148 valid responses collected. Factor analysis can allow obtaining an accurate solution with a sample size of 150 observations or more if intercorrelations are reasonably strong [33] so that the sample size is considered adequate. The questionnaire items were generally loaded under the variables they sought to measure (Table III). In some cases, items are loaded on a different construct from the one hypothesized by this research review of this paper. If the item had more than a 0.2 difference, it was used to measure the construct it loaded on the highest. Some items loaded on more than one factor, but every item loaded on at least one factor at a significant level.

Eighteen data items were finalised for measuring four variables: (1) benefits of outsourcing, (2) risk of outsourcing, (3) administrative motivation for outsourcing, and (4) desired characteristics of outsourcing. The remaining 11 of the 29 items measured not shown in Table III are: C1 Cost differential; C2 Improving business focus by keeping a leaner business model; C3 Access to world-class capabilities, including 24/7 services; C4 Accelerated reengineering benefits; C6 Shortage of information technology professionals; C12 Lack of internal resources; C13 Management of problematic and complex IT function; C14 Cost of failure; C16 Misuse of shared organisation's knowledge by vendors against company's interest; C18 Potential breach of security; and C21 Job losses.

The summary of each construct factor loadings is presented in Table IV. "Benefits of Outsourcing" explained most of the scale variance. As shown in Table III, data item C29 (Shrinkage in system life cycle) loaded higher on benefits (Factor 1) but its value was above 0.4 on Administrative Motivation (Factor 3), and the data item was logically a better fit on Factor 3; therefore, it was listed against that.

Cronbach's alpha was used to estimate the reliability of a scale shown in Table IV. An increase in the correlation between items results in an increase in the value of Cronbach's alpha. All four factors, both for manufacturing and service sectors, had alpha reliabilities within the traditionally acceptable range of above 0.70 [34]. Therefore, the exploratory factor analysis and reliability provide confidence in proceeding with a confirmatory factor analysis. A maximum likelihood confirmatory factor analysis was conducted to evaluate the 4-factor model's goodness of fit. A value below 0.90 for Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) rejects the hypothesis that the model is a good fit [35]. Both the CFI and the TLI values were above 0.90, with CFI of 0.923 and TLI of 0.908. These values and the high reliability values of each construct lead to the conclusion that the 4-factor loadings are acceptable.

TABLE IV
FACTORS WITH MEASURING ITEMS IN THE FOUR-FACTOR MODEL

			Cronbach's Alpha	
Factor	**Item code**	**% of Variance**	**Manufacturing Sector**	**Service Sector**
Benefits of Outsourcing	C5, C10, C11, C15, C22, C23, C24, C25, C28	61.950	0.948	0.932
Risk of Outsourcing	C17, C19, C20	5.456	0.924	0.863
Administrative Motivation for Outsourcing	C26, C27, C29	4.483	0.864	0.827
Desired Characteristics of Outsourcing	C7, C8, C9	4.038	0.883	0.821

Figure 1 illustrates the conceptual model regarding the contributing factors to the growth of IT outsourcing: "benefits of outsourcing", "risk of outsourcing", "desired characteristics of outsourcing", and "administrative motivation".

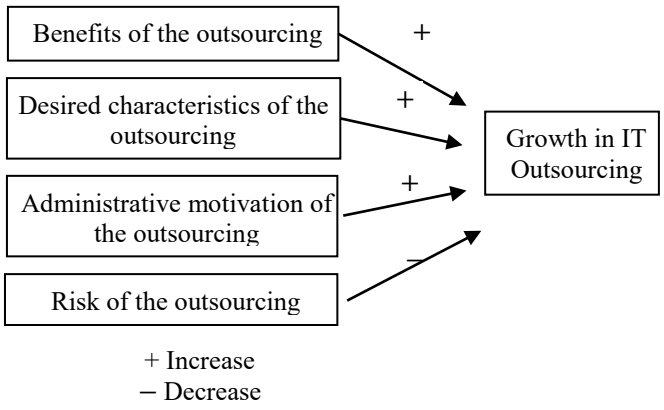

Fig. 1. Conceptual model – Trends in IT outsourcing/ and factors contributing to the trends.

IV. RESULTS AND DISCUSSION

The complete analysis was performed using SPSS Version 23.0, the data/variables were computed separately for manufacturing and service sectors, for descriptive statistics including ranking of data items/variables, and growth in the trends of allocation of IT budget in IT outsourcing. Furthermore, the computation was extended to perform a stepwise regression analysis in order to assess the four identified factors for testing the hypotheses.

A. Item and Factor Influence on Trends in IT Outsourcing

Respondents ranked the contribution of each item to their overall decision from 1 (None) to 7 (Very High). Since higher numbers are associated with a stronger preference; we ranked items based on means and counting occurrence of data. Table V shows the mean of each item sorted in descending order of preference for calculation of ranking. The data show the high perceived importance for all items; in particular, the mean varies from 4.38 to 5.1 in the manufacturing sector, while 4.58 to 5.18 in the service sector.

On the one hand, this result confirms the validity that these items are considered contributors to the adoption decision; on the other hand, their low variability in terms of central tendency prevents us from focusing on a smaller set of items (say, the top 10 contributors). Further examination of item description did not provide unambiguous groupings of closely ranked items. (Refer to Table III for item description.) As a result, we focus more on the item correlation via an exploratory factor analysis to better classify items.

When examining measuring data items only, the top three ranked items for the manufacturing sector are: C9 Increased control of operating costs; C7 Allows firms to be more flexible, dynamic, and adaptable; and C20 Risks during transition. Meanwhile, in the service sector the top three ranked data items are: C15 To improve customer satisfaction; C22 Faster deployment cycle for software/quick time to market, and C25 Improved quality of service.

The descriptive statistics for factors hypothesised to influence the trends in IT outsourcing are tabulated in Table VI. In the case of trends in IT outsourcing, the respondents ranked in the manufacturing sector the influencing variables with mean values above 4.7 (slightly high) according to a seven-point scale. However, in the service sector the respondents ranked influencing variables with a mean value little higher than 4.85.

TABLE V
ITEM INFLUENCE ON IT OUTSOURCING BUDGET ALLOCATION

	Manufacturing		**Service**	
Measuring data items	**Mean**	**Ranking**	**Mean**	**Ranking**
C9	5.140	1	5.160	4
C7	4.990	2	5.050	7
C20	4.900	3	4.970	11
C10	4.890	4	4.940	12
C15	4.870	5	5.320	1
C24	4.850	6	5.010	9
C22	4.820	7	5.190	2
C8	4.790	8	5.030	8
C5	4.770	9	5.140	5
C23	4.760	10	4.740	17
C25	4.760	11	5.180	3
C26	4.750	12	4.680	18
C28	4.730	13	5.060	6
C19	4.700	14	5.000	10
C27	4.690	15	4.860	14
C11	4.650	16	4.820	15
C29	4.650	17	4.940	13
C17	4.540	18	4.770	16

Desired Characteristics of Outsourcing were ranked first in the manufacturing and service sectors. The standard deviations range between 1.1 and 1.5 in both the manufacturing and service sectors, which seems very normal for a seven-point scale. Skewness is a measure of symmetry, or more precisely, the lack of symmetry. A distribution, or data set, is symmetric if it looks the same to the left and right of the centre point. Kurtosis is a measure of whether the data are heavy-tailed or light-tailed relative to normal distribution. The skewness for a normal distribution is zero, and any symmetric data should have skewness near zero. Negative values for the skewness indicate data that are skewed left and positive values for the skewness indicate data that are skewed right. By skewed left, we mean that the left tail is long relative to the right tail. Similarly,

skewed right means that the right tail is long relative to the left tail.

B. Regression Analysis of Major Hypotheses and Contributing Factors to Support the Trends in Usage of IT Outsourcing

As stated in [23], in 2016, in the manufacturing sector, the average IT budget allocation was as follows: 40 % in-house development, 18 % outsourcing, 25 % cloud computing and 16 % Application Service Providers (ASPs); whereas in the service sector allocation in 2016 was distributed as follows: 36 % in-house development, 19 % outsourcing, 25 % cloud computing, and 18 % ASPs. In both the manufacturing and service sectors, the outsourcing budget allocation was perceived to decrease slightly (0.31 % for manufacturing and 1.31 % for the service sector) by 2021 [23].

Regression analysis was employed to predict the change in usage of IT outsourcing and the expected budget allocation in 2021 for IT outsourcing using the four factors as predictors: Benefits of Outsourcing, Risk of Outsourcing, Administrative Motivation for Outsourcing, and Desired Characteristics of Outsourcing. Tables VII and VIII show the analysis for the manufacturing sector and Tables IX and X for the service sector.

In Table VII, the Model 1 *F*-statistic change is not significant, having $p <= 0.394$, which reveals that the model fit is reasonably not good, and taken together, the factors are not significantly related to the expected change in IT outsourcing budget allocation. In Model 2 (Table VII), the *F*-value change is statistically significant having $p <= 0.051$, which reveals that in the case of manufacturing sector, the factors are significantly related with the expected budget for IT outsourcing in five years.

When the regression is conducted, an *R*-squared (coefficient of determination) is presented. This value is the multivariate equivalent of the bivariate correlation coefficient. The *R*-squared answers the question, of all of the reasons why the outcome variable can vary, what percent of those reasons can be accounted for by the predictor(s) variables. The value of *R*-squared for Model 1 in Table VII is 5.9 % and for Model 2 is 5.4 %.

TABLE VI
FACTOR INFLUENCE ON IT OUTSOURCING BUDGET ALLOCATION

	N	Min	Max	Mean	Ranking	Std. Dev	Skew ness	Std. Error	Kurto-sis	Std. Error
Manufacturing Sector										
Benefits of Outsourcing	71	1.000	6.667	4.789	2	1.384	−1.399	0.285	1.641	0.563
Risk of Outsourcing	71	1.000	7.000	4.722	3	1.454	−0.909	0.285	0.368	0.563
Administrative Motivation for Outsourcing	71	1.000	7.000	4.695	4	1.487	−0.915	0.285	0.343	0.563
Desired Characteristics of Outsourcing	71	1.000	7.000	4.972	1	1.346	−1.031	0.285	1.633	0.563
Service Sector										
Benefits of Outsourcing	77	1.000	7.000	5.046	2	1.174	−0.825	0.274	1.176	0.541
Risk of Outsourcing	77	1.000	7.000	4.854	3	1.326	−0.597	0.274	0.341	0.541
Administrative Motivation for Outsourcing	77	1.000	7.000	4.823	4	1.399	−0.712	0.274	0.426	0.541
Desired Characteristics of Outsourcing	77	1.000	7.000	5.078	1	1.205	−0.777	0.274	0.791	0.541

TABLE VII
REGRESSION ANALYSIS OF ASSOCIATION BETWEEN MANUFACTURING SECTOR BUDGET ALLOCATION AND IT OUTSOURCING

Model Summary[b]										
Model	***R***	***R* Square**	**Adjusted *R* Square**	**Std. Error of the Estimate**	**Change Statistics**					**Durbin-Watson**
					***R* Square Change**	***F* Change**	df_1	df_2	**Sig. *F* Change**	
1	0.243[a]	0.059	0.002	6.856	0.059	1.039	4	66	0.394	1.788
2	0.232[a]	0.054	0.040	15.870	0.054	3.931	1	69	0.051	2.076
Model 1: Dependent Variable: Expected change in the budget for IT outsourcing over 5 years										
Model 2: Dependent Variable: Expected budget allocation for IT outsourcing in 2021										
a. Predictors: (Constant), Benefits of Outsourcing, Risks involved in Outsourcing, Administrative Motivations for Outsourcing, Desired Characteristics of Outsourcing										

These are fairly low. In some cases, it is possible that additional predictors can increase the true explanatory power of the model. However, in other cases, the data contain an inherently higher amount of unexplainable variability. For example, many psychology studies have *R*-squared values less than 50 % because people are fairly unpredictable. The good news is that even when *R*-squared is low, low *P* values still indicate a real relationship between the significant predictors and the response variable.

In Table VIII, the model fit is reasonably good in case of manufacturing sector and the factor "Desired Characteristics of IT Outsourcing" is significantly positively related with the expected change in IT outsourcing having *t*-test statistics value of $p <= 0.051$.

TABLE VIII
REGRESSION ANALYSIS OF ASSOCIATION BETWEEN MANUFACTURING SECTOR CHANGE IN BUDGET ALLOCATION IN IT OUTSOURCING AND IT OUTSOURCING CHARACTERISTICS

Coefficients[a]										
Model	**Unstandardized Coefficients**		**Standardized Coefficients**	***t***	**Sig.**		**Sum of Squares**	***df***	***F***	**Sig.**
	B	**Std. Error**	**Beta**							
(Constant)	4.617	7.255		0.636	0.522	Regression	989.983	1	3.931	0.051
						Residual	17 377.763	69		
Desired Characteristics of Outsourcing/Offshoring	2.794	1.409	0.232	1.983	0.051	Total	18 367.746	70		
Dependent Variable: Expected change in the budget for IT outsourcing over 5 years										

TABLE IX
REGRESSION ANALYSIS OF ASSOCIATION BETWEEN SERVICE SECTOR BUDGET ALLOCATION AND IT OUTSOURCING

Model Summary[b]										
Model	***R***	***R* Square**	**Adjusted *R* Square**	**Std. Error of the Estimate**	**Change Statistics**					**Durbin-Watson**
					***R* Square Change**	***F* Change**	df_1	df_2	**Sig. *F* Change**	
1	0.244[a]	0.060	0.034	10.038	0.060	2.344	2	74	0.103	1.942
2	0.319[a]	0.102	0.090	11.782	0.102	8.508	1	75	0.005	2.167
Model 1: Dependent Variable: Expected change in budget for IT outsourcing over 5 years										
Model 2: Dependent Variable: Expected budget allocation for IT outsourcing in 2021										
a. Predictors: (Constant), Administrative Motivation for IT Outsourcing/Offshoring										

TABLE X
REGRESSION ANALYSIS COEFFICIENTS FOR ASSOCIATION BETWEEN THE SERVICE SECTOR AND IT OUTSOURCING

Coefficients[a]											
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	***t***	**Sig.**		**Sum of Squares**	***df***	***F***	**Sig.**
		B	**Std. Error**	**Beta**							
1	(Constant)	−0.389	5.139		−0.757	0.451	Regression	472.366	2	2.344	0.103
	Benefits of Outsourcing/Offshoring	2.929	1.442	0.337	2.032	0.046	Residual	7455.764	74		
	Risk of Outsourcing/Offshoring	−2.481	1.241	−0.331	−1.998	0.049	Total	7928.130	76		
2	(Constant)	4.648	4.848		0.959	0.341	Regression	1180.970	1	8.508	0.005
							Residual	10410.822	75		
	Administrative Motivation for the Outsourcing/Offshoring	2.817	0.966	0.319	2.917	0.005	Total	11591.792	76		
Dependent Variable: Expected change in the budget for IT outsourcing over 5 years											
Dependent Variable: Expected budget allocation for IT outsourcing in 2021											

In Table IX, the Model 1 *F*-statistic change is close to significant, having $p <= 0.103$, which reveals that the model fit is reasonably good, and taken together, the factors are significantly related to the expected change in IT outsourcing budget allocation for the service sector. In Model 2 (Table IX), the *F*-value change is statistically significant having $p <= 0.005$, which reveals that in the case of service sector, the factors are significantly related with the expected budget for IT outsourcing in five years. The R^2 values are both fairly low; 6.0 % in Model 1 and 9.0 % in Model 2 of Table IX.

In Table X, Model 1 fit is reasonably good in the case of service sector; and the factors – Benefits of Outsourcing/Offshoring, and Risk of Outsourcing/Offshoring – are significantly related with the expected change in IT outsourcing, having *t*-test statistics value of $p <= 0.05$. In Model 2 (Table X), the *F*-statistics is significant having $p <= 0.005$, which reveals that the model fit is reasonably good in the case of service sector; and the factor "Administrative Motivation for Outsourcing" is significantly positively related

with the percentage of IT outsourcing budget in 2021, having *t*-test statistics value of $p <= 0.005$.

Based on the results of Model 2 and discussion of the results of principle component analysis (section III.A.1), it is safe to infer that for the manufacturing sector, the hypothesis on desired characteristics H4 and for the service sector, the hypothesis H3 on administrative motivation are supported by the data.

C. Implications of IT Budget Allocation

This study has demonstrated that organisations are currently, and after five years will be meeting the needs of IT resources by investing approximately the same percentage of IT budget in IT outsourcing. The approximately same usage of IT outsourcing in organisations indicates that organisations are happy with this option, but also look for some alternate avenues such as cloud computing and ASPs for higher benefits to them. In addition, for applications where 18–19 % of IT budget is allocated to IT outsourcing, relatively few IT professionals having skills in business processes are needed for implementation of readily supported IT applications. Further, end user training requirements are to be met by IT professionals when the need arises. For remaining IT applications where 81–82 % of IT budget is allocated, either IT department does in-house or gets the same from ASPs or vendors in cloud computing. At the strategic level, senior-level IT professionals are needed for formulating IT strategy and advising to organisations the necessary IT architecture to meet changing needs of the functional departments.

The current and future trends in the requirements of IT outsourcing will affect the curriculum of educational institutions. The IT curriculum must be redesigned equally to cater to the development and implementation needs of IT resources.

The organisations will rely on in-house IT department and on outsourcers, application service providers, and cloud computing. The vendor development and management are expected to be a vital function in the manufacturing and service sectors. Faster rate of obsolescence in technology will warrant time-to-time consultations for in-house IT professionals with external professionals in the field.

From the above, it can be argued that the current and future trends of usage of IT outsourcing projected have far reaching implications for organisations and educational institutions. Consequently, it will influence the government policies and tax structure. Lastly, it can be argued that this trend may lead to a new era pertaining to management of IT resources. This in-turn will open up tremendous opportunities for research.

V. CONCLUSION

The main objective of this study was to arrive at a better understanding of the current and future trends in the usage of IT outsourcing and its implications for organisations in the United States. The perceived usage of approximately same percentage (in 2016 and 5 years from 2016) of allocation of IT budget in this option leads us to believe that IT outsourcing is not as much a source of competitive advantage as it was in the past.

Based on the regression analysis, there are positively contributing factors (benefits of outsourcing) and negatively contributing ones (risks of outsourcing) to the change in IT outsourcing budget allocation, which lead us to believe that organisations are motivated to use IT outsourcing to reduce the time and cost with moderate risks, and they have been getting good quality with adequate support from outsourcing vendors. These facilities are available abundantly at lower costs maintaining the quality service with outsourcing vendor because of their economies of scale. The characteristics of IT outsourcing include higher flexibility for the organisations in usage of variety of IT resources, bringing quickly IT applications to the market, etc. to gain competitive advantages. The data in general support our model. The positive association with the benefits along with the negative association with risks justifies our claim that organisations are satisfied with the performance of outsourcing vendors and look aggressively to cut down costs of IT resources to maintain competitive edge in the industry.

As with any other study, the present research also has several limitations that need to be discussed. First, the list of variables pertaining to IT related issues might reflect some biases. Although the literature was thoroughly reviewed and additional perspectives were obtained from IS academicians and managers, it was not claimed that these were the only variables that could be included. The loading of an item on more than one construct can be due to high intercorrelations of the factors, the accidental inclusion of an unidentified factor, or the absence of a factor that could result in item loading cleaner when the questionnaire is refined. An instrument may need several administrations before its construct validity can be ensured.

Thus, it must be stressed that any interpretation of the findings must be made in lieu of the selected set of variables, issues, and categories. The questionnaire survey involved people from various departments such as information systems, administration, accounting/finance, production, etc. A balance among the number of respondents from each department could not be achieved.

This study provides several opportunities for future research. The results suggest that it might be useful to develop several comprehensive models. Thus, future research can extend this study to include additional factors (such as organisational maturity, IS sophistication, etc.) to test the impact of such factors. Future research may also employ more rigorous methodologies using longitudinal approaches and non-linear relationships. The need for further refinement of the survey is also a priority. While the current survey items were able to help advance this exploratory research, the number of items that cross-loaded could be a concern. Further, with a broader sample and number of variables, a more generalised model can be developed. A comparative study of U.S. organisations with their counterparts in other nations would be helpful. In addition, a study on IT related issues in other industries in the United States (i.e., airlines manufacturing, railway, chemicals, airlines operations, etc.) could provide more generalisation of results.

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