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INFORMATION TECHNOLOGY PROJECT SUCCESS IN SAUDI ARABIAN PUBLIC ORGANISATIONS: CHIEF INFORMATION OFFICERS' PERCEPTIONS

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Abstract

Several scholars have examined the high rate of IT projects failures in order to identify the critical success factors (CSFs) that impact the IT project success. This paper is the last part of an ongoing research, and its aim is to investigate the impact of CSFs on IT projects success within Saudi Arabian public organisations by surveying 73 CIOs. This has been achieved by testing the proposed framework from the authors' previous work. The study findings revealed that project management and top management support factors are the only factors that have a significant effect on the project success criteria. Moreover, the research model with organisational culture as a moderator explains a substantial variance (79.3%) in the project success criteria.

Keywords: Project success criteria; CSFs; barriers; CIOs; public organisations; Saudi Arabia;

INTRODCUTION

Information Technology's (IT) role is crucial for any organisation to work more efficiently in order to improve its performance. The organisation goals and objectives can be achieved by utilising IT properly through the successful implementation of IT projects.

Most of the research related to project success has concentrated on project management success constraints which are called the golden triangle (on time, within budget, and according to specifications). However, there are many factors which could have an impact on the project success, and these factors are called the CSFs.

This paper is organized as follows. We first review the research background. Secondly, the research methodology is presented to clarify the construct operationalization and data collection procedure, followed by the section of data analysis results and hypotheses testing. Then, the discussion of the findings are presented. Finally, conclusions and implications for future research are highlighted.

RESEARCH BACKGROUND

The research project consists of two phases (exploratory and explanatory). The exploratory phase has been published in three papers and concluded by developing the research conceptual framework, and the explanatory phase will be testing the proposed framework in the current paper.

During the construction of the conceptual framework, the researchers carried out the following process. The exploratory phase, using a literature review, semi-structured interview [1], and questionnaire survey [2], assisted to develop the research conceptual framework [3]. The content of the framework consists of three essential components. The first

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component of the research conceptual framework is the project success criteria (dependent variable). The second component of the research framework is the organisational culture (moderator). The last component is to identify the CSFs (independent variables) that may have an influence on the project success.

The research conceptual framework was carefully assessed in order to test it; this involved the assessment of measurement as well as structural models. While the measurement model was concerned with reliability and validity evaluation, the structural models involved testing the research models and hypotheses related to project success.

RESEARCH METHODOLOGY

The population of the study is the CIOs in Saudi Arabian public organizations. A survey questionnaire was used for collecting data. The items developed for measuring the CSFs, organisational culture and project success criteria were collected from different resources [4-11]. The European foundation for quality management (EFQM) material has been used in the survey since it is a suitable input for the development of questionnaires [12]. The researchers measured each of the indicators using a five-point Likert-type scale with anchors ranging from 'strongly disagree' to 'strongly agree'.

The questionnaire was divided into four sections as follows: Section one sought to gather information about the characteristics of the respondents and their background such as nationality, gender, and age. Section two contained questions about the organisational characteristics such as organisation's category and organisation size. Section three covered the project success criteria (PS). Section four covered the organisational culture (OC) and the CSFs which are: top management support and commitment (TMS), strategic planning (SP), communication management (CM), project management (PM), project team competency (PTC), stakeholders' management (SHM), partners' and suppliers' management (PSM), and training and education (TE).

After the questionnaire had been developed, it was sent to six IT experts (two CIOs, one IT professional, one IT consultant, and two IT assistant professors) to participate in the pilot study. They were asked whether: 1) the items were stated in a shared vocabulary; and 2) the items were precise and unambiguous. They could answer these questions and provide suggestions for additional items. The participants returned the questionnaires with their comments. Based on their responses and in order to improve the clarity of the instrument, certain adjustments were incorporated into the final version of the questionnaire such as the length and the clarity of each question. The content validity of the instrument was thereby addressed.

The web link of the improved questionnaires, together with a covering letter explaining the purpose of the survey, were emailed to the target people. A general invitation was sent to all the CIOs in the public sector in Saudi Arabia (142 CIOs) directly or indirectly using email and the LinkedIn social network in order to maximise the response rate. The distribution took place during the period from 1st September 2013 to 30th December 2013. In the beginning, the response rate was low so the researcher had to start sending a personal invitation by name to each of the CIOs in order to gain more attention and increase the response level. Then later, on a weekly basis, a follow up email was sent to remind the respondents to complete the questionnaire and to solve any problems they may face, and clarify any ambiguity. The high response rate could be attributed to both the level of interest in the subject or the direct and personal/email approach used by the researchers. A total of 76 questionnaires were returned, of which 3 were spoilt, leaving 73 for the analysis (a response rate of 51.4%).

Following the data collection the responses were coded to enable them to be computer processed. The software package used for the analysis was SPSS 22.0 (statistical package for the social sciences) and SmartPLS 3.0.

DATA ANALYSIS AND FINDINGS

Part of the framework has been tested and published (Almajed and Mayhew, 2014b). The tested result of the framework will be presented in this section. It consists of two main assessments: the measurement model assessment, and the structural model assessment. For measurement analysis, the validity and reliability of the study constructs are examined quantitatively using the collected data. It starts by assessing the reliability of the research constructs using internal consistency reliability. Then, it continues by assessing the research constructs'

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validity using convergent validity and discriminant validity. Using these represented constructed concepts, the structural assessment is then addressed to examine the research conceptual framework. In the structural assessment, an inferential analysis is carried out to assess the research models and hypotheses.

EVALUATION OF THE MEASUREMENT MODEL

Measurement model estimation provides empirical measures of the relationships between the indicators and the constructs [13]. Measurement model estimation enables the researcher to evaluate the reliability and validity of the construct measures. The following will describe the tests undertaken to examine the constructs in this study, including internal consistency reliability (Cronbach's Alpha and composite reliability), and validity (convergent and discriminant).

INTERNAL CONSISTENCY RELIABILITY

The first criterion to be evaluated is typically construct reliability. Construct reliability tests the degree to which individual items used in a construct are consistent in their measurements [14]. Internal consistency reliability can be assessed using two measures (Cronbach's Alpha and composite reliability). Both Cronbach's Alpha and composite reliability varies between 0 and 1, with higher values indicating higher levels of reliability. Generally, both are interpreted in the same way where the values of 0.60 to 0.70 are acceptable in exploratory research, while in more advanced stages of research, values between 0.70 and 0.90 can be satisfactory [14]. Table 1 shows sufficient scores of Cronbach Alpha and composite reliability that exceeded .7 for all constructs. Thus, the researcher assumed sufficient levels of construct reliability.

Table 1: Construct reliability

Construct	Composite Reliability	Cronbachs Alpha
TMS	.934	.921
SP	.909	.882
CM	.913	.885
PTC	.897	.856
SHM	.875	.834
PM	.895	.859
PSM	.905	.880
TE	.951	.942
OC	.903	.880
PS	.862	.807

CONVERGENT VALIDITY

Convergent validity tests the degree to which items designed to load on the same construct do, in fact, load on that construct [15]. Convergent validity occurs when each measurement item correlates strongly with its assumed construct. Indicator loading values should exceed 0.7 on their constructs, meaning that more than 50% of the indicator's variance is caused by the construct [16]. Furthermore, the AVE should exceed 0.5; this value ensures that the explained variance is greater than the variance caused by a measurement error. Table 2 shows that all the quality criteria are fulfilled: indicator loadings exceeded 0.4, and AVE scores exceeded 0.5 for all constructs [16].

Table 2: Convergent validity test

Construct	Items	Factor Loadings	Average Variance Extracted
TMS	TMS1	.762***	.614
	TMS2	.732***	
	TMS3	.718***	
	TMS4	.772***	
	TMS5	.772***	
	TMS6	.747***	
	TMS7	.837***	
	TMS8	.830***	
	TMS9	.870***	
SP	SP1	.760***	.626
	SP2	.838***	
	SP3	.793***	
	SP4	.799***	
	SP5	.786***	
	SP6	.770***	
CM	CM1	.717***	.636
	CM2	.775***	
	CM3	.758***	
	CM4	.834***	
	CM5	.819***	
	CM6	.871***	
PM	PM1	.769***	.587
	PM2	.797***	
	PM3	.793***	
	PM4	.687***	
	PM5	.821***	
	PM6	.724***	
PTC	PTC1	.881***	.637
	PTC2	.772***	
	PTC3	.897***	
	PTC4	.719***	
	PTC5	.703***	
SHM	SHM1	.738***	.587
	SHM2	.643***	
	SHM3	.833***	
	SHM4	.729***	
	SHM5	.868***	

International Journal of Information Technology and Business Management
29th December 2015. Vol.44 No.1

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Construct	Items	Factor Loadings	Average Variance Extracted
PSM	PSM1	.696***	.543
	PSM2	.789***	
	PSM3	.798***	
	PSM4	.744***	
	PSM5	.735***	
	PSM6	.753***	
	PSM7	.671***	
	PSM8	.701***	
TE	TE1	.877***	.708
	TE2	.819***	
	TE3	.839***	
	TE4	.868***	
	TE5	.837***	
	TE6	.786***	
	TE7	.851***	
	TE8	.849***	
OC	OC1	.650***	.544
	OC2	.517***	
	OC3	.692***	
	OC4	.845***	
	OC5	.833***	
	OC6	.873***	
	OC7	.663***	
	OC8	.758***	
PS	PS1	.684***	.510
	PS2	.694***	
	PS3	.655***	
	PS4	.738***	
	PS5	.816***	
	PS6	.688***	

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

DISCRIMINANT VALIDITY

Discriminant validity tests the degree to which items measuring one construct relate exclusively to the construct and not to another [17]. Discriminant validity was assessed using the Fornell-Larcker criterion that required that the AVEs of the constructs should be greater than the square of the correlations among them.

Table 3 shows off-diagonal figures as correlations among constructs, while diagonal figures indicate the square root of the average variance extracted between the constructs and their measures. As can be seen, each construct's AVE exceeded the squared correlations of this construct with any other construct. Therefore, discriminant validity can be assumed.

Table 3: Discriminant validity test (Fornell-Larcker Method)

	TMS	SP	CM	PM	PTC	SHM	PSM	TE	OC	PS
TMS	**.784**									
SP	.615	**.791**								
CM	.560	.575	**.798**							
PM	.495	.628	.623	**.766**						
PTC	.474	.503	.633	.726	**.798**					
SHM	.479	.638	.655	.736	.694	**.766**				
PSM	.618	.503	.714	.639	.674	.636	**.737**			
TE	.498	.598	.632	.577	.660	.661	.682	**.841**		
OC	.571	.599	.608	.511	.443	.631	.533	.585	**.738**	
PS	.652	.532	.463	.563	.384	.367	.512	.293	.437	**.714**

EVALUATION OF THE STRUCTURAL MODEL

Assessment of the structural model provides empirical measures of the relationships between the constructs [13]. The assessment of the structural model examines the relationship between constructs as well as the model's predictive capabilities [18].

COLLINEARITY ASSESSMENT

The first step is to establish that the model does not have any collinearity issues. The reason for this is the path coefficients may be biased if the estimation involves significant levels of collinearity among the predictor constructs [13]. Tolerance and VIF values are used to assess collinearity. A VIF analysis was performed for each set of predictor constructs in the model (TMS, SP, CM, PM, PTC, SHM, PSM, TE). From Table 4 it can be seen that all VIFs were above 0.20 and well below 5.0, which indicates that the model does not exhibit collinearity problems [18].

Table 4: Collinearity statistics

Construct	Tolerance	VIF
TMS	0.455	2.197
CM	0.371	2.693
PTC	0.334	2.993
SHM	0.303	3.296
PSM	0.317	3.153
PM	0.325	3.074
SP	0.391	2.557
TE	0.373	2.68
OC	0.444	2.252

THE EFFECTS OF CSFS ON PROJECT SUCCESS CRITERIA

This section is designed to examine which of the CSFs had a significant effect on the dependent variable (project success criteria). The researcher commences with the null hypothesis that none of the CSFs has a statistical significance effect on the project success criteria. Also, the researcher commences with the null hypothesis that the moderator variable (organisational culture) has no

International Journal of Information Technology and Business Management
29th December 2015. Vol.44 No.1

ISSN 2304-0777 www.jitbm.com

statistical significance effect on the relationships between all the CSFs and project success criteria.

In order to obtain an estimate for the structural model relationships, the PLS-SEM algorithm procedure has been run with 73 cases (research sample size) on smart PLS version 3. Figure 1 displays the path coefficients and the *t* values for all the main relationships in the model.

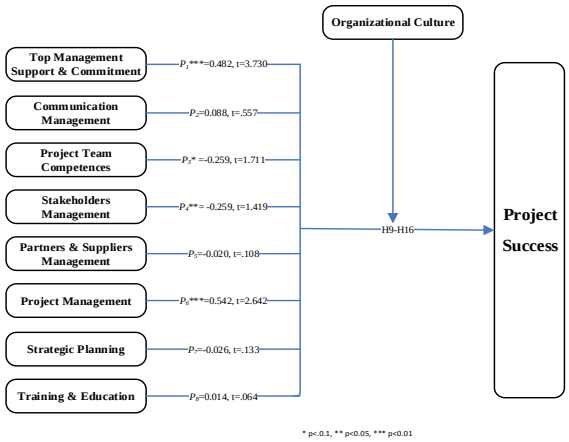

Figure 1: Research Conceptual Framework

In order to conduct the significance test of all the CSFs and the project success criteria, bootstrapping procedure has been run with 73 bootstrap cases (research sample size) and 5000 bootstrap subsamples as a minimum [19]. Table 5 displays the path coefficients, the t values, their significance levels, and p values for all the main relationships in the model.

Table 5: Structural model paths coeficients

	Path-*B*	*t* Value	*Sig. Levels*	*p* Value
TMS →PS	0.482	3.171	***	0.002
CM →PS	0.088	0.622	Not Sig.	0.535
PTC →PS	-0.259	1.509	Not Sig.	0.134
SHM →PS	-0.259	1.333	Not Sig.	0.186
PSM →PS	-0.02	0.097	Not Sig.	0.923
PM →PS	0.542	3.033	***	0.003
SP →PS	-0.026	0.194	Not Sig.	0.847
TE →PS	0.014	0.072	Not Sig.	0.943

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

It shows that there is a statistically significant positive effect between top management support and commitment and the project success criteria at the level of $p < 0.01$ and $t >= 2.58$. Top management support and commitment significantly contributes to explaining the project success criteria with a total effect of 0.482. Thus, the null hypothesis that top management support and commitment has no effect on the project success criteria can be rejected. The alternative hypothesis would be: top management support and commitment have a statistically significant effect on the project success criteria.

Furthermore, the results above shows that there is a statistically significant positive effect between project management and the project success criteria at the level of $p < 0.01$ and $t > =2.58$. Project management significantly contributes to explaining the project success criteria with total effect of 0.542. Therefore, the null hypothesis that project management has no effect on the project success criteria can be rejected. The alternative hypothesis would be: project management has a statistically significant effect on the project success criteria.

In contrast, all other CSFs (strategic planning, communication management, project team competency, stakeholders' management, partners' and suppliers' management, and training and education) have no statistical significance on the project success criteria, and they do not contribute to explaining the project success criteria. Therefore, the null hypotheses that strategic planning, communication management, project team competency, stakeholders' management, partners' and suppliers' management, and training and education have no effect on the project success criteria cannot be rejected.

THE EFFECTS OF MODERATING VARIABLE (ORGANISATIONAL CULTURE)

In order to conduct the significance test of the moderating variable (organisational culture) on the relationship between all the CSFs and the project success criteria, the PLS-SEM bootstrapping procedure has been run with 73 bootstrap cases (research sample size) and 5000 bootstrap subsamples as a minimum [19]. Table 6 displays the path coefficients, the t values, their significance levels, and p values for the moderation effect on all

International Journal of Information Technology and Business Management
29th December 2015. Vol.44 No.1

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the relationships between the CSFs and the project success criteria.

The results from the table above show that the interaction effect of organisational culture on the relationships between the CSFs and the project success criteria are not statically significant as the t values are less than 1.65 and the p values are greater than 0.1.

Therefore, the null hypotheses that the moderator variable (organisational culture) has no statistical significance effect on the relationships between the CSFs and the project success criteria cannot be rejected. However, even though there is no significant interaction effects of the moderator variable on all the relationships in the model, the coefficient of determination (R2 value) has been affected positively as presented in the following section.

Table 6: Summary results of the moderator effects

	Path-*B*	*t* Value	*p* Values
TMS * OC →PS	0.28	0.743	0.459
CM * OC →PS	0.002	0.005	0.996
PTC * OC →PS	-0.128	0.300	0.765
SHM * OC →PS	-0.443	0.824	0.412
PSM * OC →PS	0.218	0.406	0.685
PM * OC →PS	0.525	0.935	0.352
SP * OC →PS	0.157	0.452	0.459
TE * OC →PS	-0.103	0.347	0.996

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

COEFFICIENT OF DETERMINATION (R^2)

The most commonly used measure to evaluate the structural model is the coefficient of determination (R^2). This coefficient is a measure of the model's predictive accuracy and is calculated as the squared correlation between a specific endogenous construct's actual and predicted values. The R^2 value ranges from 0 to 1 with higher levels indicating higher levels of predictive accuracy. In scholarly research that focuses on marketing issues, R^2 values of 0.75, 0.50, or 0.25 for endogenous latent variables can be respectively described as substantial, moderate, or weak [19, 20].

In order to estimate the coefficient of determination (R^2 value), the PLS-SEM algorithm procedure has been run with 73 cases. The coefficient of determination (R^2 value) is 0.581 when no moderating variable is taken into account. This value increases slightly to 0.587 when organisational culture is considered in the model as an independent variable and to 0.793 when organisational culture is considered to moderate the interaction terms. The increased R^2 indicates that organisational culture is a moderator in the proposed model. The research model with organisational culture as a moderator explains 79.3% of the variance in the project success (R^2 = 0.793). The value for R^2 can be considered substantial [13]. Thus, the model constructs exhibited a sufficient level of predictive validity.

DISCUSSION OF RESEARCH FINDINGS

This section discusses the interpretations of the study findings. In particular, the researcher intends to link the findings of the survey with prior research conducted in the field of project success, as well as with the findings of the exploratory investigations [1, 2].

The research results shows that the top management support and project management are the most significant factors with regards to the project success criteria as shown in Figure 2. The following subsections will discuss the key findings.

Project Management

Project management has become a key activity in most modern organisations [21], and is crucial for success. Since IT projects are challenging, costly, and risky, in order to achieve their desired benefits, the implementation of IT projects must be carefully managed and monitored. Consequently, project management is a methodology and practice that is expected to play a critical role in any project in general, and in IT projects in particular, for any organisation. Project management provides the single point of integrative responsibility needed for everything on the project to be managed effectively, and to ensure that a successful project is deliverable. Therefore, project management deals with various aspects of the project, such as planning, organisation, information system acquisition, personnel selection, and management and monitoring the IT project implementation. Project management is an important success factor in the literature review [5, 6, 22-28].

International Journal of Information Technology and Business Management
29th December 2015. Vol.44 No.1

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The outcome of the interviews in the exploratory study part I (Almajed and Mayhew, 2013a) was consistent with the studies in the literature review, where most of the interviewed CIOs (80%) agreed that project management is important as a success factor. In the exploratory study part II (Almajed and Mayhew, 2013b), the factors were listed in a questionnaire to be ranked based on the importance of the participants' point of view. The outcomes of the questionnaire confirm that project management is very important, as it was ranked second in the list. Therefore, project management was considered to be part of the research conceptual framework (Almajed and Mayhew, 2015) in order to test its impact on project success criteria.

In the explanatory phase, the main findings of the survey results show that project management is a critical success factor, and it has the highest impact on the project success criteria. This result is consistent with Nah, et al. [5] and Dezdar and Ainin [6]. Also this finding supports the results of previous research [29-31].

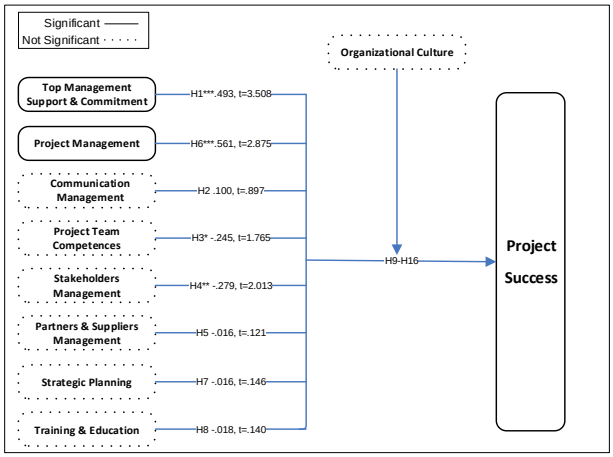

Figure 2: Research Framework

As a result, project management is seen as essential for success, and the following tasks should be considered carefully in each IT project: the scope should be clearly established; a detailed project plan with measurable results should be provided; the responsibility for all parts should be assigned; the activities across all affected parties should be coordinated properly; a formal management process should exist in order to monitor suppliers' activities; and project progress should be reviewed on a periodic basis. As discussed above, adopting a proper project management standard and methodology is expected to increase the success of IT projects in public organisations in Saudi Arabia.

Top Management Support and Commitment

Top management support and commitment has been highlighted as a key factor in IT project success by many researchers. Thus, there was an agreement between the researchers on the significant role of top management support in IT project success [32]. This is because IT projects are large-scale and have an effect on a number of people and departments in any organisation. Consequently, this kind of project requires a lot of resources and should receive support and commitment from top management prior to its implementation. Top management sponsorship, championship, support, and participation are critical for IT project success, and public, explicit, and direct support for the project implementation must be present to emphasise the priority of the IT project [5]. Top managers should mediate between different stakeholders in order to resolve any potential conflict [6]. Hence, top management support and commitment is a significant success factor in the literature review [6, 23, 33-37].

The outcome of the interviews in the exploratory study part I (Almajed and Mayhew, 2013a) was consistent with the studies in the literature review where all of the interviewed CIOs (100%) agreed that top management support and commitment is an important success factor. In the exploratory study part II (Almajed and Mayhew, 2013b), the factors were listed in a questionnaire to be ranked based on their importance in the participants' point of view. The outcome of the questionnaire shows and confirms that top management support and commitment was very important as it was the top of the list. Therefore, top management support and commitment is considered to be part of the research conceptual framework (Almajed and Mayhew, 2015) in order to test its impact on the success criteria.

In the explanatory phase, the main findings of the survey results show that top management support and commitment is a critical success factor; it has the second highest impact on the project success criteria. This result is consistent with many previous studies such as Dezdar and Ainin [6], Kamhawi [31] and Al-Mashari, et al. [29], but it contradicts the results of previous research which has been conducted by Nah,

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et al. [5] where top management support was shown to have no impact on the project success criteria. The unexpected results by Nah, et al. [5] have been explained from two sides based on previous studies. One explanation is that top management support was a far more critical factor for small- and medium-sized organisations than for large multinationals [38], and the other explanation is that top management support may be more critical for IT project implementation in developed rather than developing countries [39].

As a result, it can be confirmed that top management support is vital for success, where the following roles should be deliberated carefully by top management during the IT project's implementation: sufficient incentive and commitment should be provided; IT projects should be viewed as a strategic decision; IT projects should be actively supported and treated as a critical priority; top management encouragement and participation should exist; sufficient budget and resources should be allocated, and the suitable environment for IT projects to succeed should be created. As discussed above, assuming proper top management support and commitment is expected to increase the success of IT projects in public organisations in Saudi Arabia

Organisational Culture (The Moderator)

In the explanatory phase, testing the research model using the organisational culture as an independent variable shows that the organisational culture does not have a significant impact on project success criteria, and the coefficient of determination (R^2) of the project success criteria increased slightly from 0.580 to 0.587. This result is consistent with Nah et al. (2007); when organisational culture was included as independent variable in their research model, they found that the coefficient of determination (R^2) of the endogenous variable increased slightly.

A surprising finding of the survey results shows that organisational culture as a moderator does not have a significant impact on any of the relationships between the CSFs and project success criteria. However, the coefficient of determination (R^2) of the project success criteria increased from 0.587 when the organisational culture was included in the research conceptual framework as a success factor, to 0.793 when it was incorporated in to the model as a moderator.

The results can be analysed from two perspectives: first, the individual relationships between organisational culture and the CSFs are not significant; Although some correlations exist, this result is not consistent with Nah, et al. [5], Dezdar and Ainin [6], and Annamalai and Ramayah [40] where these studies have found that organisational culture as a moderator had a significant impact on the relationships between CSFs and project success criteria. Second, the collective relationships between all the CSFs and organisational culture show a significant impact on the prediction of the project success criteria which further increases R^2 from 0.587 to 0.793 which is consistent with Nah, et al. [5]; when organisational culture was included in their research model as a moderator, they found that the coefficient of determination (R^2) of the endogenous variable increased considerably. This suggests that by including organisational culture in the model as a moderator, the variations in project success criteria caused by organisational culture is 20.6%. Another possible explanation for this result is that the CIOs have not mentioned or have neglected organisational culture during the interviews in the exploratory and validation studies where they could add it as an important player in the project success; as these studies are qualitative, they have the opportunity to raise this issue. Hence, they believe that organisational culture is not critical for projects to succeed.

CONCLUSION AND FURTHER RESEARCH

This paper concludes a comprehensive assessment of project success by developing empirically a new conceptual framework for project success in Saudi Arabian public organisations from the CIOs' perspective. The conceptual research framework was empirically assessed using a distinctive dataset from Saudi Arabian public organisations. Based on the assessment of the research framework, the empirical results have revealed several major findings. It explores and identifies the CSFs of IT project success with regards to the CIOs' perceptions. Also, it examines the impact of organisational culture on the CSFs and project success criteria relationships, and examines the possible relationships between CSFs and project success criteria.

In conclusion, the project success assessment carried out by this research could be used to draw up guidelines for top management and decision makers.

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Such guidelines would help them to focus on areas that need improvement before implementing their IT projects, which in turn should lead to a higher success rate of such initiatives. This research revealed that project management and top management support are the areas that need to be given the highest priority in order to increase the chances of project success.

This research represents the viewpoints of public organisations in Saudi Arabia, and it is suggested that future research utilises the same model in private organisations in Saudi Arabia in particular, and in other developing countries in the Middle-East region in general, in order to test its generalisability and applicability.

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