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A Pilot Examination of an Improved Agile Hybrid Model in Managing Software Projects Success

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Abstract:
Managing software projects successfully requires the use of effective and robust methodologies. The Agile Manifesto in 2001 introduced 4 values and 12 principles as a set of development and management criteria to provide a more suitable and effective way to design and use agile methods in software projects. The agile management methods have improvedthe success rates of software projects, but the increase is not significant. Agile hybrid management methodshave shown more promise when compared to pure agile methods with an overall increase of 16%. A review of the current hybrid models have identified some gaps to be addressed and improved for the hybrid approaches.This paper presents a pilot study analysis of an initial model development for an improved agile hybrid model with experts in the software industry.The findings support the model based on the questionnaire review and a pilottest analysis.

Keywords: *Traditional, Agile, Methodologies, Hybrid.*

1. INTRODUCTION

A hybrid project management model is the combination of two ends of a spectrum of project management philosophies which takes the best of both project managementenvironments and creates a model that is robust through a collective interaction of combination patterns(Kuhrmann et al., 2018a; Papadakis & Tsironis, 2018). The concepts, characteristics and attributes of the various 'pure' traditional and 'pure' agile methodologies are the main ingredients in developing anagile hybrid modelwhich are then strengthened with adaptive, dynamic and complex features (Dao, Kermanshachi, Shane, Anderson, & Hare, 2016; Drazin & Govimodele, 2017; Onix, Fielt, & Gable, 2017). Current researchers have provided evidence that the use of agile software management methodologies for project success have gained momentum from the traditional model approaches(Anitha, Savio, & Mani, 2013), but reports from industry statistics indicate the increase in software project success rates is still not significant. This is evident from the

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Standish Group Research CHAOS Report 2016(Joseph, Marnewick, & Santana, 2016; Rahmanian, 2014)which indicatesa success rate that is fluctuating between 27-31% with little progressive improvement over the last 10 years.

2. MATERIALS AND METHODS

A review of the current traditional, agile and hybrid project management models in the initial part of the study identifiedgaps in adaption, tailoring, inefficient combination patterns and inability to manage medium to large project efficiently.A summary of the gaps are provided in Table 1. As hybrid models have a 16% increase in success rate than pure models(Carvalho et al., 2012), a new hybrid project management model was developed and proposed to close some of the gaps instead of developing a new pure traditional or a new pure agile model. To provide opportunities to manage a wide range of small to large project attributes in the model, adaptive, dynamic and complexity moderators were introduced to strengthen the proposed hybrid model for project success.

Table 1. Current Gaps in Project management Models (Traditional, Agile and Hybrid Models).

Project Management Model	Research Gap in Project Success	Project Management Components	Literature
Traditional	- Insufficient conditions to meet delivery timely. - Insufficient studies on adaption - Unable to identify quick solutions for small projects.	Schedule, Complexity	(Papadopoulos, 2015; Spalek, 2016)
Agile	- Ineffective management of tailoring activities - Unable to identify solutions for large and complex projects	Adaptive, Organization, culture	(Vedsmand, Kielgast, & Cooper, 2016; Wells, Dalcher, & Smyth, 2015)
Hybrid	- Not managed in a systematic, efficient and reliable manner for medium and large projects - Corporate implementation is limited - Not all projects fit into the model. A project needs to be adaptive and flexible. - Not able to combine models. - Combination techniques not working well. - Benefits not efficiently realized - Improvement in management of contextual dependency.	Traditional, Agile, Hybrid, Operational Objectives, Adaptive, Dynamic Project Size	(Conforto et al., 2016; Cooper, 2014; Ziółkowski & Deręgowski, 2014;Rahmanian, 2014;)Kuhrmann et al., 2018b; Rauf & AlGhafees, 2015)

The agile hybrid proposed model was also developed from existing traditional, agile and hybrid project management models with the various relevant theories and moderators

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to address the gaps. The proposed model and the measurement indicators are provided in Figure 1.Due to a large number of indicators the abbreviation '1 to n' is used, e.g. T1....Tn for Traditional Model indicators.

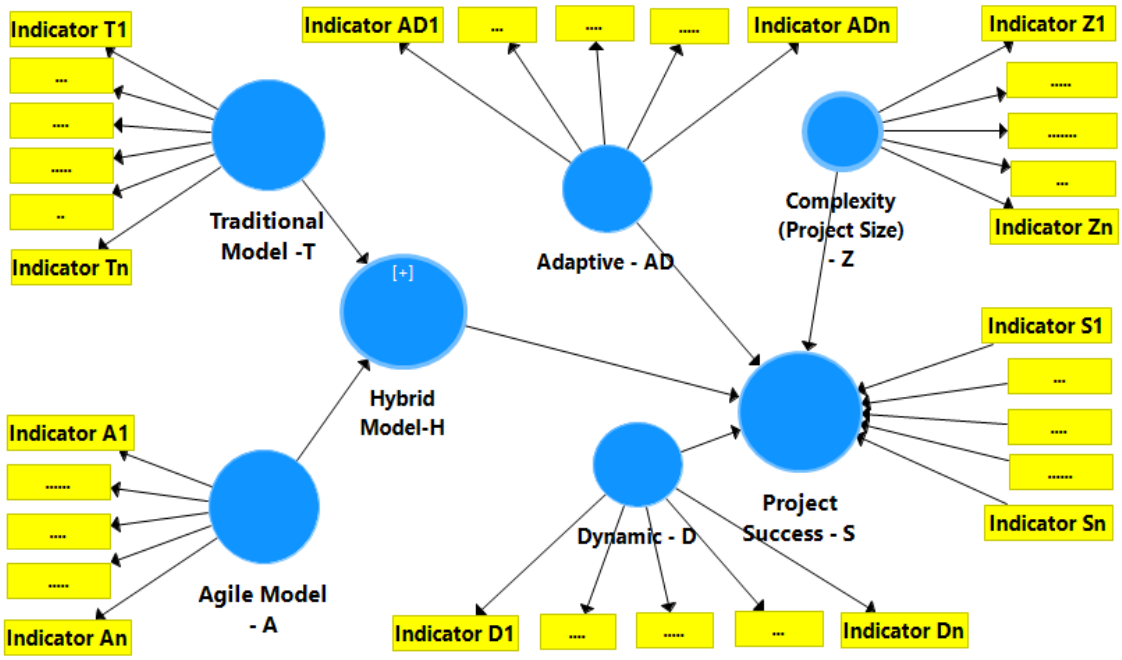

Figure 1.The proposed agile hybrid measurement model with the constructs and indicators.

An instrument in the form of a questionnaire was designed with the set of indicators that wereused as measures to the model. The design comprised a set of 6 components(constructs) with nominal and ordinal questions for each component. This is summarized in Table 2. Asa pilot test is usually done before the main study (Pereira, Cerpa, Verner, Rivas, & Procaccino, 2008), a reliability and validity evaluationto the set of questions on the proposed hybrid model was planned.

Table 2.Questionnaire Design in the 6 Components.

Component (Constructs)	Questions		Total	Literature
	Nominal (Categorical)	Ordinal (Likert Scale)		
1-Traditional (T)	9	22	31	(Jørgensen, 2016;Gill et al., 2016; Takeomi Imani, Masaru Nakano, 2017)
2-Agile (A)	8	18	26	(Fontana et al., 2015; Jørgensen, 2016; Takeomi Imani, Masaru Nakano, 2017)
3-Adaptive (AD)	0	29	29	(Serrador & Pinto, 2015; Cooper, 2016; Davis, 2017;Takeomi Imani, Masaru Nakano, 2017)
4-Dynamic (D)	0	8	8	(Takeomi Imani, Masaru Nakano, 2017; Drury-Grogan et al., 2017)
5-Complexity –	0	15	15	(Serrador & Pinto, 2015; Jim Johnson, Jim

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Project Size (Z)				Crear, Lou Vianna, Theo Mulder, 2015; Jørgensen, 2016; Takeomi Imani, Masaru Nakano, 2017)
6- Project Success (S)	15	3	18	(Dao, Kermanshachi, Shane, Anderson, & Hare, 2016; Takeomi Imani, Masaru Nakano, 2017; Wood & Ashton, 2010; Nguyen et al., 2018)
Total	**32**	**95**	**127**	

As suggested by Bowden (2002), respondents views should be independent with little interaction amongst themselves to questionnaires. The questionnaire was given to 27 respondents independently to review the face and content aspects to provide their responses. The feasibility, style, type, flow and readability together with the appropriateness of the content in meeting the objectives of the 6 project management components were investigated.

The data from the 27 respondents for the various components (used as constructs) in the model were collected and the factor loadings of the indicators were obtained using the SMART-PLStool. The Cronbach's alpha loadings were assessed and a reliability and validity test was performed on the proposed measurement model.

3. FINDINGS

The face and content review comments indicated the questionnaire and the components were detailed and would require a project that was recently completed to be assessed in response to the questions. The suggestion to increase the likert scale range from 5to 7 to request inputs for large and tremendous impact on projects for the questions was encouraged to provide for more detailed analysis. Some of the indicators for the components (constructs)were too wordy and were required to be shortened. Other concerns included the length of time required to complete the survey and to target the respondents from a special interest group to ensure the data collection content is more robust.These comments were incorporated in the main study.

A SMART-PLS algorithm calculation was used to assess the proposed agile hybrid measurement model. About 13% of the indicators (12out of 95)were required to be deleted as the factor loadings were below the 0.7 threshold (Cronhach's alpha).This is an acceptableindicator reliability and internal consistency reliability as it meets the threshold of 0.7 and the deletion percentage is less the 20% (Black & Anderson, 2013). The convergent validitywas evaluated using the average value extracted (AVE) with an acceptable threshold of 0.5.Adaptive, Agile and Hybrid constructs and dynamic and complex moderators were found to have an AVE above the thresholdand the R^2value was assessed to be above 0.04 for adaptive, dynamic and project success for the 27 respondents surveyed. It is envisaged that more constructs would have acceptable threshold AVE results evaluated with more respondents assessed after the main study is completed for a better overall construct validity.Table 3 and Table 4 provide the assessed AVE and R^2 values in the pilot study.

Table 3.AVE results in the pilot study.

	Adaptive	Agile	Hybrid	Iterative	Mod-Complex-Hybrid	Mod-Dynamic-Hybrid	Team Size
Adaptive	**0.932**						
Agile	0.628	**0.516**					
Hybrid	0.544	0.498	**0.552**				
Iterative	0.717	0.95	0.512	**1.063**			
Moderator-Complex-Hybrid	0.42	0.332	0.607	0.126	**0.601**		
Moderator-Dynamic-Hybrid	0.42	0.233	0.444	0.045	0.756	**0.727**	
Team Size	0.917	1.025	0.687	0.644	0.132	0.317	**0.978**

Table 4.R^2 values in the pilot study.

	R Square	R Square Adjusted
Adaptive	1	1
Hybrid	0.999	0.999
Project Success Operational Objectives	0.845	0.841

4. CONCLUSION

The study provides some relevance to the proposed agile hybrid model and the selected project management and success theories. The analysis of the survey questions and the findings from the validation of the measurement model through factor loadings, composite reliability, AVEand R^2valuessupport the questionnaireto be initially used as a measurement instrument for the model in the main study.As the data is only a small sample, it is reasonable to suggest that a larger sample with a similar reliability analysis method would further improve the validity of the proposed agile hybrid model. Additionally, some effort and adequate attention is required to address the refinement of the questions which had factor loadings below the threshold values.

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