Implementation of IT Project Management Control and Achieving the Control Objectives using Hybrid Extended Methodology

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ABSTRACT
This paper looks into the various aspects and components of project management control with a view to identify a new methodology using a hybrid model to achieve control objectives. Classical approaches to project management control are explored. The best known methods of Project management are *Water fall* [3] and *Scrum* methods [3]. However in a real world scenario, neither of these methodologies may be the best fit. Hence with the help of empirical project data an attempt is made to analyze options and see how effective is a hybrid model in achieving optimal control.

To achieve this, additional control criteria like *quality control* and development of *reusable components* etc are used. The analysis is carried out using specific IT project implementation data of a medium size project. The project was implemented using standard Software Development Life Cycle (SDLC) techniques.

General Terms
IT project management, software development

Keywords
IT project management, Control objectives, Hybrid extended methodology, software development life cycle

1. INTRODUCTION
In traditional project management, monitoring project progress against schedules and budgets is the focus and priority of managers. In the modern approach, many additional variables of control at different stages of the project progress (e.g. user contributions, efficiency of team task completion, performance of the team, quality of delivery etc.) are also considered.

One of the major challenges faced by project owners is to get assurances that business objectives are being met without compromising on compliance of standards and quality. This is achieved by appointing specialist consults to develop and manage extensive control frameworks and use specialist auditors to ensure full compliance to the control frame work.

According to the Project Management Body of Knowledge (PMBOK) [4], "*the Monitoring and Control Process Group consists of those processes that are performed to observe project execution so that potential problems can be identified in a timely manner and corrective action can be taken, when necessary, to control the execution of the project.*"

Project Monitoring and Control activities take place in parallel with Project Execution Process Group activities. This will enable monitoring and controlling of the project by applying appropriate level of corrective action while the project work is being executed, to avoid potential delays and cost over-run.

The project progress is monitored and measured at predefined intervals against the mile stones in project plan. This is done to ensure that the project is executed within acceptable level of variances of scope, schedule and cost. Also, the identified risks are monitored continuously and corrective actions are taken as necessary.

The regular monitoring and controlling activities will enable finding of issues proactively ahead of time and help in taking corrective actions in line with the project control objectives. Some corrective actions will require revisiting Planning Process Group resulting in updating the Project Management Plan. These activities will enable mitigating any delays and helps in bringing back the project back in track in line with project objectives and time lines.

2. PURPOSE
Purpose of this research paper is to develop a hybrid project control model to achieve control objectives of a project. Control processes include:

1. Controlling the Project Work
2. Integrated Change Control
3. Scope Control
4. Quality Control
5. Schedule Control
6. Resource control
7. Cost Control

3. DISCUSSIONS
3.1 Current Models and Approaches
Most project managers either adopt **Agile** or **Waterfall** approach to project management to achieve the project management and control objectives

The **waterfall** approach is based on phases that consist of *"Plan, Do, Check and Act"* method. On the other hand, **Agile** approach is based on a modular approach that require work to be planned as per the Acceptance Process and in concurrent form wherever possible.

**Waterfall** [3] is a linear approach to software development. In this methodology, the sequence of events is something like:

1. Gather and document requirements
2. Design
3. Code and unit test
4. Perform system testing
5. Perform user acceptance testing (UAT)
6. Fix any issues
7. Deliver the finished product

Agile [3] is an iterative, team-based approach to development. This approach emphasizes the rapid delivery of an application in complete functional components. Rather than creating tasks and schedules, all time is "time-boxed" into phases called "sprints." Each sprint has a defined duration (usually in weeks) with a running list of deliverables, planned at the start of the sprint. Deliverables are prioritized by business value as determined by the customer. If all planned work for the sprint cannot be completed, work is reprioritized and the information is used for future sprint planning.

The typical stages of a project as per PMBOK [3] are _"Initiate, Plan, Execute, Control &Complete"._

COBIT (Control Objectives for Information and Related Technologies) framework[1] is used to provide a set of controls for implementing IT projects. Edward W. N. Bernroider[1] discusses how to achieve control objectives in an IT project using COBIT.

4. OBJECTIVE

This paper is an attempt to see how a Hybrid model (part use of Agile and part use of Scrum) approach to better achieve Project management and control objectives

Detailed analysis using empirical data to be carried out to establish the concept and validity of it

4.1 Key Control objectives

Below are the list of key project management areas and their performance control objectives [1].

Sl No	Project Management Areas	Performance Control Objectives
1	Business & Regulatory Environment	Business revenue/benefit will be realized

2	Scope & Change Control	Impact of any changes are understood and managed
3	Time (Schedule) Management	Key upcoming milestones will be met
4	Quality & Inspection	Technical, standardization and quality requirements are met
5	Cost Management	Actual & forecast vs planned cost variances are authorized
6	Communication & Reporting	Stakeholders happy & team / suppliers are performing at the desired level
7	People Management	
8	Procurement and Contracts	
9	Risk and Issue Management	Issue impacts are understood and improvements planned

4.2 The Criteria to Assess Achievement of the above control Objectives:

The basis for assessing whether control objectives are met is the maturity of control processes, in line with their criticality. Processes which are assessed/rated as _'Not achieved'_ will require time based and documented improvement plans. The normally used criteria and rating are

1. Nothing in place
2. Informal (not documented)
3. Working, but not fully documented or tested or regularly monitored
4. Documented and in place, but not tested or monitored
5. Documented and tested. Also monitored and reported
6. Fully Optimized and gone through improvement processes to improve value

4.3 Control gap assessment

The basis for the control gap assessment is a matrix of critical process controls. These processes span across the life cycle of the project with key gaps included in the project risk register. Some examples are listed below

Planning stage	Design stage	Implementation/development stage	Testing stage	Roll Out stage	Maintenance /Support stage
Acceptance of the Project and Funding	Assessment of Business requirements	Development of success criteria		Development of continuous Improvement and plan	
Definition of Projects phases and components	Design and develop Project Components	Agree Change Control Process and framework		Define User Acceptance Process and criteria	Define Operations Acceptance Process
Project Schedule Requirements	Baseline Project Schedule	Detailed Schedule Management		Schedule the Completion Check List	Ongoing Maintenance Schedule

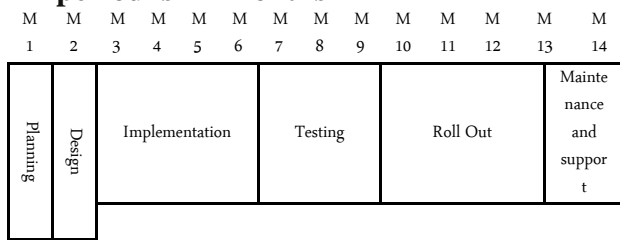|					
Project Concept and Performance Requirements	Review and Approval of the overall design	Quality Assurance (QA)Process	Carry out Inspections & Quality Review	Project completion Check List	Quality Assurance Process
Capital Budgeting	Forecast Cost and Schedule	Cost Control/cost optimization		Final Payment	Operation and maintenance Budget
Project Management Plan and Resourcing			Staff optimizing	Planning Operations Staff	Ongoing Requirements / Skills Review
Defining Project Reporting Requirements	Project Status reporting	Define variance - Project Cost, and Schedule	Project Quality Performance	Project Closure Performance	Financial Reporting
Outsourcing/External Contracting Options	Partner Qualification / RFP Process	Vendor Selection	Contract Compliance Review	Trouble shooting/debugging	Vendor Qualification
Project Risk Management Planning	Risk and Issue Tracking and achieve Resolution			Confirm Issue Resolution	Continuous Issue Management Process
Acceptance of the Project and Funding	Assessment of Business requirements	Development of success criteria	Development of continuous Improvement and plan		
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Defining Project Reporting Requirements	Project Status reporting	Define variance - Project Cost, and Schedule	Project Quality Performance	Project Closure Performance	Financial Reporting
Outsourcing/External Contracting Options	Partner Qualification / RFP Process	Vendor Selection	Contract Compliance Review	Trouble shooting/debugging	Vendor Qualification
Project Risk Management Planning	Risk and Issue Tracking and achieve Resolution			Confirm Issue Resolution	Continuous Issue Management Process

5. PROPOSED MODEL

In the proposed model, upon completion of the planning and design stage, the next four stages (Design, implementation, testing, roll out and support) can be implemented in an agile manner running all these stages in parallel in a modular way.

Based on empirical data derived from the case study in Appendix 1 below clearly shows the advantage of the Hybrid model.

5.1 Water Fall Method - Roll out time period is 14 Months

M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14
Planning	Design	Implementation				Testing			Roll Out				Maintenance and support

5.2 Hybrid Extended Model - Roll out time period is 10 Months

M1	M2	M3	M4	M5	M6	M7	M8	M9	M10
Planning	Design	Implementation							
		Testing							
			Roll out						
				Maintenance and support					
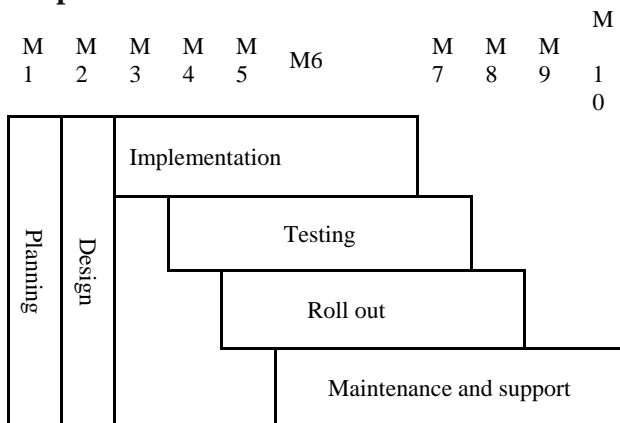
It is obvious that by adopting a Hybrid model, on an average 40 % (10 months instead of 14 months) reduction in project timelines can be achieved by implementing proper control.

6. CONCLUSIONS

It is very obvious that in complex software implementation projects where system roll out is required across multiple locations, hybrid model is most appropriate for achieving control and delivery objectives . This is also applicable in the case of IT projects were reusable components are to be deployed.

However there will be a slightly higher effort in testing of the solution as the roll out starts before the completion of the full development cycle. However the overall saving in project time line and hence costs will more than make up for the additional testing efforts.

7. REFERENCES

[1] *IT project management control and the Control Objectives for IT and related Technology (CobiT) framework* by Edward W. N. Bernroider and Milen Ivanov, Article *in* International Journal of Project Management , April 2011

[2] *Modelling project management performance*. International Journal of Quality & Reliability Management, 20, 229-254 by BRYDE, D. J. 2003

[3] Waterfall Vs Agile: Which is the Right development methodology for your Project? http://www.seguetech.com/waterfall-vs-agile-which-is-the-right-development-methodology-for-your-project/

[4] A Guide to the Project Management Body of Knowledge (PMBOK® Guide)—Fifth Edition, PMI Institute

[5] *Project management: cost, time and quality, two best guesses and a phenomenon, its time to accept other success criteria* by Roger Atkinson Department of Information Systems, The Business School, Bournemouth University, Talbot Campus, Poole, Dorset BH12 5BB, UK

[6] *Defining and measuring project success* by Danie van der Westhuizen, Department Information Systems, Faculty of Business, University of Southern Queensland - Wide Bay Campus, Hervey Bay, Queensland, Australia

[7] *Project Controls: What is it and why is it important?* at http://www.projectcontrolsonline.com/Home/DefinitionandImportanceofProjectControls.aspx

[8] Breaking through the Project Fog by James Norrie published by John Wiley and Sons

[9] *Portfolios of Control Modes and IS Project Management by* Laurie S. Kirsch, Katz Graduate School of Business, The University of Pittsburgh, Pittsburgh, Pennsylvania

[10] Project Management Methodologies: A Comparative Analysis, by M. M. Chin (Kuala Lumpur Infrastructure University College), (PhD) and A. C. Spowage, (University of Nottingham Malaysia Campus), (PhD) and E. H. Yap, (University of Nottingham Malaysia Campus), (PhD)

[11] *Project Management Methodologies: A Review of the Literature* by Pamela McClinton

[12] *Project Controls to Minimize Cost and Schedule Overruns: A Model, Research Agenda, and Initial Results* David N. Ford , James M. Lyneis , and Timothy R.B. Taylor

[13] *Statistical Project Control at* http://www.projectmanagement.ugent.be/?q=research/project_control/spc

[14] Impact of Real-time Project Control on Capital Project Cost and Schedule Performance by David Grau and Amin Abbaszadegan, School of Sustainable Engineering and the Built Environment; Arizona State University; Tempe AZ, USA david.grau@asu.edu

8. APPENDIX

Below is the project plan of an ERP implementation that is rolled out across 6 locations. As per the project plan developed in a Hybrid model, the first location takes double the roll out time of remaining locations. Also, as many tasks are carried out in parallel, overall project completion time is substantially reduced.

But the implementation will become complex requiring strong project management skills and additional project resources for parallel roll out.

ERP implementation Plan

S/N	M	S	Activity Name	Team	Scheduled	
					Start Date	End Date
1	A		Requirement Analysis			
		A1	Demonstration of modules			
		1	HR & Payroll Module	MI/D/U	20/07/2015	
		2	Analysis of Reports Requirements HR & Payroll Module	MI/D/U		
		3	Identify the GAP solutions and Acceptance criteria - HR & Payroll Module	MI/D		
		4	Preparing SRS Documentation - HR & Payroll Module	MS		28/07/2015
		5	Financial Module	MI/D/U	25/07/2015	
		6	Analysis of Reports Requirements -Financial Module	MI/D/U		
		7	Identify the GAP solutions and Acceptance criteria - Financial Module	MI/D		
		8	Preparing SRS Documentation -Financial Module	MS		2/8/2015
		9	Assets Module	MI/D/U	10/8/2015	
		10	Analysis of Reports Requirements –FA	MI/D/U		
		11	Identify the GAP solutions and Acceptance criteria - Assets Module	MI/D		
		12	Preparing SRS Documentation -Assets Module	MS		16/08/2015
		13	Procurement & Inventory Module	MI/D/U	3/8/2015	
		14	Analysis of Reports Requirements - Procurement & Inventory Module	MI/D/U		
		15	Identify the GAP solutions and Acceptance criteria Procurement & Inventory	MI/D		
		16	Preparing SRS Documentation - Procurement & Inventory Module	MS		11/8/2015
2		A2	GAP Analysis			
		1	Discussion on SRS Documentation	MI/MS/D	29/07/2015	18/08/2015
		2	Approval of SRS Document	D	1/8/2015	19/08/2015
3	B		Data Preparation			
		B1	Data Preparation			
		1	Briefing about Data Input Templates	MI/D/U	1/8/2015	
		2	Preparing the Data in Templates	D/U		25/08/2015
4	C		Development and Testing			
		C1	Development and Testing			
		1	Prepare the Technical Documents	MS	2/8/2015	13/08/2015
		2	Design specification of Requirements & Modification	MS	4/8/2015	16/08/2015
		3	Development of Functionality- HR & Payroll	MS	6/8/2015	29/08/2015
		4	Unit testing	MS		30/08/2015
		5	QA Testing - HR & Payroll			1/9/2015
		6	Development of Functionality- Procurement & Inventory	MS	8/8/2015	30/08/2015
		7	Unit testing	MS		1/9/2015
		8	QA Testing - Procurement & Inventory			3/9/2015
		9	Development of Functionality- Financial	MS	15/08/2015	7/9/2015
		10	Unit testing	MS		8/9/2015
		11	Development of Functionality- Assets	MS	25/08/2015	10/9/2015

		12	Unit testing	MS		12/9/2015
		13	QA Testing - Financial & Assets	MS/MI		15/09/2015
		14	System Testing [SIT]- HR & Payroll	MI/D	2/9/2015	5/9/2015
		15	System Testing [SIT]- Procurement & Inventory	MI/D	6/9/2015	8/9/2015
		16	System Testing [SIT] - Financial & Assets	MI/D	19/09/2015	22/09/2015
		17	User Testing [UAT]- HR & Payroll	MI/D/U	14/09/2015	19/09/2015
		18	User Testing [UAT]-Procurement & Inventory	MI/D/U	19/09/2015	23/09/2015
		19	User Testing [UAT] - Financial & Assets	MI/D/U	26/09/2015	30/09/2015
		20	Feedback & Final Release	MS/MI/D	26/09/2015	8/10/2015
5	D		Deployment Process			
		D1	Database & Application Deployment			
		1	Database Implementation	MI	13/08/2015	
		2	Application Deployment -Procurement & Inventory Module	MI		15/08/2015
		3	Application Deployment-HR & Payroll Module	MI		15/08/2015
		4	Application Deployment - -Financial & Assets Module	MI		15/08/2015
6	E		Data Migration			
		E1	Data Migration & Verification			
		1	Verifying Data integrity	MI/D	20/08/2015	
		2	Uploading Inventory &Procurement Master data	MI	30/08/2015	31/08/2015
		3	Uploading HR Master data	MI	23/08/2015	24/08/2015
		4	Uploading Accounts & Asset Master data	MI		29/08/2015
		5	Integration of modules to Finance	MI/D/U		4/10/2015
7	F		Training , Finalizing & Handover			
		F1	Training			
		1	Training on Inventory &Procurement Module	MI/D/U	14/09/2015	17/09/2015
		2	Training on HR& Payroll Module	MI/D/U	9/9/2015	13/09/2015
		3	Training on Accounts & Assets Module	MI/D/U	22/09/2015	27/09/2015
8		F2	Finalizing & Pilot Run			
		1	Finalizing Printing Formats - HR& Payroll Module	MI/MS/D/U	10/10/2015	11/10/2015
		2	Finalizing Printing Formats - Inventory &Procurement Module	MI/MS/D/U	12/10/2015	13/10/2015
		3	Finalizing Printing Formats - Accounts & Assets Module	MI/MS/D/U	14/10/2015	15/10/2015
		4	Finalizing User Access- HR& Payroll Module	MI/D	17/10/2015	18/10/2015
		5	Finalizing User Access - Inventory &Procurement Module	MI/D	19/10/2015	20/10/2015
		6	Finalizing User Access - Accounts & Assets Module	MI/D	21/10/2015	22/10/2015
		7	Pilot Run- HR& Payroll Module	MI/D/U	24/10/2015	5/11/2015
		8	Pilot Run- Inventory &Procurement Module	MI/D/U	24/10/2015	5/11/2015
		9	Pilot Run- Accounts & Assets Module	MI/D/U	24/10/2015	5/11/2015
		10	Review of Output	D/U	7/11/2015	12/11/2015
		11	Live Run - HR& Payroll Module	D/U		14/11/2015
		12	Live Run - Other Module	D/U		14/11/2015
		13	Sign Off	MI/D		15/11/2015

D-Delivery Team, **U**- End USER, **MI**- Main IMPLEMENTATION Partner, **MS**- Main SOFTWARE DEVELOPMENT Team

Project Days requirement by stage by location   **LOCATIONS**

S/N	M	S	Activity Name	Team	Loc-1 Days	Loc-2 Days	Loc-3 Days	Loc-4 Days	Loc-5 Days	Loc-6 Days
1	A		Requirement Analysis							
		A1	Demonstration of modules		8	4	4	4	4	4
P		1	HR & Payroll Module	MI/D/U						
P			Analysis of Reports Requirements -HR & Payroll Module	MI/D/U						
2		A2	GAP Analysis		15	7	7	7	7	7
		1	Identify the GAP solutions and Acceptance criteria	MI/MS/D						
		2	Preparing SRS Documentation	MI/MS						
		3	Discussion on SRS Documentation	MI/MS/D						
		4	Approval of SRS Document	D						
3	B		Data Preparation							
		B1	Data Preparation		40	25	25	25	25	25
P		1	Preparation of Data Input Templates	MI/MS						
P		2	Briefing about Data Input Templates	MI/D/U						
P		3	Preparing the Data in Templates	D/U						
P		4	Data Template Verification	MI/D/U						
4	C		Development and Testing							
		C1	Development and Testing		90	22	22	22	22	22
P		1	Development of Functionality-	MS						
P		2	Unit testing	MS						
P		3	Development of Functionality Country Specific	MS						
P		4	Unit testing	MS						
P		5	QA Testing	MS/MI						
P		6	User Testing [UAT]	MI/D/U						
P		7	Feedback & Final Release	MS/MI/D						
5	D		Deployment Process							
		D1	Database & Application Deployment		22	22	22	22	22	22
		1	Database Implementation	MI						
		2	Application Deployment -Procurement Module	MI						
		3	Application Deployment -Inventory Module	MI						
		4	Application Deployment -Financial Module	MI						
		5	Application Deployment -Assets Module	MI						
		6	Application Deployment -HR & Payroll Module	MI						
6	E		Data Migration							
		E1	Data Migration & Verification		15	7	7	7	7	7
		1	Verifying Data integrity	MI/D						
		2	Uploading Inventory &Procurement Master data	MI						
		3	Uploading HR Master data	MI						
		4	Uploading Accounts & Asset Master data	MI						
		5	Integration of modules to Finance	MI/D/U						
7	F		Training , Finalizing & Handover							

		F1	Training		10	10	10	10	10	10
		1	Training on Procurement Module	MI/D/U						
		2	Training on Inventory Module	MI/D/U						
		3	Training on Accounts & Assets Module	MI/D/U						
		4	Training on HR& Payroll Module	MI/D/U						
8		F2	Finalizing & Pilot Run		60	14	14	14	14	14
		1	Finalizing Printing Formats	MI/MS/D/U						
		2	Finalizing User Access	MI/D						
		3	Pilot Run	MI/D/U						
		4	Review of Output	MI/D/U						
		5	Live Run	D/U						
		6	Sign Off	MI/D						
			Total Days		**260**	**111**	**111**	**111**	**111**	**111**

D-Delivery Team, **U**- End USER, **MI**- Main IMPLEMENTATION Partner, **MS**- Main SOFTWARE DEVELOPMENT Team

P	Parallel Run