Identifying the Most Critical Documents and Reviews for Small Information Technology Projects

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Agenda

- Introduction
- Research problem
- Objectives
- Methodology
- Results
- Conclusions
- References

Research Problem

- Global spending in IT has exceeded $3T since 2007(Reuters, 2009)
  - A far larger figure describes the financial equities that depend on IT
- IT failure rates continue to be high
  - Depending on the specific study and how failure was defined, IT failure rates have ranged from 26% to 68%. (Lynch, 2009) (El Emam, 2009)
- The world cannot continue to afford these problems even though this has been the history of IT

Background

- This paper attempts to improve upon the application of PM and SE procedures for the case of small IT projects
- Small projects often do not have the benefit of employing both a project manager and a systems engineer,
- The effort behind this paper has been to merge the best tools of both knowledge areas for small IT projects.
- It is emphasized that the present work is in no way trying to question or abridge the PM and SE knowledge areas
- The present work is combining the best thinking from both knowledge areas into one that can be afforded by small IT projects

Small IT Projects

- For the purposes of this research, a small project is defined as one having a duration from three to twelve months and a dollar value from $5,000 to $1.5M (Kerzner, 2009)
- A recent survey showed that about half of IT projects fit into this category
  - About half the projects had a duration of less than nine months and had fewer than ten developers. (El Emam, 2008)

Definitions

Project Management

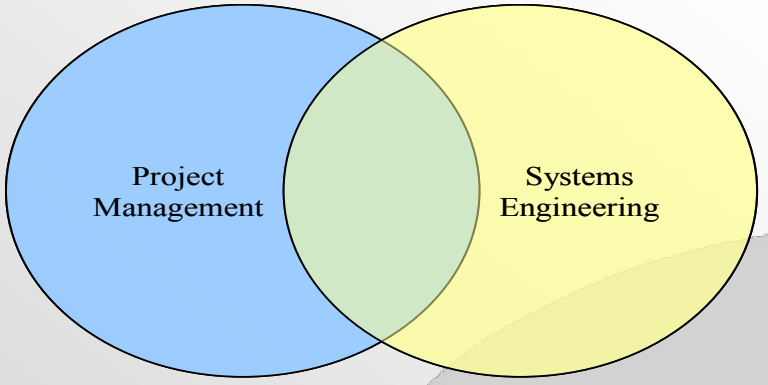
- **Project** - PMI Definition – "A project is a temporary endeavor undertaken to create a unique product, service, or result." (PMI 2004)
- **Project Management** - PMI Definition – "Project management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements." (PMI 2004)
- **Systems Engineering** – PMI Definition – Systems engineering is not defined by the PMBOK.

Systems Engineering

- **Project** - INCOSE SE Handbook 2011 – an endeavor with defined start and finish criteria undertaken to create a product or service in accordance with specified resources and requirements (from ISO/IEC 15288:2008)
- **Project Management** – not in definitions is App D; referenced in Section 5
- **Systems Engineering** - INCOSE SE Handbook 2011 – an interdisciplinary approach and means to enable the realization of successful systems

Management of IT Projects

- Management of IT projects has been traditionally divided into two partially overlapping functions: PM and SE
  - Project managers typically focus on cost and schedule management (Mooz, 1996)
  - Systems engineers focus on all phases of the technical solution (Mooz, 1996)



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Combining PM and SE Knowledge Areas

- Decide on PM and SE baseline knowledge areas
- PM – PMBOK (PMBOK, 2009)
- SE - Honour and Valerdi coordinated and combined these standards into a single ontology that provides general agreement across eight systems engineering areas (Honour, 2006)

PM Knowledge Areas

Project Management Knowledge Areas	Definitions
Project Integration Management	Processes and activities needed to identify, define, combine, unify and coordinate project management activities
Project Scope Management	Processes required to ensure the project includes all, and only the work required, to successfully complete the project
Project Time Management	Processes required to manage timely completion of the project
Project Cost Management	Processes involved in estimating, budgeting, and controlling costs so the project can be completed within budget
Project Quality Management	Processes and activities that determine the quality policies, objectives, and responsibilities to satisfy project needs
Project Human Resource Management	Processes that organize, manage, and lead the project team
Project Communications Management	Processes required to ensure timely generation, collection, storage, retrieval, and disposition of project information
Project Risk Management	Processes of risk management, planning, identification, analysis, response planning and monitoring and control
Project Procurement Management	Processes necessary to purchase or acquire products, services, or results needed from outside the project team

PM Knowledge Areas (PMI, 2008)

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SE Knowledge Areas

SE Knowledge Areas	Definitions
Mission / Purpose Definition	Defines the mission and purpose of the new or changed system
Requirements Engineering	Creation and management of requirements, formal technical statements that define capabilities, characteristics, and quality
System Architecting	Design aspect of systems engineering that defines the system in terms of its component elements and their relationships
System Implementation	Responsible for the technical development of the system, including delivery and installation of the prototype version
Technical Analysis	Responsible for system-level technical analysis, particularly Assessing system performance against requirements
Technical Management / Leadership	Technical management and leadership of the project
Scope Management	Technical definition and management of acquisition and supply issues
Verification and Validation	Comparison of the system with the requirements and the intended use of the system

SE Knowledge Areas (Honour et al., 2006)

The Combined PM and SE Knowledge Areas

Project Management Areas	Overlapping Areas	Systems Engineering Areas
Project Time Management	Project Integration Management	System Architecting
Project Cost Management	Mission / Purpose Definition	System Implementation
Project Quality Management	Technical Management / Leadership	Technical Analysis
Project Human Resource Management	Project Scope Management	
Project Communications Management	Requirements Engineering	
Project Risk Management	Verification and Validation	
	Project Procurement Management	
	Scope Management	

IT Knowledge Areas

IT Knowledge Areas	
1	Project Integration Management
2	Project Scope Management
3	Project Time Management
4	Project Cost Management
5	Project Quality Management
6	Project Human Resource Management
7	Project Communications Management
8	Project Risk Management
9	Project Procurement Management
10	System Architecting
11	System Implementation
12	Technical Analysis

Research

- PM and SE standards were reviewed to identify the documents and reviews
  - PMBOK, ANSI/EIA-632, IEEE1220, ISO-15288, MIL-STD-499C, the Software Engineering Institute's Capability Maturity Model Integration (CMMI), and the Systems Engineering Handbook from INCOSE
- Documents and reviews were both unique to a particular standard and contained in more than one standard

Survey

- A survey was conducted to identify which of the many project related documents and reviews were considered to be of highest values to IT professionals
- The standards contained a total of 74 documents and 34 reviews
- The survey was sent to a 105 people. There were 56 responses, 45 non-responses, and four people who felt they did not have the background to properly answer the questions

Survey Construct

- The survey instructed the participants to group the documents and reviews into one of three categories;
  - “Fully Perform” - This is necessary for the project and should be performed in great detail, “fully perform” was assigned a 1
  - “Perform in a Limited Manner” - Some of this is helpful for the project and should be performed in a limited manner. “perform in a limited manner” was assigned a 2
  - “Don't Perform” - This is not needed for a project of this size and scope. “don’t perform” was assigned a 3
- The documents were grouped into twelve knowledge areas and there was one area for reviews

Document Categories

- **Project Integration Management** – 13 documents - business case, project charter, project management plan, performance reports, tasking document, strategic plan, concept specification, maintenance concept, concept of operations, disposal concept, total cost of ownership, systems engineering management plan, and software development plan
- **Project Scope Management** – 10 documents – requirements document, work performance measurements, requirements management plan, requirements traceability matrix, project scope statement, project scope baseline, work breakdown structure (WBS), WBS dictionary, scope management plan, and testability plan.
- **Project Time Management** – 6 documents – activity list, milestone list, project schedule, project schedule network diagram, activity resource requirements document, and resource breakdown structure.
- **Project Cost Management** – 5 documents – activity cost estimates, cost performance baseline, budget forecasts, cost management plan, and earned value management documents
- **Project Quality Management** – 4 documents – quality management plan, quality metrics, quality checklists, and process improvement plan

Document Categories

- **Project Human Resource Management** – 3 documents- human resource plan, staffing management plan, and training plan
- **Communications Management** – 1 document – communications management plan
- **Project Risk Management** – 2 documents - risk management plan and risk register
- **Project Procurement Management** – 7 documents – procurement management plan, statement of work, source selection criteria, resource calendar, request for proposal, contract, and contractor identified technical information services plan
- **System Architecting** – 15 documents – enterprise policies, project procedures, configuration management plan, data management plan, electromagnetic compatibility/interface control plan, human factors engineering plan, interface control plan, supportability plan, maintenance plan, reliability plan, producibility plan, system safety plan, system security plan, survivability management plan, and mass properties control plan
- **System Implementation** – 3 documents – system specification documents, integrated data package, and systems integration plan
- **Technical Analysis** – 5 documents – trade-off analysis document, system verification plan, system validation plan, test plan, and test procedures

Document Rankings

Rank	Document Name	Score	Rank	Document Name	Score	Rank	Document Name	Score
1	Project Schedule	1,125	26	Systems Integration Plan	1,661	51	Integrated Data Package	2,054
2	Requirements	1,179	27	Software Development plan	1,691	52	Resource Breakdown Structure	2,073
3	Milestone List	1,250	28	System Verification Plan	1,714	53	WBS Dictionary	2,089
4	Concept of Operations	1,304	29	Cost Performance Baseline	1,750	54	Risk Register	2,089
5	Project Management Plan	1,339	30	Staffing Management Plan	1,750	55	Trade-off Analysis Document	2,089
6	Test Plan	1,375	31	Project Charter	1,804	56	Project Schedule Network Diagram	2,091
7	Project Scope Statement	1,393	32	Source Selection Criteria	1,804	57	Communications Management Plan	2,107
8	Test Procedures	1,429	33	Cost Management Plan	1,818	58	Supportability Plan	2,125
9	System Security Plan	1,455	34	System Validaton Plan	1,818	59	Scope Management Plan	2,143
10	Business Case	1,464	35	SEMP	1,821	60	System Safety Plan	2,161
11	WBS	1,464	36	Maintenance Concept	1,839	61	Strategic Plan	2,179
12	Activity Cost Estimates	1,464	37	Project Scope Baseline	1,839	62	Training Plan	2,196
13	System Specifications	1,464	38	SOW	1,839	63	Survivability Management Plan	2,196
14	Contract	1,500	39	Interface Control Plan	1,893	64	Resource Calendar	2,214
15	Tasking Documents	1,589	40	Maintenance Plan	1,907	65	Services Plan	2,232
16	Concept Specification	1,589	41	Procurement Management Plan	1,911	66	Enterprise Ploicies	2,250
17	Testability Plan	1,600	42	Total Cost of Ownership	1,929	67	Reliability Plan	2,268
18	Performance Reports	1,607	43	Requirements Management Plan	1,929	68	Process Improvement Plan	2,339
19	Risk Management Plan	1,607	44	Quality Checklists	1,929	69	Disposal Concept	2,375
20	Requirements Traceability Matrix	1,618	45	Work Performance Measurements	1,946	70	EVM	2,375
21	Activity List	1,625	46	Project Procedures	1,946	71	EMI interface control plan	2,393
22	Budget Forecasts	1,625	47	Quality Metrics	1,964	72	Human Factors Engineering Plan	2,429
23	CM plan	1,636	48	Quality Management Plan	1,982	73	Producability Plan	2,429
24	Data Management Plan	1,636	49	Human Resource Plan	2,018	74	Mass Properties Control Plan	2,661
25	RFP	1,643	50	Activity Resource Requirements	2,018			

Review Rankings

Rank	Review Name	Score	Rank	ReviewName	Score
1	System Acceptance	1.482	18	Inspection and Product Reviews	1.857
2	Operational Readiness	1.482	19	System Technical	1.889
3	Systems CDR	1.527	20	Employee Performance Review	1.911
4	Systems Requirements	1.554	21	Quality Audits	2.036
5	Management Review	1.571	22	Activity Cost Estimate	2.054
6	Status	1.589	23	System Definition	2.089
7	IOT&E Review	1.696	24	Subsystem Requirements	2.143
8	Approved Change Request	1.714	25	Functional Configuration	2.143
9	Documentation	1.750	26	Activity Duration Estimate	2.161
10	System Verification	1.768	27	Design Configuration Audits	2.196
11	Test Readiness	1.768	28	Production Approval	2.196
12	Phase-end Review	1.782	29	Procurement Performance	2.200
13	System PDR	1.786	30	Physical Configuration	2.286
14	Risk Reviews	1.804	31	Disbursement Review	2.309
15	System Detailed Design	1.818	32	Component	2.321
16	Readiness	1.818	33	Procurement Audit	2.375
17	Performance Reviews	1.821	34	Alternative System	2.464

Discussion

- The purpose of this research was to identify the most critical documents and reviews for a project manager and systems engineer to help structure project plan that is appropriate to the project
- Introducing an ontology specific to small IT projects, combining PM and SE knowledge areas, may be useful for several reasons
  - IT projects require both PM and SE skills, small projects most likely can't support both skill sets
  - Combining knowledge areas eliminates redundancy
  - The existing solution to improve project is to obtain PMP certification. Creating an IT project ontology allows PMs to be exposed to SE skills
  - PMs benefit from the ordering of documents and reviews in their selection process
  - PMs benefit from a comprehensive set of documents and reviews, along with their definition and sourcing information

Top 15% of Documents and Reviews

Rank	Document Name	Score
1	Project Schedule	1.125
2	Requirements	1.179
3	Milestone List	1.250
4	Concept of Operations	1.304
5	Project Management Plan	1.339
6	Test Plan	1.375
7	Project Scope Statement	1.393
8	Test Procedures	1.429
9	System Security Plan	1.455
10	Business Case	1.464
11	WBS	1.464
12	Activity Cost Estimates	1.464
13	System Specifications	1.464

Rank	Review Name	Score
1	System Acceptance	1.482
2	Operational Readiness	1.482
3	Systems CDR	1.527
4	Systems Requirements	1.554
5	Management Review	1.571
6	Status	1.589

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Further Research

- The authors created a project planning assistant tool to help create project plans for small IT projects
- The project planning assistant tool was tested with novice project managers
  - Test scenario was created
  - 32 participants; ½ used tool
  - Participants using tool were significantly better able to identify the correct documents and reviews to produce (documented in a separate paper)

Conclusion

- Managing IT projects will continue to be a challenge
- Properly structuring projects at the beginning will facilitate better and more efficient project execution
- Identifying the most critical documents and reviews to manage the project will help the project manager balance the information required for performing the project verses the cost of producing documents and conducting reviews
- Understanding this information at the beginning of the project provides the ability to adjust the plan while the cost impact is minimal
- The hope is that this research will provide guidance on the relative importance of documents and reviews so that project managers and systems engineers can more effectively plan small IT projects

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QUESTIONS?