The Integrated Project Risk Management Methodology:

The effective use of software in IT Projects

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Abstract

The Integrated Project-Risk Management Methodology IPRM [1] was proposed as a result of an investigation of the effectiveness of conventional methodologies used in the implementation of IT projects. As well as integrating risk principles and practices to the project planning and management, the methodology emphasizes the effective use of tools to support project resources throughout the life cycle of the project.

In this paper, we examine the software usage component of the implementation methodology. We investigate the effectiveness of using different software to support the project team, to successfully complete the project. We consider the findings of a survey to gauge the current usage of software in IT projects to support the different functions imbedded in the adopted model. A suitability assessment of software and analysis tools is based on requirements derived from and associated with features introduced by IPRM Methodology. We conclude with recommendation for a set of measures to secure the project's IT environment and provide guidelines to select, and effectively use supporting software and programs to ensure the well-being and the successful conclusion of the implementation projects.

1. Background

1.1 Managing IT Projects:

The perceived operational, tactical and strategic importance [3,4] of computer applications and systems to corporate business has resulted in senior management committing huge amounts of investment funds to purchase and implement such systems.

Important decisions of this sort represent a major undertaking that involves many risks and uncertainties, yet decision makers are never short of reasons to justify it, most common of which is the claim to adopt best practice, state of the art technology to gain a competitive edge over others [2,5]. To make the case even more convincing the proposition is usually supported by ROI (Return on Investment) studies that are increasingly becoming convenient tools to seal the purchase deals of such expensive applications and systems. The majority of these ROI studies incorporate many assumptions and fail in many cases to consider all the important factors to reflect the real measurable tangible and intangible benefits the new investment will bring to the business. [6]

Different methodologies have been adopted to control the complex environment in which IT project implementations take place and to ensure successful outcomes. The majority of methodologies adopt the conventional time / project management principles that are enhanced with some measures to avoid cost or time overruns and /or to ensure acceptability of the delivered solution. [7]

A typical methodology sets the guidelines and provides the roadmap for the implementers to plan and manage (project) activities. This may include the definition of project phases, activities start and finish times, durations, resources, materials, tools, constraints, deliverables and relationships.

There are many cases reported of IT projects that fail to meet the original planned expectations and consequently deliver huge losses to business [1,8]. Although there is a debate about the best criterion for project success and failure [9], it is generally accepted by both practitioners and researchers that the main project key performance indicator (KPI)

is a measure of the ratio of actual to planned in relation to:

- 1) Project scope
- 2) Delivery (delays)
- 3) Budget of project (Cost)
- 4) Quality & Performance
- 5) Customer / User Satisfaction

The high rate of project failures has prompted both researchers and practitioners to investigate causes and to look at alternative solutions to the way projects are managed. Some researches [10] suggest there is a need to reconsider the suitability of the current project / time management paradig ms and tools, because the project environment has grown significantly since the development of project management tools. The principal tools are, in IT terms, ancient: PERT was developed in 1958 by Department of Navy and Booz Allen, and CPM was developed in 1957 by Dupont [11].

No one can deny that these tools have been very helpful in project planning and to a lesser extent in project control but the complexity of the environment and the high risks embedded in applying new technologies and computer systems have made necessitated the urgent need consider alternative approaches [12] and to adopt formal, structured implementation methodologies to plan, manage and control projects. 'Failing to adopt such a methodology' itself is a huge risk that might result in project failure.

1.2 IT Software & Tools:

The accelerated boom of the personal computer hardware technology over the last two decades has paralleled the gradual standardization of the operating system environment, and the introduction of increasingly user-friendly and business function related software. Eagerly driven by goals to increase market share of their products, software development companies viciously competed to introduce programs and applications to support new business functions and to release software upgrades with enhanced features.

Large-scale computer applications to business went through two distinct phases:

- The software development phase; where programming and CASE tools were the main vehicles to build a system business application (mostly) on mainframe environment. The software development was supported by methodologies such as the waterfall development methodologies and a variety of CASE tools [13]
- The application phase, where readily programmed & integrated applications (solutions) for different business areas are ready to be deployed or implemented. Most of those are relational database and object oriented or Java application. Configuration and /or customization tools are used to tailor the application to meet specific customer's requirements.

The advance of computer technology, specifically in processing speed and data storage capacity from hardware viewpoint, and the emergence of (RDBMS) relational database management systems, and multi-tier client server architecture have paved the way for a new phase of information technology application.

Integrated ERP systems and best of breed business applications appealed to organizations, as offering comprehensive solutions and opportunity to revamp and re-engineer business processes. Businesses invest billions of dollars into implementation projects of such systems to serve all business function and processes in Finance, Human Resources & Personnel, Accounting, Asset and Maintenance Management, Inventory Management, Fleet Management, Facility Management, Project Management & Planning, Procurement and Contracts etc. [1]

The complex nature of the implementations, have highlighted the need for structured methodologies, to guide the planning, management and control of project activities by a sizable team. The criticality of time and cost factors in completing project activities highlighted the need to effectively use and utilize different supporting software and IT tools. [7]

2. IPRM: The Integrated Project Risk Management Methodology

2.1 Research Background

The investigation of the effectiveness of the risk models and approaches adopted in a number of IT projects indicate clearly that there is a lack of, and a need for an appropriate risk management model that can be used effectively in the management of IT projects with the following characteristics:

- flexible enough to be integrated to the system development methodology, project management and planning
- effective management tool which will help in the decision making process.
- tailored to suit IS environments and the specific issues affecting the implementation of major projects

The proposed risk management (RM) model is based on the analysis of existing RM approaches, standards and guides, and supported by findings from typical IT projects case studies. The risk model is integrated with project management and planning and can be used by management as an effective decision making tool, see figure 1.

The initial proposition introduced the main feature and the general outlines of the model. However, the details of the model, its testing and fine-tuning would be part of a comprehensive work that is a subject of a doctoral research. [1]



Fig 1 The Integrated Risk model

2.2 IPRM: Features & Components

Refinement of the model included analysis of data from a number of IT projects with different levels of commitment to risk management. This has resulted in introducing some modifications to the initially proposed 'integrated risk based model'. It was evident that the adoption of the proposed model would not produce the sought benefits unless it has been combined with supporting programs, procedures and IT tools.

The introduced modifications have expanded the scale of the proposition to what amounts to a comprehensive integrated project risk management methodology (IPRM), comprising the following components:

- Project Planning & management - Risk modeling & management

- Quality Standards & Procedures
- Awareness programs



- Software and IT Tools

Fig (2) IPRM features, integration of project & risk management and planning

IPRM promotes comprehensiveness, integration, continuity and effective use of supporting tools in order to cope with environment complexities and variables and to ensure project success:

1. Comprehensiveness:

IPRM is not merely a project management methodology guiding the progress of an implementation of a new system in isolation of the business strategic, tactical and operational plans. It is a comprehensive approach with different components addressing all aspects – business, administrative, managerial and technical – and sets the roles and relationships between all involved parties.

2. Integration

The IPRM implementation methodology seeks to integrate risk principles, concepts and practices tightly into project planning and management. Standard risk management activities such as risk identification, assessment, analysis, ranking, treatment and control are based on risk standards and procedures and are applied at the planning stage by projecting risks onto the project plans, and are reviewed regularly, as shown in figure 2. Risk profiles at project activity, phase and project levels are consolidated to be used by management as decision-making tools. The risk management awareness program is applicable to all team members to promote an environment of informed risk decision-making and judgment at all levels by all project employees.

3. Continuity (Life Cycle Approach)

Investment in computer systems and applications is important and can be critical to the business both functionally and strategically in order to achieve the goals and objectives and do actually impact on the business bottom line.

Thus it is perhaps justified to view the acquisition of computer application as company assets. This may include all the components adding up to a solution (application software, databases, information, hardware). By adopting this approach IPRM considers the lifecycle of the application solution assets that includes the three phases (pre-implementation implementation and post implementation). IPRM is mainly concerned with the implementation phase but is also concerned with the links to the other two phases at both ends, as shown in figure 3. Only through this project success or failure can be realized properly. After all, the main driver for investment is the return on investment, which is outside the boundaries of the implementation phase.

4. Effective use of supporting tools and software

Analysis of how we perform work tasks or project activities indicate that we are spending more and more time in front of our PCs and becoming increasingly dependent on IT tools, computer programs and software to help us complete our assignments much faster. Since time is the most important variable in project, it makes since therefore to consider the suitability and effectiveness of using such tools in projects. It is also important to highlight that accuracy and precision in performing complex tasks that involve is another important benefit time saving is only one benefit among many others associated with usage of IT tools and software, such as data storage, presentation. not the only benefit. However, using IT and more accurate and precise and more presentable.

5. Proactive Risk Reduction component

Recognizing the criticality of project activities in certain areas, IPRM adopts a proactive approach to reduce risk levels:

-To ensure the implementation team members from both client and vendor have the appropriate knowledge and skills in their respective areas, including the ability to use supporting IT tools and software.

-To ensure organization preparedness to integrate the system into its business processes.

-To ensure that the technical infrastructure environment (hardware, software, network) meet requirements to run applications smoothly at server side and to enable users clients reliable and reasonable speed access.

-To ensure the availability of data necessary to the system, correct and in the proper format.

-To ensure users have training, awareness, information resources, and change managed.



Fig 3 Representation of the integrated nature of the main components of IPRM over project life cycle

2.3 IPRM: Software Tools Component

The implementation of major IT projects are intensive IT environments that involve:

- The applications, programs and databases associated with the business solution and
- The software programs and tools that are used to support the project implementation.

The first group includes expensive software programs, relational database applications and computer systems serving corporate business areas such as, Finance, Inventory management, Purchasing & Contracts, Asset maintenance management, Production, Human Resources etc.

The second group of software and IT tools is not as expensive, yet of great importance to the success of the implementation project and support the project manager and project team throughout the project. They may be software used for planning and tracking the project activities, support risk analysis and ranking, project documents management, finance control or office / administration software used for correspondence, reporting, documentation and presentations.

The supporting software and IT tools component of IPRM methodology comprise the following tasks:

- a- Project and Risk management software and tools:
 - The project and risk management integration nature of the methodology make it critical to select the suitable tools and software to perform the related tasks throughout the project. This includes activities such as; project planning, scheduling and tracking, risk assessment, analysis and treatment.
- b- Analysis of project team function-software skills

As part of the project planning & preparation phase, the functions and the project activities for each project team member (resource) are consolidated and a suitability assessment study is conducted to identify the most effective IT tools and software programs. After completing the exercise for all project teams and all project activities, gap analysis is conducted to identify the areas where software training or orientation is needed for the project team members from both the vender and the customer side. Skill gaps are bridged by means of structured training programs.

c- Project's Technical Infrastructure

As part of the project planning & preparation phase, a suitable technical infrastructure standards are agreed to define the project's operating environment (software, hardware and network) and helpdesk procedure.

3. Investigation Framework & Analysis

The investigation is focusing the areas where IPRM considers the software supporting tools usage is most critical to the success of projects:

- Project & Risk Management Software & Tools
- Project Team Function Software skills
- Technical Infrastructure

We use the findings of a survey to support our investigation of the above, with consideration of the IT project environment and the current (suitability and effectiveness) of tools usage in IT projects. We also consider the measures to improve the suitability and effectiveness of IT tools and the technical environment through the risk reduction component of IPRM.

The survey took the form of in-person interviews with many IT professionals involved in five major IT projects within the United Arab Emirates. The interviews were arranged by telephone or email.. The majority of the interviews were conducted over a cup of coffee in a non-work environment and they averaged 1.5 hours.

Two different questionnaires were used,; one for interviews with project managers and the other for interviews with other professionals. The survey was designed with pre-decided aim to adopt a descriptive statistics data analysis method, that may include counts, proportions, central tendencies and or measure of variations.

The survey included in-person interviews with five people from each of the following categories:

Project managers, quality assurance / control coordinators, business team leaders, technical team leaders, business consultants, technical consultant, office administrator, system administrator, database administrator, data entry operator, application analyst, support engineer

3.1 Project and Risk Management Software & Tools

		Project 01	Project 02	Project 03	Project 04	Project 05
1	Structured Methodology	90%	90%	80%	85%	75%
2	Project Plan & software rate	85%	85%	80%	85%	75%
3	Risk Plan	Y	Y	Y	Ν	Ν
4	Risk analysis software	2 (spreadsheet)	3 (@Risk)	0	1	0
5	Number of plan's versions	2	3	9	5	6
6	Number of variation orders	0	2	4	3	5
7	Overrun (delay) delay /target	1/12	3/18	3/12	2/15	4/12
8	Overrun (cost) cost variation/target	5%	10%	12%	18%	23%
9	Performance /function	90%	85%	80%	75%	75%
10	User Satisfaction	75%	75%	75%	70%	60%
11	Success rate (by project manger)	85%	90%	80%	80%	85%
12	Success indicator (by applied model)	76%	67%	59%	57%	39%

Interviews with the project managers category indicate the following:

Table 1 Use of support technologies across the five projects

Delay and cost overruns are the most important indicators of project failures. User satisfaction and performance (functional & technical) are correlated to project success. The ratings in the table are based on a criteria explained to the interviewee, then normalized and incorporated in a simple model equating project success to the four relevant parameters. Raw 12 of the table indicate the success of the project.

We have the following observations:

- By comparing the project managers rating of the success of the project in raw (11) to the success indicator in raw (12) it is clear that there is a exaggerated view of the success. While this is understandable, ideally a third party is more suitable to make such judgment.
- It is evident that project 01 & project 02 are more successful than the rest of the projects. Those are the projects which seem to have been more committed to a structured project management approach and have adopted some risk planning and used risk tools (spreadsheet in project 01 and Crystal ball in project 02). However, Project 05 seem to have been improperly planned and managed and has resulted in overruns and failure in performance and customer satisfaction. This may be referred to as an uncontrolled environment that can be vulnerable to high risks.
- Managers of project 01, project 02 and project 03 agreed that integrating easy-to-use risk management tools could contribute to the success of projects. Manager of project 04 suggested that project planning software are sufficient and that risks need not be formalized. The manager of project 05 suggested that adopting risk management component and tools is a time burden of little benefit.
- The manager's skill in using project planning and management (MS Project) seems to vary; two of the managers seemed to lack basic understanding of the concepts and the software usage. Manager of project 02 seemed to be the most knowledgeable of different planning and management tools (PERT, MS Project, Primavera)
- Three of the managers failed to define the basic concept of risk management.
- Four of the managers recognized none of the commercial project risk management software (@Risk, OPERA, CRYSTALBALL, FUTURA)
- Project managers usage of different software and IT tools to support their tasks as follows: (averaged)

Resource	Mail	WP	SS	DB	FC	PR	SQL	MM	RW	www	PM	RM	System Tools	IT tools	Tools %age	
Project																
Manager	10%	5%	4%	2%	2%	10%	2%	2%	0%	10%	22%	5%	5%	74%	79	%

Table 2 Use of software applications by project manager

WP= Word Processing, SS= Spreadsheets, DB=Databases, FC= Flow Charting, PR= Presentation, MM=Multimedia, RW= Report Writing, WWW=Internet, PM=Project management, RM=Risk Management

IPRM defines the roles and relationships of all project team members. The roles are projected as project tasks onto the project plan. The project manager is the key project member responsible for the success or failure of the project. Therefore, IPRM associate the PM role with all the project and risk planning and management activities throughout the project cycle and defines the supporting tools.

3.2 Analysis of project team function-software skill

In this part of the survey each of the interviewees provide an estimate of the time of using different software and tools to complete project tasks assigned to him / her as a project resource. The estimated time is translated to a proportion of the total hours. The results from interviewing 5 persons from each category are consolidated and averaged out.

task	Planned (Hrs)	Mail	WP	SS	DB	FC	PR	SQL	MM	RW	www	PM	RM	System Tools	System Tools %age	IT tools	IT Tools %age	Total Tools	Tools %age
Prepare Functional Specification	80.00	3	20	6	5 2	8	2	2	2	c	4	1	C	10	13%	50	63%	60	75%
Set-Up Screens	40.00	2	2 2	2 3	3 3		d c	C	3	C	2	1		18	45%	16	40%	34	85%
Set-Up Value Lists	24.00	1	2	2	2 2		c c	2	0	C	0	1	0	12	50%	10	42%	22	92%
Specify Item Merge Facility	32.00	1	2	2 2	2 C	3	з с	2	0	C	0	1	C	10	31%	11	34%	21	66%
Specify Item Audit Trail Facility	32.00	1	1	1	C	0	d c	1	1	C	0	1	0	6	19%	6	19%	12	38%
Specify Inventory Reports	240.00	6	95	12	2 4	12	2 4	. 6	6	24	12	1	0	30	13%	182	76%	212	88%

Table 3 Business Consultant project activities vs. software usage.

For example, one of the project tasks assigned to the Business consultant is the task 'Prepare Functional Specification'. the total hours. The estimated duration of this project tasks is 80 hours (10 days). The estimated number of hours of software and tools usage by the Business consultant to complete this task is entered against different applications such as mail 3 hours, Word Processing 20 hours, Spreadsheets 6 hours etc. The time using different software is added (IT Tools 50 hours) and this total divided by the task duration (80 hours) represents the percentage of the task duration where software or IT tools have been used by the resource (IT Tools % age 63%). System tools are development or configuration tools used to customize the system to meet the requirements of customer such as screen editing tools or database configuration tools. The time of using such tools to complete the project task is also estimated (System tools 10hrs)and the percentage of system tool usage to total activity duration is worked out as a percentage (system tools % age 13%). The procedures are repeated for all project tasks and the results are consolidated. The exercise is repeated for 5 business consultants. (see Table 4).

The results from interviewing 5 persons from each category are consolidated and averaged out.

Dessures	Mail		~~										System	IT toolo	Tools
Resource	IVIAII	VVP	33	DB	FC	PR	SQL	IVIIVI	RVV	~~~~	PIVI	RIVI	TOOIS	10015	76aye
Business Consultant	5%	!4%	5%	7%	4%	4%	3%	4%	2%	3%	2%	1%	23%	40%	63%
Technical Consultant	5%	6%	3%	12%	4%	3%	10%	1%	6%	4%	1%	0%	42%	55%	97%
Office Administrator	13%	23%	6%	0%	2%	9%	0%	1%	0%	4%	3%	0%	2%	61%	63%
Database Administrator	5%	4%	2%	17%	2%	1%	8%	1%	0%	5%	1%	0%	18%	46%	64%
System Administrator	5%	5%	4%	8%	2%	2%	10%	1%	9%	3%	2%	0%	20%	51%	71%
Application Analyst	3%	5%	6%	5%	1%	0%	6%	0%	13%	2%	0%	0%	24%	41%	65%
Support Engineer	13%	3%	3%	7%	1%	0%	2%	0%	0%	3%	0%	0%	8%	32%	40%
QAC	9%	10%	7%	6%	7%	6%	0%	2%	0%	3%	15%	18%	3%	83%	86%
Data-Entry Operator	5%	2%	10%	10%	0%	0%	0%	0%	0%	0%	0%	0%	25%	27%	52%
Business Team Leader	8%	7%	6%	4%	4%	5%	0%	3%	0%	4%	6%	1%	5%	48%	53%
Technical Team Leader	7%	5%	7%	5%	4%	5%	2%	1%	0%	4%	6%	1%	6%	47%	53%
Project Manager	10%	5%	4%	2%	2%	10%	2%	2%	0%	10%	22%	5%	5%	74%	79%

Table 4 Summary - Project team usage of software and Tools

By having a close look at the information presented in table (4) we have the following observations:

- a clear indication of the importance of software and tool usage by project team members to complete their tasks successfully and effectively. Up to 86% of the Quality Assurance Coordinator time is spent in front of PC using a software or an IT tool. The support engineers at the other end of the scale spend only 40% of their times using software.
- It is evident that by multiplying the resource total cost by the IT tool usage %age the estimated cost to the project of activities that are mainly completed through usage of such tools. This highlights the criticality of ensuring the ability of all members to use the suitable software and IT tools effectively. This confirms IPRMS Resources Function-Software skill analysis in order to identify and address possible skill gaps. Example; The business consultant activities cost an estimated (\$165,250*40%=\$66100).
- It is clear that management and team leaders have little involvement in usage of system configuration tools because of the nature of their activities. However, they spend over 50% of their time using software. Most commonly used tools are mail, word processing and spreadsheets. It is very clear from the interviews that the skill level in using such software is not high. Most of the interviewees have only basic skill level of using these software and actually seek help from office administrators.
- The Mail software seems to be consistently used by all parties, indicating the importance of communication between the different parties because of the complexity of the project and the size of the project team.
- Database, software and SQL seem to suit the technical resources in completing their tasks. This makes sense as the implemented applications are relational databases.
- There is a clear indication of the lack of involvement of the resources in risk and management tools. Clearly, in adopting a methodology such as IPRM, it will be expected from all resources to be able to apply risk concepts to support them in making decisions related to the completion of their tasks. Risk awareness programs are highly recommended.
- QA&C seem to be the party most involved in project and Risk management tool usage. This is probably because QA&C seem to playing a supporting role to the PM.

3.3 Technical Infrastructure

The project technical team leader is the custodian of the project technical infrastructure and needs to produce a comprehensive document detailing the policies, processes and procedures related to ensure a secure effective IT environment. This may include details of the standard operating environment; operating system, standard software, IT tools, internal and external security policy, archiving, data backup and storage, hardware and software inventory, and helpdesk procedures.

The huge number of documents of different formats produced by the different team members indicate the value of having a document management system to control the flow and storage of the project documents and files.

4. Conclusion

Considering the rate and scale of IT project failures, it is imperative to search for alternative methodologies to avoid failures and ensure success of projects. IPRM is proposed to be that alternative. Failure avoidance is achieved by integrating risk principles and practices to project management. Ensuring success is achieved by adopting best of practice concepts as part of the methodology. The importance of the effective use of software and IT tools is highlighted by the findings of surveys. Professionals are increasingly dependent on tools for accurate, timely completion of assigned project tasks. Failure to do saw will result in either accumulated delays or quality compromise. Both can result in project cost overruns, the main ingredients for project failure. The same rationale apply to project and risk management software. Proper planning and control of the project environment and variables is of a paramount importance to the success. Thus the effective use of software and IT tools and the structured approach to technical infrastructure represent an important component of IPRM methodology.

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