Project Management (PM) Prosperity: A Second Half of the 20th Century Literature Review

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Abstract

The present study firstly adopts a holistic approach upon the project management (PM) principles that prevail in the relevant business, services, and high-technological environments during the second half of the 20th century. Particularly, this study presents and chronically categorizes existing literature works that are exploring the project management, in combination to other affiliated managerial and administrative tools. The bibliographical overview was implemented through bibliographical databases research during the first half of the year 2011. The outcome of the above research is presented as relevant Table-formatted information. Secondly, a specified project was selected and unfolded in parallel to the above general/holistic approach over the study. Finally, the data collected were categorized in eight sub-groupings revealing that the orientation upon project management in a continuously changing and globally liquefied economic environment is equally determined by human and non-human entrepreneurial characteristics.

Keywords: Project management, Life cycle, Risk management, Applications, Case study, Laboratory, Review

1. Introduction

Behind a typical project management system, there are the following four basic phases, namely the PM: Initiate, Specify, Implement, and Close (Murch 2007; Stetler et.al., 2008).

1.1 Initiate

In this phase the information is gathered about a project's aims, objective, scope, strategy, and key components. A rough time and cost estimate are also calculated, while the end point of this phase is the decision on whether or not the project leader will proceed in the project materialization or not. In the "Initiate" phase, the determining parameters are the concentration on the strategic objectives, the adequate and appropriateness of available resources, the co-evaluation of all potential alternative choices, and the handling of complex and/or environmental threats at the more advantageous choice.

1.2 Specify

This phase include all the work to be undertaken – Work Breakdown Structure (WBS), and the desired end results – Product or Component Breakdown Structure (PBS or CBS). Moreover, the phase includes the assignment of responsibility for carrying out the necessary work in matrix format or composite plan such as Gantt charts and PERT charts, as well as the resource requirement. This phase is also resulting in the project budget and schedule.

1.3 Implement

This phase is considered as a foregone conclusion to implement the project, and especially managing the factors that were not foreseen. Frequent monitoring should be carried out and focused reviews should involve all the stakeholders in keeping the project on tract. Additionally, decision-making will concern whether and how to release the new development, leading to refinement or scrapping the project's results altogether.

1.4 Close

The phase of a project closure can have the consequences of failure to benefit from the project's achievements, doubt over the responsibility for the project's results, failure to learn from the project management and its intermediate progress, and waste of economic and human resources, involved in the project. In this phase could

be also noted that a project should be categorized as physical or non-physical. This project's categorization is helpful in making decisions about the project team, the nature of planning and communication at reasonable intervals that should take place. Moreover, this physical-categorized project has the advantage of being clearly ended; the main concern is the re-deployment of all the project-compounded human, physical and non-physical resources.

The above successive phases, even non closed/non loop-shaped, could have a broad application to many different types of projects, offering a useful starting point for a discussion of the key stages in each project life and implementation.

2. Literature overview upon project management during the second half of the 20th century

The relevant literature in the project management involvement in the contemporary globalized economy is vast. The present study aims at revealing the determining parameters of a temporal project management approach during the second half of the 20th century. The references' outcome is categorized within eight sub-groupings, which are presented in eight relevant Tables. Additionally, this holistic approach has been further focusing on a specific case study application adopted from the academia environment; that reveals the critical factors affecting the project management in this in-field case.

Table 1 presents a references' overview upon the project management and its instrumental characteristics and applications in the business environment; Table 1 – Instrumental Characteristics. Moreover, this study adopts that the main organizational parameters determining each project's organization and people, are the Project Team and the Contractors. These two features that influence each project successful implementation are presented in the Table 2 – Project Team, and Table 3 – Contractors, respectively. All references are presented from the latest to the earliest, with author(s) last name alphabetical list.

Placement of Table 1

Placement of Table 2

Placement of Table 3

The present literature review aims firstly at unfolding the main administrative tools of PM implementation, during the second half of the 20th century. Consequently, the accompanying case study of PM implementation focuses on the PM consistence to a contemporary PM academic project; further revealing all the determining procedures that are involving to an up-to-date PM approach in a liquefied business environment. Conclusively, the study denotes that the managerial handling of both human and non-human resources play an equally influential and critical role to a viable entrepreneurial prosperity.

3. Case Study information

3.1 Description and Principles of the examined project

The examined project is the installment of an experimental device in one laboratory of a Technical University. Particularly, the above project is identified as external and physical; where it merits leadership from beyond functional line and draws on functional resources. The characteristics of the above project are:

Firstly, the project leader is an academic Professor, being the Director of the above laboratory. Secondly, the project team consists of one senior researcher and three specialists employed on a contract basis. Thirdly, the device is delivering and installing within the laboratory environment of the Technical University.

In the following sections, it is noteworthy to further presenting the background and principles, which each one of the above project stakeholders deserves.

3.2 Project team characteristics

The project leader, as an academic staff, based on his educational experience at the field of his scientific expertise, is responsible to materialize the project. Besides, the roles of each team member in the examined project are determined with the following PM systematic approach:

Scoping the rationale of the device ordering, besides the environment in which it will be undertaken.

Specifying what needs to be done and to what standard levels of the project.

Planning how and when the project will be implemented, and by whom.

Reviewing progress and controlling the use of resources.

3.3 Success and failure criteria of project implementation

Generally speaking, the project has to be considered as a non-routine task undertaken to deliver a beneficial result, meet pre-defined specifications, having defined time and cost features, and containing an element of risk.

The examined project, by its nature, requires a diversity of resources, such as people with different skills, expertise and interests, besides a range of different equipment items. The functional structure, even though offering clear communication and responsibilities lines, does not contain the flexibility to integrate resources with a viable prosperity. Therefore, the examined project is assigned to its specific multifunctional scope. The project fits naturally within the laboratory environment, but it is also noteworthy that the success/failure prosperity of the project is endangered by the potential involvement of other functions, departments' complexity, bureaucracy confrontation, and unavoidable conflicts' resolution.

Therefore, the examined project prosperity is evaluated according to its scope, rationale, and responsibilities clarification. Additionally, the project is materialized in the view of the technological acceleration and its maximizing benefits of developing technologies; besides controlling arising problems, conflicts, and risks. It is also apparent that the incorporation of up-to-date device in the examined laboratory is fostering the viability and credibility of the outcoming research within the scientific arena; thus intensifying competition by eliminating the falsely measurements due to out-of-warranty devices, and optimizing the internal laboratory leadership outcomes/procedures with high speed and low costing outcomes.

Other determining factors of the examined project success are the appropriate determination of the involving technical and environmental uncertainty, the precise anticipation of the influential role of external factors, the cautious progress in all the project stages, the need for cooperation of team working from dispersed teams, the size of the undertaking, the complexity of the work, and the urgency of decline.

Furthermore, attempts to point out potential failure criteria of the examined project implementation, are not improving performance. Project implementation is further affecting by the project leader prejudice towards the software role, and the necessity of his involvement of complex processes could be valued as enemy/time-consuming, no ally, to the overall laboratory prosperity. It is also possible that despite the laboratory staff training, it would be claimed of not fully understanding the installed system or its viable adaptation to the regional educational status/culture of the deliverable country. Conclusively, the laboratory staff could withstand of being expertise to the newcoming device, thus quietly return to manual or more "conventional" experimental techniques.

4. Project management implementation proposal

As it is already aforementioned, the detailed roles of each team member in the investigated case study are determined with the following project systematic approach (Koskela and Howell, 2002; Lewis, 2007):

Scoping the rationale of the device ordering, besides the environment in which it will be undertaken. Particularly, the determining environmental parameters of the proposed device could either be an up-to-date apparatus replacing an obsolescent device already occupied in the laboratory; or an almost modern multifunctional device that could effectively replace numerous obsolescent apparatuses of the laboratory.

Specifying what needs to be done and to what standard levels of the project. In particular, for the scope of the presented case study, it is assumed that the examined device is multifunctional, thus effectively replacing obsolescent apparatuses of the laboratory. The main standard level of maintenance is achieved through the device successful installation in the laboratory, the training of the laboratory senior researcher, and the regular calibration of the device with the support of all the three specialists and the regional company's representative in the deliverable country.

Planning how and when the project will be implemented, and by whom. As it is aforementioned, the planning approach is mainly characterized as responsibilities' allocation, taking into consideration the scientific background and the nature of expertise of all the stakeholders involved. A possible response to the time of the project implementation would refer to the time of laboratory funding either from indigenous resources or as a part of a wider European or International Educational Project. The way of the project implementation is determined by either the existing mutual satisfied collaboration with an external provider (scientific apparatuses' company), or in terms of the current European or International Educational Project. For simplicity reasons, in the adopted project it is assumed that the external provider is an existing experienced collaborator of the laboratory. This choice has the advantage of devotion; therefore, the successful implementation of the project is considered as granted, at least of the burdening allocation that refers to the external provider responsibility. This partnership

also warrants the successful future calibration of the multifunctional device, as well as the technical problems' smooth resolution, whenever this need arises.

Reviewing progress and controlling the use of resources. This stage refers to the overall monitoring throughout the device ordering, installation, staff education, calibration, and technical maintenance.

As it has been already presented in the first three literature sub-groupings, being presented in the Tables 1 – 3 respectively, the literature data exploitation is further materialized according to the following five determining organizational parameters, which are involved in their project management processes and procedures. Theses five parameters are also taking into consideration the examined case study project, namely the new device project in the examined laboratory of a Technical University.

Therefore, the following five groups are the: 1) PM in laboratories, 2) PM and devices' certification, 3) PM and life-cycle, 4) PM and its scheduled applications and parameters, and 5) PM and Risk Management (RM). These five features are presented in the corresponding: Table 4 – Laboratories, Table 5 – Devices' Certification, Table 6 – Life-Cycle, Table 7 – Scheduled Applications and Parameters, and Table 8 – Risk Management, respectively. All references are presented from the latest to the earliest, with author(s) last name alphabetical list.

Placement of Table 4

Placement of Table 5

Placement of Table 6

Placement of Table 7

Placement of Table 8

5. Discussion

While attempting to categorize the above presented eight sub-groupings of the data extracted, a credible methodology to investigate both the PM approach during the examined period, and to rationale the PM orientation and implementation, is described in the following "summarized" Table 9. This table depicts the eight sub-groupings proposed, the total references within each sub-grouping, and the references' contribution with the overall PM approach in a decade-based index.

Placement of Table 9

Table 9 shows that the proposed categorization of the determining parameters affecting the PM implementation reveals a dipolar structure of significance. On the one pole, the three Groups 6, 7, and 8, occupy the 46% of the total references. Therefore, the PM is predominately affected by the non-human entrepreneurial characteristics, namely the business life cycle, the scheduled applications and parameters, and the risk management. On the other pole, the Groups 1, 2, and 3 –accounting 42% of the total references– signify that the PM is equally affected by human entrepreneurial characteristics. Indeed, this result is apparent from the fact that this "human-compounded" pole is mainly formed by both the project team, and the project contractors' stakeholders. Finally, the Groups' 4 and 5 contribution accounts only 12% of the total references' exploited. This conclusion should be mainly attributed from the adopted case study traits. In particular, both the Groups 4 and 5 characteristics –namely the PM in laboratories and the PM and certification– reflect a narrower scientific/academic area of interest, comparing to the wide spectrum of potent PM applicability.

Moreover, the outcome of the present review should be evaluated with respect to the total examinable period of the second half of the 20th century. Specifically, the proportion of the literature devoted in the PM approach during the last decade, 2000s, exceeds of 60%; while the relevant proportion reached hardly 20% during the first two decades of the present review, 1970s and 1980s. From the Table 9 it should be also concluded that this increased interest of the PM involvement towards the entrepreneurial prosperity is apparent from all the eight sub-groupings adopted in the present literature review.

6. Conclusion

The present study adopts a holistic approach upon the project management principles that prevail in the globalized economy. The methodology of the study chronically categorizes existing literature studies that are exploring the project management, in combination to all proposed affiliated managerial and administrative tools. The outcome of the above research is accompanied by a specified case study of the academia environment. The data collected were categorized in eight sub-groupings, showing both an indirect and dipole-compounded phenomenon. These two poles are the non-human and human entrepreneurial characteristics. Particularly, the "non-human" pole is represented by the business life cycle, the scheduled applications and parameters, and the

risk management; while the "human" pole is represented by both the project team, and the project contractors' stakeholders. The limited literature interest of the case study two sub-groupings, Groups 4 and 5 respectively, could be attributed to the specified character and the narrow applicability of the adopted case study, comparing to the overall range of the PM prosperity in the globally liquefied economic environment.

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Table 1. Group 1 – Project management and instrumental characteristics' overview

Ref. No	Bibliographical source	Thematic area	Decade: Subtotal of Refs
1	Brauers and Zavadskas, 2010	Project management and instrumental techniques	2000s: 7
2	Hartmann et.al., 2009	Project management of global new product launches	
3	Rebenok, 2008	Project management as enterprise's business strategy implementation	
4	Sehu and Thron, 2008	Instrumental project management in a Swiss railway	
5	Kolesar and Wïnterroth, 2004	Project management policies and practices for successful new medical device product introductions are adopted. With the support of a matrix management style set up, project managers are able to report obstacles to management for review and correction. Cross-functional interactions with authority and responsibility being shared among the team members, are also discussed	
6	Peña-Mora and Dwivedi, 2002	The study presents a collaborative project management system with a knowledge repository, analysis resources, and multiple device access, to support the infrastructure of distributed project management teams in complex architecture/civil engineering projects. The supportive role of PC-based resources, such as personal digital assistants (PDA) or phones, and the potential limitations on the computing device, are also discussed	
7	Hiller et.al., 2001	Instrumental multiproject management in an integrated project landscape	
8	Schneider, 1995	Project management in international and intercultural diverse teams forming a new communal working platform in transnational companies	1990s: 1
9	Bergen and Pearson, 1983(a)	A comparative analysis was studied the performance of firms in the scientific instrument industry in the UK and the Federal Republic of Germany. This analysis was based on a scored structured interview technique and incorporated the characteristics and role of the project leader	1980s: 2
10	Bergen and Pearson, 1983(b)	Influential parameters of productivity and performance in the scientific instrument industry, by using interviews at 32 companies in both the UK and the Federal Republic of Germany (FRG)	
11	Bula, 1974	Complementary role of both software and hardware projects' management as an instrument of leadership for hierarchically and horizontally projects' organization. Projects were formed in three consecutive phases: pilot phase; planning; implementation	1970s: 1
Total			**11**

Table 2. Group 2 – Project management and project team overview

Ref. No	Bibliographical source	Thematic area	Decade: Subtotal of Refs
1	Shtub, 2010	This paper presents a new Project Team Builder (PTB) software tool for integrating course textbooks and teaching them to professional project management students	2000s: 6
2	Cervone, 2009	The study defines and describes Pugh matrix analysis (PMA) as a method for decision making when there are multiple criteria that must be factored into a decision. Pugh matrix analysis (PMA) is useful as a method for understanding the relationship of multiple issues and determining a course of action as well as gaining consensus with a project team	
3	Kulkarni et.al., 2009	The fundamental and determined role of project teams in an organization is stated. The study focuses on the formulation and the effectiveness of project management in distributed software projects. Broader guidelines and skills, awareness, education, and connections in all knowledge areas of project management are also pronounced within an entire project team needs	
4	Yang and Chen, 2009	The study proposes a novel incentive pay system for project management based on responsibility assignment matrix (RAM) and fuzzy linguistic variables	
5	Settas and Stamelos, 2008	The proposes the Dependency Structure Matrix (DSM) as a method that visualizes and analyzes the dependencies between related attributes of software project management antipatterns. The proposed framework can be used by software project managers to resolve antipatterns that occur in a software project in a timely manner	
6	Woo, 2008	The study examines the adoption of a functional matrix structure by a project driven enterprise in China to further the knowledge of the practices of managing Chinese project driven enterprises and their Chinese management characteristics	
7	Robins, 1993	The study states the effective project management within a matrix-management environment, pointing out that control can only be achieved if authority is vested along with responsibility in the delegation process	1990s: 2
8	Lovett et.al., 1991	The study uses survey results of perceptions to total quality management (TQM) implementation plan by matrix oriented project management personnel in Hilton Systems Inc (June, 1989)	
9	Clymer, 1984	A project- oriented matrix is an organizational structure where technical specialists are supervised by functional mangers, but are assigned to work on various projects, managed by different persons. This paper, firstly, describes organizational factors that influence most interdisciplinary ID projects and relate them to the features of the project-oriented matrix; and secondly, lists and explains specific matrix management strategies that instructional developers can use to solve common management problems	1980s: 3
10	Shlaer et.al., 1984	The Project Matrix, a model and methodology for software engineering project management, is described. This model has proved to be effective in coordinating the work of many people, managing the projects' operations, reducing the complexity of the software process, and producing high-quality results	
11	Eglinton, 1982	Prospects of matrix organization for project management	
12	Starke,1979	The woman's point of view in the field of business, at her entering the field of project management in male-prevalent working environment	1970s: 2
13	Dullien, 1975	Prospects of matrix organization for project management	
Total			**13**

Table 3. Group 3 – Project management and contractors' overview

Ref. No	Bibl. source	Thematic area	Decade: Subtotal of Refs
1, 2	McDermott, 2011(a) and McDermott, 2011(b)	The study states the development of a cost accounting and project management system for a small defense contractor. The defence industry was chosen for its rich array of incentive-based contracts, which provide unique challenges to management accountants. Most principles taught in the study are applicable to contractors in other industries (parts 1 and 2, respectively	2000s: 6
3	Elbarkouky and Fayek, 2009	The stages involved in developing a project management (PM) structure that defines the responsibilities of owner organizations in a managing contractor (OMC) project delivery model, are presented. This research is supported by one of the largest oil and gas owner organizations in Canada, managing its projects using its internal resources	
4	Luu et.al., 2008	A conceptual research framework was generally developed to perform a benchmarking study of the project management performance (PMP) from the contractor's viewpoint. Three typical large contractors are involved in this study to validate the research approach. The study provided nine key performance indicators (KPIs) which can be applied to measure PMP and evaluate potential	
5	Anonymous, 2003	Project management capability key to selecting engineering contractors, is investigated. The study designated seven engineering contractors as leading firms (Bechtel Corp, Fluor Corp, Jacobs Engineering Group Inc, JGC Corp, KBR, Snamprogetti SPA, and Technip-Coflexip). Study evaluation covers capital investment, owner perceptions, EPC contractor selection, and strategic issues	
6	Aschaber and Daschutz, 2000	Strabag was the building company that acted as general contractor, was commissioned with the entire execution of the construction work, a 5.4 km road project in the south of Linz. For this purpose a project-related quality management system (PQM) was developed on the basis of the international ISO 9000 standards. In addition to faithfulness to deadlines and absence of cost overruns, special attention was paid to the quality of the construction work by both the general contractor and the contracting companies who were in charge. In spite of the new type of project management the only novelty was the use of a controlled and selective internal surveillance system, which had been laid down in the PQM system in a detailed/comprehensible manner	
7	Westhaver et.al., 1994	The 1994 Alaska flood recovery demonstrated an excellent regional management, since the region successfully recovered in minimum time and within the forecasted budget. This recovery was achieved by a general contractor employed by government agencies to manage the reconstruction effort	1990s: 1
8	Anonymous, 1985	A turnkey contract had been placed by PT Cold Rolling Mill of Indonesia Utama (PT CRMI) with a consortium of contractors. The project management was computerized with software which allowed cost control and scheduling to be done with the same data base, the same language and non-specialist operators	1980s: 3
9	Kingsnorth, 1983	Project management with a contractor in the mining and metallurgy sector	
10	Ritchie, 1983	Computer aided project management: a point of view from a contractor's project manager	
11	Richards and Donovan, 1971	The study illustrated one means of contract coordination employed by experienced to turnkey contracts, international company. The diverse requirements of the contract, the high locally manufactured content, and the long distance between prime contractor and customer indicated that best coordination would be obtained by appointing two project managers, UK and Australia, with equal general authority but each with overriding authority in his own sphere of activities	1970s: 1
Total			**11**

Table 4. Group 4 – Project management in laboratories' overview

Ref. No	Bibliographical source	Thematic area	Decade: Subtotal of Refs
1	Dillard, 2005	A major curriculum reorganization that created four robot laboratories, introducing students to laboratory procedures and designing projects' management is presented. The new goals and methods for the robot laboratories included fully custom design, design of experiments, generating diagnostic procedures, project management, and, independent learning	\
2	Fox and Spence, 2005	The study presents the results of an empirical laboratory study that examined the influence of decision style on a project manager's use of the project management tool, Microsoft Project. Project managers from eight companies participated in the study, and generated an interesting pattern indicating that significant differences exist with respect to the use made of a project management tool when the project manager's decision style is taken into consideration. Determining factors of the study were the analytical, conceptual, or behavioral approach on behalf of the managers, the time taken to complete the plan, and the accuracy of the plan	
3	Cano and Sáenz, 2003	The concept of project management simulation laboratory in order to research the mechanisms of knowledge acquisition in the project management environment is described in the present study. The framework, under which the laboratory operates, was based on: simulation techniques, means that allow knowledge transfer around simulation games playing and the behavioural approach in the design of experiments. The circumstances under which the participants achieved an optimum learning and the influence of the players' motivation were analyzed. Indications and working lines were posed in order the study's confirmation and broadening	
4	Parten, 1995	The Electrical Engineering Laboratories at Texas Technical University were used to develop the students' project management skills. Using sophisticated computer tools, students made an excellent job of managing and reporting on projects. These types of laboratory projects and the required planning and tracking mechanism, enhanced considerably the students' experience in project management	1990s: 1
5	Morgan, 1984	Three steel works' Computerized Production Control laboratory Systems were described where, over a period of time, their design and project management had had to increasingly take account of the effects and influence of electromagnetic radiation from the analytical instruments and from the overall works' environment. Chemical analyses, plants' design, and availability for their operation and function were crucial factors of the outcomes' evaluation	1980s: 2
6	Woodall et.al., 1984	This analysis identified the basic parameters in which Conversational & Interactive Project Evaluation & Control (CIPREC), being implemented throughout the R&D division, would be expected to operate, including the nature of, and responsibilities for data collection/processing/updating, report distribution, and project related decisions. In this manner, the application principally became a matter of adapting CIPREC to address an already defined set of requirements	
Total			**6**

Table 5. Group 5 – Project management and certification, according to the case study, overview

Ref. No	Bibliographical source	Thematic area	Decade: Subtotal of Refs
1	Franceschini, 2007	Management plans and certification of project management	2000s: 4
2	Abraham and Boetticher, 2006	Project Management Institute (PMI) identifies project managers who have satisfied a standardized set of requirements and validates this knowledge with the Project Management Professional (PMP) certification. Professional certifications can provide competent managers vital to organizations' economic viability. A risk associated with becoming certified is that certifications only prove professionals are book smart but may not have the hands-on experience. Other risks are the amount of time and effort required to complete the application process and pass the examination. Certification, also, requires acquiring professional developments units after attaining the initial certification	
3	Kuprenas and Nasr, 2006	Project management training and certification for a public sector engineering organization	
4	Anonymous, 2001	A representative applied study at project management is presented. Indicatively, a company that designs, produces and sells marine lighting and electronics for the shipping and offshore industry is shown. This company is represented by Theunissen Technical Trading (TTT) in the Netherlands. The services offered for the cruise and ferry markets are outlined. Company's dimming system, GALL Low-Location-Lighting System and fibre optic applications are also described	
Total			**4**

Table 6. Group 6 – Project management and projects' life-cycle overview

Ref. No	Bibliographical source	Thematic area	Decade: Subtotal of Refs
1	Favaro, 2010	The software project management body of knowledge is gradually being renewed across the entire lifecycle. The conception, construction, and the project conclusion phases, are also analyzed in the present study	2000s: 8
2	Patanakul et.al., 2010	Even though project management tools and techniques (PMTT) have been commonly used by project managers, research on PMTT still lacks of evidence to whether its use contributes to the success of a project. Therefore, large-sample study based on a survey and statistical analyses investigates the use of PMTT	
3	Yin and Chen, 2010	The life cycle project management theory has helped to improve the defects of traditional project management model and improve the performance of project management to some degree. The present study focuses on China's government investment projects, applying the life cycle project in the government invested project	
4	Jin et.al., 2007	Project Management (PM) consists of three core interactive processes: planning, execution and controlling. In the present study, Product Life Cycle Support (PLCS) –an emerging ISO standard (ISO 10303-239)– addresses the through-life product information and provides a base to improve project management	
5	Jaafari and Doloi, 2002	The study adopts a simulation model specifically designed for holistic evaluation of project functionality within a life cycle project management framework. The description of a methodology for development of the aforementioned tool, referred to as a dynamic simulation modeling system (DSMS), is also presented. The aim of the above development is to apply the simulation technique, in order to evaluate the overall project functionalities from the dynamic business perspective	
6	Anonymous, 2001	In the present study the project management is focuses on a simulating project life cycle, making better decisions	
7	Chaaya and Jaafari, 2001	The study introduces a visual design management system, developed to reflect the fundamentals of information and design management within the life-cycle project management paradigm; thus focusing on the creation of a business to service the project objectives employing concurrent engineering/construction approaches	
8	Jaafari and Manivong, 2000	The focus of this article is on life-cycle objective-based project management models in general. The model has been designed (1) to facilitate employment of life-cycle objective-based project management approaches and (2) to support concurrent engineering and construction, thus promoting greater integration of total processes under which projects are proposed and implemented. A detailed case study of a large capital project, was applied	
9	Gransberg and Ellicott, 1997	Life-Cycle Project Management (LCPM) is considered as the management of the entire life of a project from conception, to warranty project management close-out	
10	Jaafari, 1997	The study investigates "concurrent construction" and its potential application in life cycle management of capital projects. While the potential benefits of concurrent construction are beyond doubt, current contractual, organizational, and work method barriers militate against realizing these	1990s: 3
11	Khan and Girgis, 1996	The structured analysis and design (SAD) and object-oriented (OO) software development life-cycles are introduced in the present study	
12	Cave and Salisbury, 1978	A quantitative measure of software quality is proposed along with requirements and techniques for establishing and maintaining control of the life cycle of large-scale software systems deployed in multiple installations over a wide geographic area	1970s: 1
Total			**12**

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Table 7. Group 7 – Project management, and its scheduled applications and parameters' overview

Rf. No	Bibliographical source	Thematic area	Decade: Subtotal of Refs
1	Yaghootkar and Gil, article in press	The study's focus is to illuminate how a schedule-driven project management policy can lead to a vicious cycle that degrades the organization's capability to meet the planned project milestones in the long-term	2000s: 8
2	Hori et.al., 2010	Project management methods for preventing schedule delays caused by changes and late elicitation of requirements during development processes, are examined in the study. There also examined the actual conditions of various project management patterns which succeeded in preventing schedule delays, resulting from changes and late elicitation of requirements during development processes	
3	Klanšek and Pšunder, 2010	The study presents the cost optimization of the time schedules for project management. It is developed and applied a nonlinear programming (NLP) model for the cost optimization of the time schedules under the generalized precedence relations between the project activities. Besides, an application example and an example of the time-cost trade-off analysis are also presented, showing the advantages of the proposed approach	
4	Shinn et.al., 2010	The study analyzed data collected by The Johns Hopkins University from the NASA Cost Analysis Data Requirement mission, and its Instrument Cost Model instrument databases, to identify trends in project management (PM) and systems engineering (SE) effort. Knowing the necessity of PM/SE, and the more recent trends and cost estimating relationships (CERs) allow more robust/accurate mission planning/cost tracking	
5	Hori et.al., 2009	The extraction of various typical project management (PM) techniques for preventing schedule delays caused by requirements elicitation, is discussed. PM techniques, or so named "PM patterns" were also applied to other projects, within the two-dimensional framework: knowledge areas of PM, and a group of PM processes	
6	Lipke, 2008	Earned Value Management (EVM) even being a good method of project management, it cannot provide information as to how the schedule is being accomplished. Therefore, the paper utilizes the new practice of Earned Schedule (ES) to discuss a proposed measure for further enhancing the practice of EVM	
7	Ma, 2008	Mathematical models, experience and construction practice to Chashma Nuclear Power Plant Project, are examined. The study reveals the basic principles for the analysis method, relevance between cost and schedule, and further proceeds in setting reasonably achievable measures/approaches for the establishment of such cost/schedule relevance	
8	Ayyubi et.al., 2007	An important aspect of the software project manager's role is to deal effectively with slippage. This study is based on the main factors in all phases of software development that cause delays in project schedule. Software development projects in different software organizations are observed to see: the schedule slippage, major factors of the slippage, and the project management practices followed in those projects	
9	Rushinek and Rushinek, 1997	Project management software can manage, schedule, and monitor tasks, resources, and costs. The present study provides a methodology for selecting the most profitable features for project management, discovering the features that mostly contribute to the segment margin and the profitability to the vendor	1990s: 3
10	Riggs et.al., 1994	The study describes a computerized method for integrating technical, cost, and schedule risk, since these compounded factors should and can be addressed within the context of a single analytical methodology	
11	Smith et.al., 1991	Public (LA) works project management improvement using project schedule risk analysis	
12	Rowings, 1986	Reference schedules characteristics of their time-consuming development and their advantages through their numerous applications	1980s: 1
Total			**12**

Table 8. Group 8 – Project Management (PM) and Risk Management (RM) overview

Rf. No	Bibl. source	Thematic area	Dec. Sub. Refs
1	Lima et.al., 2010	The Web-based Groupware on Project Management System (WGPMS) is an infrastructure that aims to support the collaborative project activities. This modular environment, named Risys, which provides the intelligent identification and the qualitative analysis of the project risks. The study aims at presenting the modifications in the Risys in order to enhance the risk management in WGPMS	
2	Liu, 2010	Engineering project risk management is a systematic and whole process management. This study analyzes the risk influence on engineering by means of active-matrix theory. Risk factors include aspects of nature, economy, management, technology	
3	Xiaocong and Ling, 2010	With the economic and social development, as well as risk management consciousness improved, the importance of risk evaluation is increasingly recognized in project management (PM). The need for risk management (RM) decision support system is valuable and essential. The paper proposes a new RM decision support system based on bayesian network. This network can be used for real time risk assessment and decision-making in PM	
4	Dantas et.al., 2009	Whenever organizational project activities of cooperation are not adequately coordinated and supported, they provoke significant delays on the project, putting the final product quality at risk. The study describes the risks control module, named Risys, to support the execution of project developed using the Web-based Groupware on Project Management System	
5	Moussa et.al., 2009	The objective of this study is to present the features incorporated into an under-development simulation-based project risk assessment platform. The platform offers environment that models and integrates complex projects into an enterprise scheme	2000s: 10
6	Li and Zhang, 2006	The study compares uncertainty- with risk- management in PM. It is proposed that project risk management (PRM) processes might be modified to facilitate an uncertainty management perspective, supporting that project uncertainty management (PUM) can enlarge its contribution to improving PM performance	
7	Schieg, 2006	For construction project managers, as well as real estate developers, a consideration of the risk management process is worthwhile. The risk management process comprises 6 process steps, which are discussed in the present study. Integration of management of risks that are attributed in the personnel area; particularly for enterprises providing highly qualified services, specialized employees are essential for market success	
8	Baram, 2003	The study introduces a future trend in Engineer, Procure, Construct (EPC) project management where more risk taken by contractors requires more management oversight, to ensure healthy and successful projects and protect the interests of the company	
9,10	Rosen, 2003(a) and Rosen, 2003(b)	Risk management can be viewed as the project management in a controllable manner. Numerous models exist and involve varying levels of detail and complexity, as managers with experience in medical product development are likely to be familiar with the general aspects of hazard analysis. This analysis can help to determine the relative impact on the overall project so as to improve input to the project managers' decision making process	
11	Phillips et.al., 1998	Integration of risk management, concerning the efficiency of the Resource Conservation and Recovery Act (RCRA) corrective action process, is studied in the present study	
12	Lister and Carr, 1997	Risk management describes what is different about a project from all others. Effective risk management consists of two activities. Informed decisions requires sufficient information to choose among various available options for mitigating a given risk	1990s: 4
13	Charette, 1996	PM involvement as a robust management approach in large-scale software projects	
14	Thomasen, Butterfield, 1993	The study outlines problems involved when combining constraints such as risk management and resource optimization together with a real calendar, suggesting potential problems solution	
Total			**14**

Table 9. Extracted literature data manipulation, according to their time-scale and scoping allocation

Decade / **Subtotals of Refs**	**1970s**	**1980s**	**1990s**	**2000s**	**Subtotal Refs**
Group 1	1	2	1	7	11
Group 2	2	3	2	6	13
Group 3	1	3	1	6	11
Group 4	0	2	1	3	6
Group 5	0	0	0	4	4
Group 6	1	0	3	8	12
Group 7	0	1	3	8	12
Group 8	0	0	4	10	14
Subtotal Refs	**5**	**11**	**15**	**52**	**83**
Total (%)	**6.0**	**13.2**	**18.1**	**62.7**	**100.0**