

Information Systems Project Success Factors: Literature Review

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Abstract – The purpose of this paper is to identify and collect most commonly discussed project success factors in the context of information systems (IS) projects. Through the process of review of 88 books, relevant studies and scientific works 72 success factors were detected, with a total of 689 appearances, which are then classified into six factor groups: Planning, Project team, Project management, Development, Customer, Project facilitation. The paper reveals that factors that were recognized as the most critical ones for the success of information systems projects by majority of authors belong first to Planning, and then to Project team and Project management groups of factors. Findings in this paper are expected to serve as a valuable theoretical basis for future empirical research of success and failure of projects in modern information technologies (IT) organizations, and development of related IS project success models.

Keywords – *Project success, project success factors, information systems, literature review.*

1. Introduction

Despite efforts IT organizations are making today to survive and take a lead in the high competitive market, reports show that project success rates haven't changed significantly over the past 15 years. Back in 2003, King [1] reported that in one IT organization three out of ten projects fail on average. In the same year, Lewis [2] reported that around 70% of all IS projects fail to fulfill the objectives set, where all failed and defectively completed projects were included. According to Arcidiacono [3], International Data Corporation published in 2009 that 25% of observed projects failed completely, and 50% of projects required rework. Eight years later, in 2017, PMI [4] performs a study observing "underperforming" organizations with less than 60% of project completed successfully, meeting their fundamental goals and business purpose. It is reported that 24% of projects in these organizations were completed within set timeframes, 25% within budget, 33% met original goals/business intent, 68% experienced scope creep, 24% were a complete failure and 46% of the budget was lost in case of project failures [4].

Considering the project definition adopted from Pinto and Slevin [5], explaining a project as an organization of people committed to common goals, involving valuable, high risk tasks of different sizes that have to be completed by previously set deadlines for a certain budget with high quality, and must have a very well defined objectives and sufficient resources necessary for task execution undertakings, it becomes clear that project success depends on many different factors. It's very important to recognize and understand these factors because they serve as a guidance for definition of project management processes [6]. While investigation of

project success factors has been a topic of interest for many researchers and authors, there is still a lack of literature that summarizes findings in this context. This paper is intended to fill in this gap by collecting success factors in a broad range of relevant material in order to determine which aspects of project development process should be given the biggest attention to ensure the project success.

After this introduction, a short background of the topic is presented, followed by explanation of the literature review methodology. Then, outcomes of the literature review process are presented in several segments, with short conclusion that gives suggestions for future research directions.

2. Background

A. IS projects

Most of the authors who contributed to the theory of project management by formulating a concrete definition of a „project“ agree that the definition is always based around five aspects, regardless of the field the project belongs to. Those are: people, project goals and requirements, project tasks, resources and various conditions. More specifically, a „project“ is generally defined as a complex organizational system of coordinated activities being performed in predefined order to achieve desired outcomes, in accordance with time and resource constraints ([7], [8], [9], [10], [11]).

Information System (IS) projects on the other hand, which are objects of examination in this review, have more concrete characteristics. IS projects can be described as IT projects designed to answer the information processing needs of a certain organization. Attributes that make them different from any other non-IS project are three-fold: (1) they depend heavily on human resources and significant capital that is usually a constraint; (2) they are people oriented projects and their stakeholder teams are composed of three groups: development team members, managers, end users; (3) they are conceptual, meaning that IS projects can often be subjects to risks that come from stakeholder teams, their lack of knowledge or project type [12].

B. Project success criteria

When it comes to defining the project success, the majority of researchers agree about the general success criteria: a successful project is a project completed on time, within scope and budget constraints ([13], [14], [15]). However, the application of this definition in real project environments is usually not that simple.

The empirical research, conducted by Hussein [16], reveals that inadequate definition of the project success criteria is commonly a result of incomplete understanding of the project itself and setting unrealistic expectations about the benefits provided by project outcomes. Better understanding of project stakeholders' inputs, who have the impact on project context and who define the final outcome expectations, is recognized as the right approach to solving this challenge [16].

According to Frerer et al. [17] review of project success criteria literature, authors like Pinto and Slevin [18], Freeman and Beale [19], Khosravi and Afshari [20], Bryde and Robinson [21] define even five to nine criteria for measuring the project success. Collins and Baccharini [22] and Munns and Bjeirmi [7] find that there is a direct effect of project success towards project management success. Baccharini [13] concludes that there is no unique definition of project success that could be applied on any project, and that criteria specific for a given project needs to be defined at its inception point to ensure that all team members and stakeholders work in the same direction.

3. Methodology

In order to respond to the research goal, it was necessary to review larger amount of literature, thus semi-systematic review approach was selected as the most suitable. It helps discover theoretical aspects and themes, or common issues within a certain research discipline [23]. Books and journals suitable for review were collected from journal databases and online libraries. To shorten the material collection process search keywords like “information systems project success”, “project success factors”, “project success criteria” were used. 88 books, scientific works and articles were collected. Materials with repeating content adopted from previous literature were not taken in consideration.

The review process was executed through three steps: (1) in the first literature walkthrough list of unique project success factors was created, 72 of them in total; (2) frequency of appearance of every factor was registered; (3) factors were grouped into 6 groups for easier interpretation: Planning, Project team, Project management, Development, Customer, Project facilitation.

4. Literature Review

A. Project success seminal works

According to Pinto and Prescott [24] critical success factors represent factors that lead to significant improvement of project implementation chances, if appropriately addressed. Therefore, many researchers have tried to recognize critical success factors that can be significant for all IS project in general. Leidecker and Bruno [25] explain these factors as variables or conditions that, if properly maintained, managed or sustained, can have a crucial impact on the organization success or failure. Definition of critical success factors may also depend on development of country, type of organization and business [26]. An overview of project success factors that have been discussed by the authors in previous studies on this topic is presented in the next sections.

First studies in this field have started in early seventies, and in the next 20 years seven seminal works related to this topic have been created, written by seven different groups of authors. All other works that followed have considered these seven works as a starting point of their research. Seven seminal works and project success factors they define as critical ones for project success are listed below:

- Sayles and Chandler [27]: Capability and knowledge of a project manager, continuing involvement in execution of project activities, control subsystems, scheduling and time frames, monitoring activities and feedback provision.
- Martin [28]: Project and organizational philosophy, project planning, definition of project goals, control and monitoring mechanisms, top management support, authority delegation and organization, project team, resource allocation.
- Cleland and King [29]: Project schedule, project scope, process of task execution, financial support, logistic requirements, facility support, market intelligence (who is the client), executive development and training, manpower and organization, acquisition, information and communication channels, project review.
- Baker et al. [30]: Project manager, skills and knowledge of the project team, team commitment, project goals, project planning, budget and cost estimates, monitoring and control techniques, project inception difficulties, inadequate hierarchy.
- Lock [31]: Team commitment to project activities, top management support, communication procedures, progress review meetings, control mechanisms, project manager
- Morris and Hough [32]: Technical complexity, project goals, project scheduling, budgeting, legal issues, implementation issues, project idea and innovation.
- Pinto and Slevin [33]: Client involvement, human resources, monitoring and control, project team lead, communication, issue handling, technical difficulties, urgency, project politics, environmental impact.

B. Project success factors

In this section 72 project success factors collected through literature review process and their groupings are presented. Graph on Figure 1 shows the comparison of number of different success factors contained in every one of the six factor groups, while graph on Figure 2 shows the frequency of appearance of success factors in each group in the reviewed literature.

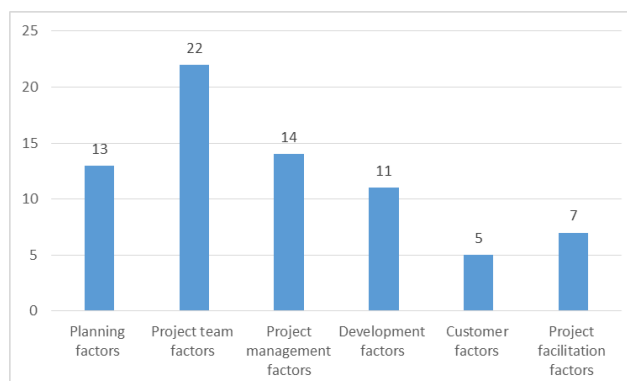


Figure 1. Number of success factors in each group of factors

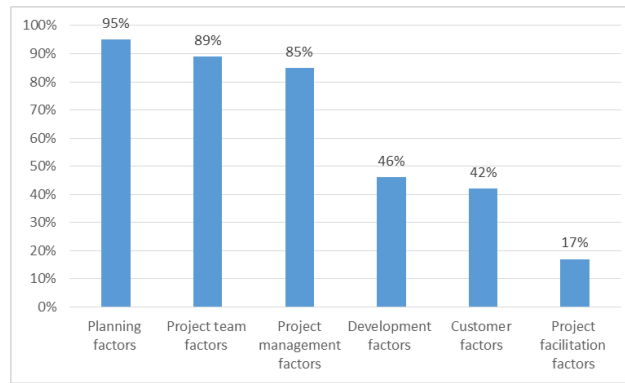


Figure 2. Frequency of appearance of success factors in literature

Charette [34] claims that IS projects almost never fail for only one or two reasons. According to him the reason of projects failing is a combination of few factors from the following list: bad estimation of necessary resources, poorly defined project requirements, unrealistic expectations and project goals, absence of communication between customers, poor management of users and developers, inadequate technology, lack of a good reporting of the project status, poor risk management, low quality of project management and development practices, project complexity. Ewusi-Mensah [12] agrees with him, indicating that the cancelation of IS development projects is usually caused by few combined factors, such as: project objectives, knowledge and skills of a project team, monitoring and control, lack of involvement of the top management, project costs and deadlines. Both authors consider definition of project goals and management as the most significant factors.

Moohebat et al. [26] did an investigation about the country difference impact on project success factors, considering developed and developing countries. According to their research, the only project success factor, which is of equal importance for both groups of countries, is the top management support.

Procaccino et al. [35] focus on the project success factors strictly from developers' point of view. They find that successful project for a developer means a project that is managed the way that ensures that development team has enough of necessary resources and the least possible amount of distractions when executing their daily jobs. For them, involvement of the customer in the project execution who is available to give feedback for the work done, and well defined project scope lead to successful project outcomes [35].

Egorova et al. [36] focus on stakeholders' point of view, dividing them into three groups: strategic-view stakeholders, operational-view stakeholders and tactic stakeholders. In their work, Egorova et al. [36] state that both operational and strategic stakeholders place „understanding the customer's problems“ to the first place. Operational respondents give a special attention to good programming, and strategic respondents see „customer involvement“ and „completed and accurate requirements“ as more important factors. Tactic stakeholders choose „very good project management“ as the most important factor for the project success. For both operational and tactic respondents, „team experience“ plays the essential role. Frese and Sauter [37] divided reviewed projects into failed, challenged and successful projects groups, aiming to see if there are common factors affecting project outcomes in all three groups. The conclusion they draw is that the quality of customer involvement and requirements definition affect the project's final status in all three groups.

Planning factors

In 95% of reviewed literature the Planning group of factors is discussed as the essential one for the project success. Project planning, scheduling and control, project requirements and scope, project goal, mission and vision are recognized as leading success factors in this group by majority of authors. All Planning success factors are listed in Table 1.

Table 1. Planning group of project success factors

<i>Planning success factors</i>	<i>Source</i>	<i>Freq.</i>	<i>%</i>
Project planning, scheduling and control	[5], [18], [27], [28], [29], [30], [31], [32], [33], [35], [36], [37], [38], [39], [40], [41], [42], [43], [44], [45], [46], [47], [48], [49], [50], [51], [52], [53], [54], [55], [56], [57], [58], [59], [60], [61], [62], [63], [64], [65], [66], [67], [68], [69], [70], [71], [72], [73], [74]	49	56%
Requirement specification and scope	[11], [12], [18], [20], [26], [34], [35], [36], [37], [38], [39], [40], [43], [45], [47], [49], [50], [52], [53], [55], [56], [58], [60], [62], [67], [68], [69], [70], [71], [74], [75], [76], [77], [78], [79], [80], [81], [82], [83], [84]	41	47%
Definition and understanding of project goals, mission and vision	[5], [11], [12], [18], [26], [28], [30], [32], [33], [34], [37], [43], [45], [47], [48], [50], [52], [58], [60], [61], [63], [66], [67], [68], [69], [72], [74], [75], [76], [77], [81], [83], [85], [86], [87], [88], [89], [90], [91]	39	44%
Budgeting – cost estimates	[12], [29], [30], [36], [39], [45], [50], [51], [53], [59], [60], [62], [64], [67], [68], [69], [71], [73], [74], [78], [81], [89]	22	25%
Project/technical complexity	[12], [34], [47], [48], [63], [69], [70], [74], [78], [79], [81], [82], [87], [90], [92]	15	17%
Process and working procedures	[6], [34], [35], [49], [64], [66], [67], [68], [69], [70], [74], [75], [81], [87], [93]	15	17%
Time estimations	[12], [22], [35], [36], [50], [53], [71], [83], [94]	10	11%
Project organizational philosophy/ organization structure	[6], [12], [28], [29], [38], [57], [59], [73], [95]	9	10%
Realistic expectations	[36], [37], [58], [71], [75], [81], [96], [97]	8	9%
Project itself/ project idea	[6], [29], [49], [70], [76], [95]	6	7%
Project strategic fit	[6], [26], [38], [60], [75]	5	6%
Project size	[78], [87]	2	2%
Project pace	[59], [92]	1	1%
TOTAL (max = 88)		84	95%

Morisio et al. [45] write that definition of requirements before projects starts or, if not possible, their completion in the initial phases is a factor of success, which supports the “Glass law” which says that insufficiently defined requirements are the major reason for project failures. Zouaghi and Laghouag [11] find that clear definition of needs through requirements is one of three factors that present a high risk for the final result of a project. According to Kappelman et al. [52], not documenting the functional performance and reliability of requirements and scope is an early warning sign of IS project failure, which shouldn't be ignored. Definition of requirements is also stated by Frese and Sauter [37] as a common factor for successful, challenged and failed projects. Nasir and Sahibuddin [74] rated the clear requirements and specifications factors as the most important ones among all project success factors.

Reel [75] sees project complexity as the basic problem of computing in the context of project development. Handerson [78] agrees with him, saying that complexity, together with the project size, is the main reason why large IT projects fail. On the other hand, Nguyen [87] does agree that complexity, from technical perspective, makes a strong negative effect on project success, but unlike Handerson [78], he rates project size as a factor that almost doesn't affect the project success. Ogden [76] finds that the project idea is a success factor, but not a very important one for the project success.

Hirshfield and Lee [96] say that successful projects are ones with realistic expectations and timeframes, and suggests „planning in advance“ as an activity that should ensure meeting schedule related conditions [96].

Project team factors

As presented in Table 2, 89% of reviewed literature detected Project Team related factors as the most common success factors in an IS project creation. Role of a project manager, team commitment and communication are recognized as leading success factors in this group.

Morisio et al. [45] asserts that human factors play a key role in software development. Zouaghi and Laghouag [11] and Ogden [76] also put the accent on productivity and motivation of the project team and their cross-functionality.

According to the research study of Wong et al. [54], poor project manager's effectiveness serves as a critical project failure factor. Manager's capability and skills are recognized by Nguyen [87] and Nasir and Sahibuddin [74] as a strong positive effect on a project's success. Perkins [98] states that the major cause of project failure is project manager not having the required knowledge, or not being able to apply it appropriately. While many researchers share opinion that project manager's field experience is also very important, Kaya et al. [70] disagree with that. Surprisingly, researchers in only 2% of reviewed literature found that working environment is a factor that affects the success of an IS project. Unlike Nguyen [87] and Pinto and Slevin [33], Nasir and Sabihuddin [74] even find environmental influences as completely unsubstantial factor.

Hong et al. [73] suggest that it's important to have a good communication among all related parties including planners, consumers and developers for establishment of a good project model.

Table 2. Project team group of project success factors

<i>Project team success factors</i>	<i>Source</i>	<i>Freq.</i>	<i>%</i>
Project manager	[12], [26], [29], [30], [31], [35], [36], [37], [38], [39], [42], [43], [47], [49], [50], [52], [54], [55], [57], [70], [71], [74], [76], [77], [78], [80], [83], [85], [87], [88], [90], [91], [92], [94], [98], [99]	36	41%
Team commitment	[6], [11], [26], [27], [28], [30], [32], [31], [33], [35], [37], [38], [39], [40], [41], [44], [48], [52], [55], [58], [59], [61], [66], [70], [71], [72], [74], [75], [76], [93], [100]	31	35%

Communication	[5], [12], [26], [29], [31], [33], [34], [36], [37], [38], [39], [43], [47], [48], [52], [53], [56], [60], [61], [63], [66], [67], [69], [70], [72], [73], [74], [76], [79], [90], [93]	31	35%
Knowledge and skills of development team	[12], [30], [37], [41], [42], [49], [52], [53], [62], [66], [67], [68], [69], [70], [72], [74], [78], [81], [82], [87], [98]	21	24%
Capability, skills and experience of a project manager	[27], [33], [36], [37], [45], [49], [50], [55], [61], [63], [66], [67], [68], [69], [70], [72], [74], [81], [82], [95], [98]	21	24%
Team composition and assembly	[5], [12], [36], [38], [66], [69], [74], [82], [86], [90], [91]	11	13%
Personal Recruitment/ Ambition	[12], [30], [41], [60], [77]	5	6%
Education and training availability	[29], [47], [70], [88], [98]	5	6%
Team motivation and productivity	[11], [59], [74], [81]	4	5%
Losing skilled team members	[45], [52], [54], [75]	4	5%
Experience of development team	[12], [36], [47]	3	3%
External consultant	[49], [69], [76]	3	3%
Knowledge sharing	[38], [54], [101]	3	3%
Teamwork and collaboration	[41], [78]	2	2%
Team building	[12], [47]	2	2%
Personal interests	[44], [98]	2	2%
Knowledge application	[98], [56]	2	2%
Working environment	[33], [87]	2	2%
Adding new team members	[45]	1	1%
Access to talented people	[47]	1	1%
Best practices and lessons learned	[75]	1	1%
TOTAL (max = 88)		78	89%

Project management factors

Project management activities are defined as success factors in 85% of the reviewed literature (Table 3). In this group, top management support and effective monitoring and reporting are recognized as leading success factors.

Whittaker [50] avers that inadequate risk management is among biggest IS project failure reasons. As the organization gets bigger, risk management becomes more significant factor of success. Taylor [51] states that inability to manage the risk and project related uncertainties has been frequently recognized as a critical segment of IS project management. Kappelman et al. [52] find the lack of support of top managers as an extremely important early warning sign of IS project failure, even the most important among other factors. Nguyen [87] emphasizes that good management in general is essential for a project to succeed, especially human resources management, quality management and time management.

Table 3. Project management group of project success factors

<i>Project management success factors</i>	<i>Source</i>	<i>Freq.</i>	<i>%</i>
Top management support	[5], [11], [12], [26], [28], [33], [34], [35], [36], [47], [48], [50], [52], [54], [55], [57], [60], [61], [66], [67], [68], [69], [70], [72], [73], [74], [78], [81], [91], [92], [94]	31	35%
Monitoring and reporting	[12], [26], [27], [28], [29], [33], [34], [47], [48], [50], [55], [56], [59], [60], [63], [64], [65], [67], [68], [69], [70], [71], [72], [74], [79], [81], [93], [98]	28	32%
Change management	[26], [37], [41], [42], [44], [46], [47], [50], [52], [55], [56], [61], [64], [67], [69], [71], [74], [75], [79], [89], [90], [91]	22	
Project risk management	[6], [11], [14], [34], [38], [41], [45], [47], [50], [51], [55], [59], [67], [74], [78], [80], [92], [101], [102]	19	21%
Effective leadership	[12], [38], [41], [47], [63], [67], [69], [71], [74], [90], [99], [100], [103]	13	15%
Executive management support	[12], [37], [44], [58], [71], [83], [97], [100]	8	9%
Quality management	[41], [62], [64], [65], [70], [74]	6	7%
Time pressure	[33], [34], [75], [76]	4	5%
Measurement systems	[12], [31], [76]	3	3%
Authority delegation	[28], [31]	2	2%
Time management	[39], [78]	2	2%
Late failure warning signals	[53]	1	1%
Success criteria Definition	[52]	1	1%
Overtime handling	[45]	1	1%
TOTAL (max = 88)		75	85%

Development factors

Development related factors are recognized as ones critical for project success in 46% of the reviewed literature. Technology and tools, together with the availability of adequate resources are recognized as leading success factors in this group. Yet, many authors agree that success of technical development depends on the proper project planning phase.

May [53] concludes that projects with inflexible technical architecture and undefined guidelines for managing the project technical requirements have high risk of failures. According to him the key of success lays in correct handling of technical aspects of the project. White and Fortune [47] underline that quality of planning must be taken into account peculiarly to have a successful development phase, and that it's extremely important that schedule of development activities is realistic.

All detected Development group success factors are listed in Table 4.

Table 4. Development group of project success factors

<i>Development success factors</i>	<i>Source</i>	<i>Freq.</i>	<i>%</i>
Technology, tools	[12], [32], [34], [49], [50], [57], [59], [61], [67], [68], [69], [71], [74], [75], [81], [82], [88], [91], [92]	19	22%
Adequate resources availability	[28], [34], [37], [47], [49], [53], [65], [66], [67], [71], [72], [74], [76], [81], [82], [94]	16	18%

Development approach	[18], [74], [83], [91]	4	5%
IT infrastructure	[54], [64], [74], [83]	4	5%
Testing, verification and validation	[26], [54], [79], [80]	4	5%
Programming	[26], [36], [80]	3	3%
Data quality and integrity	[26], [91]	2	2%
Architecture and design	[53], [80]	2	2%
Technical tasks	[30], [33], [60]	2	2%
Interface with other projects	[57]	1	1%
Facility support	[29]	1	1%
TOTAL (max = 88)		40	46%

Customer factors

Customer related group of factors is recognized as an important one for IS project success in 42% of reviewed literature, having the overall customer involvement as the most critical factor.

Frese and Sauter [37] find that certain level of user involvement is a prevalent factor of project success and failure. According to Hirshfield and Lee [96] project team with their project manager can be sure their project meets its goals only if end users are involved in the process. On the contrary, Nasir and Sahibuddin [74] claim that project champion is not important in project development process at all.

All detected success factors in the Customer group are presented in Table 5.

Table 5. Customer group of project success factors

<i>Customer success factors</i>	<i>Source</i>	<i>Freq.</i>	<i>%</i>
Customer involvement	[5], [11], [33], [35], [36], [37], [42], [45], [47], [48], [49], [52], [54], [59], [60], [61], [66], [67], [68], [69], [71], [72], [73], [74], [82], [83], [84], [85], [88], [94], [96], [97], [100]	33	38%
Customer approval	[5], [33], [36], [72]	4	4%
Involvement of project champion	[26], [49], [58]	3	3%
Inflexible customer	[54]	1	1%
TOTAL (max = 88)		37	42%

Project facilitation factors

Project facilitation factors are recognized as project success factors in 17% of reviewed literature. Although the most significant literature about project management and project success doesn't write about troubleshooting, conflict handling or external influences as project success factors a lot, the 10-factor model of the project development process defined by Pinto and Slevin [33] lists troubleshooting as its tenth component. Human error factor is recognized as the success factor by White and Fortune [47] and Levenson [79], but Attarzadeh and Ow [13] who also discuss human error factors as significant ones for the project success, claim that the reason for the human error is the cause of bad project management and inability of responsible roles to convert the theory of project management into practice.

All detected success factors in the Project facilitation group are listed in Table 6.

Table 6. Project facilitation group of projects success factors

<i>Project facilitation success factors</i>	<i>Source</i>	<i>Freq.</i>	<i>%</i>
Troubleshooting	[5], [26], [33], [48], [70], [72]	6	7%
Conflict handling	[39], [47], [53]	3	3%
External influences	[47], [95], [98]	3	3%
Human error factor	[47], [79]	2	2%
Tolerance of bad news	[90]	1	1%
Technical difficulties	[89]	1	1%
Start-up difficulties	[30]	1	1%
TOTAL (max = 88)		15	17%

5. Conclusion

The paper summarizes findings of the review of 88 works that discuss factors that affect the success of IS projects. While each of 72 detected success factors can play a major role for the outcome of an IS project, the majority of authors agree that project planning, scheduling and control; requirements and defined project scope; definition and understanding of project goals, mission and vision; role of a project manager; team commitment; communication and involvement of customers belong to the most significant ones. On the other hand, technical difficulties; overtime work; project size and strategy; development team dynamics; overtime handling; project architecture and design are the least frequent success factors in reviewed literature. Detected factors are classified into 6 groups, according to the segment of IS project development process these factors may have an impact on. The outcome shows that Project team group of factors is found to be the most diverse and highly significant, while Planning group of factors is recognized to be the most significant one for the IS project success.

During the review process, it is noticed that not a lot of empirical research was conducted on this topic in the last 10 years, which results in the lack of literature with fresh findings and conclusions published in this period. This paper provides a foundation for conducting such empirical research as a future research direction, with two-fold goal: (1) to discover if recent trends in the process of IS project development – like Agile methodologies, and unpredictable dynamic of software market today, resulted in significant changes in the list of key project success factors and definition of “project success” overall; (2) to establish a project success model that can be used as a guidance in the process of IS project development.

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