# Success Factors of Process Digitalization Projects – Insights from an Exploratory Study

*Original Research*


## Abstract

**Purpose –** Digitalization substantially impacts organizations, which increasingly use digital technologies to improve and innovate their business processes. While there are methods and tools for identifying process digitalization ideas and related projects (PDPs), guidance on the successful implementation of PDPs is missing. Hence, we set out to explore PDP success factors.

**Design/methodology/approach –** In an exploratory approach, we conducted a structured literature review to extract candidate PDP success factors from the literature on business process management, project management, and digitalization. After that, we validated, refined, and extended these intermediate results through interviews with 21 members of diverse PDP teams. Finally, we proposed the PDP Success Model by linking the candidate success factors with relevant success criteria.

**Findings –** The PDP Success Model covers 38 PDP success factor candidates, whereof 28 are already backed by the literature and ten have emerged during the interviews. Furthermore, the success factors are structured according to seven categories from the literature covering a broad range of socio-technical topics (i.e., strategy, structure, culture, people, process, project, and technology) as well as equipped with preliminary success rationales.

**Originality –** Our work is the first to systematically explore PDP success factors. The PDP Success Model shows that PDPs require a unique set of success factors, which combine established and hitherto underrepresented knowledge. It extends the knowledge on business process management and serves as foundation for future (confirmatory) research on business process digitalization and the successful implementation of PDPs.



**Keywords** – Business Process Management; Digitalization; Success Factors; Literature Review; Exploratory Interviews

**Article Type** – Research paper

# 1 Introduction

Digitalization is driven by the fast emergence and adoption of digital technologies (DTs), changing societal conventions and organizational routines (Beverungen *et al.*, 2020). DTs range from established technologies (e.g., social, mobile, analytic, and cloud) (Fitzgerald *et al.*, 2014) to emerging ones (e.g., distributed ledger, artificial intelligence, extended reality, and quantum computing) (Daugherty, 2020; Gartner, 2020). Accordingly, digitalization entails a hyper-connected environment for organizations (Beverungen *et al.*, 2020), which is characterized by the access to new data sources, the fusion of the digital and the physical world, pervasive connectivity, and interactions among individuals, organizations, and real-world objects (Benbya *et al.*, 2020).

Although digitalization brings about manifold opportunities, organizations struggle with deriving value from DTs (Davenport and Westerman, 2018), as they do not fully understand how to use DTs (Denner *et al.*, 2018). Apart from the DT-enabled transformation of products into smart things (Beverungen *et al.*, 2019; Huber *et al.*, 2019), DTs enable organizations to improve and innovate business processes (Mendling *et al.*, 2020). For example, DTs support advanced process automation, adaptive process execution, and process data analytics (Kerpedzhiev *et al.*, 2020). To capitalize on the opportunities of digitalization, organizations must embed DTs into existing or novel processes (Denner *et al.*, 2018), which commonly happens through projects (Lehnert *et al.*, 2016; Kerzner, 2013). In our study, we refer to projects that leverage DTs for improving business processes in terms of effectiveness and efficiency as process digitalization projects (PDPs). While the literature contains methods and tools assisting practitioners in the identification of process digitalization ideas and projects (Denner *et al.*, 2018; Rosemann, 2020), guidance on the successful implementation of PDPs is missing. This circumstance presents organizations with challenges, as PDP failure may entail sunk costs or jeopardize competitiveness (McLean and Antony, 2014).

In the literature on business process management (BPM), project management (PM), and digitalization, which are relevant reference disciplines when investigating PDP success, antecedents of successful BPM and digital transformation initiatives as well as of process improvement and digitalization projects have already been investigated. We refer to such antecedents as success factors (SFs) (Bullen and Rockart, 1981). For example, Trkman (2010), Rosemann and Vom Brocke (2015), and Castro *et al.* (2020) proposed SFs for BPM on the enterprise level, whereas McLean and Antony (2014) as well as Al-Mashari and Zairi (1999) studied failure factors on the project level. Some studies also focused on SFs and pitfalls related to specific activities of process change such as process modeling (Bandara *et al.*, 2005; Rosemann, 2006). In the PM domain, McLeod *et al.* (2012), for example,

investigated how project stakeholders perceive project success. As opposed to BPM and PM, research on successful digitalization projects and digital transformation initiatives is still emergent. While Gimpel *et al.* (2018) offer a framework of action fields for successful digital transformation of incumbent firms, Soluk and Kammerlander (2021) present barriers and enablers for the digital transformation of family-owned Mittelstand firms. These studies demonstrate that there are isolated pockets of understanding. However, an integrated and up-to-date view on factors that drive PDP success yet needs to be developed. Hence, our research question is as follows: *Which factors drive PDP success?*

To answer this question, we followed an exploratory approach. First, we extracted candidate SFs from the BPM, PM, and digitalization literature via a structured literature review. This review resulted in a comprehensive *ex-ante* list, which included 30 candidate SFs. With Kerpedzhiev *et al.* (2020) arguing that digitalization questions fundamental BPM assumptions, SFs retrieved from the literature most likely do not fully account for the peculiarities of PDPs. Owing to the fast-moving nature of digitalization, many first-hand experiences yet need to be documented academically. Therefore, as a second step, we conducted semi-structured interviews with 21 participants of PDPs performed in German manufacturing companies. This step resulted in a validated, refined, and extended *ex-post* list of candidate PDP SFs, which includes 38 elements, whereof 28 are backed by the literature and ten emerged during the interviews. Our key contribution is the *PDP Success Model*, which links the candidate SFs with PDP success criteria.

The remainder of this study is structured as follows: In Section 2, we provide relevant background on digitalization, BPM, and PM, before presenting our research design in Section 3. In Sections 4 and 5, we present our findings of the literature review, the interviews, and the *PDP Success Model*. In Section 6, we discuss implications, point to limitations, and sketch ideas for future research.

# 2 Background

## 2.1 Digitalization and Digital Technologies

Digitalization is a socio-economic phenomenon. Rather than translating information into a digital format (digitization) (Legner *et al.*, 2017), it enables novel value propositions by embedding DTs in products (Beverungen *et al.*, 2019; Huber *et al.*, 2019) and processes (Kerpedzhiev *et al.*, 2020). Digitalization has evolved into a key topic of information systems (IS) research with scientists making huge effort to understand the phenomenon and its

effects (Majchrzak *et al.*, 2016; Baskerville *et al.*, 2020). Capitalizing on new data sources, the pervasiveness of computing capabilities increases connectedness (Benbya *et al.*, 2020) to the extent that the fusion of the physical and digital world is just one facet of the digital society (Matt *et al.*, 2015). Despite attempts to identify relevant action fields of digital transformation (Gimpel *et al.*, 2018; Wessel *et al.*, 2021), knowledge is in its infancy (Benbya *et al.*, 2020; Vial, 2019). Hence, it presents new opportunities and challenges (Loebbecke and Picot, 2015).

Digitalization is driven by DTs (Daugherty, 2020; Berger *et al.*, 2018). While the general term technology is well-understood (Arthur, 2009), the term DT is used as an umbrella term for information technology in the context of digitalization (Denner *et al.*, 2018). Hence, one cannot draw clear lines between information technology, information systems, and DTs. Yoo *et al.* (2010) proposed fundamental characteristics to differentiate DTs from other types of technology: (1) *homogenization of data*, (2) *re-programmability*, and (3) *self-referential nature*. Moreover, DTs have been characterized as embedded, connected, editable, communicable, identifiable, and associable in line with their foundation in symbol-based computation (Benbya *et al.*, 2020). Coining the term ontological reversal, Baskerville *et al.* (2020) even proposed that the classical view of IS as representations of physical reality will become obsolete, as DTs create and shape physical reality. In practice, the Gartner Hype Cycle of Emerging Technologies is a prominent tool in the DT context (Gartner, 2020). Its 2020 edition includes DTs such as affective computing, distributed ledger, and smart advisors to generative artificial intelligence, authenticated provenance, and digital twins. Another popular practice-oriented classification of DTs follows the SMAC acronym (i.e., social, mobile, analytics, and cloud) (Fitzgerald *et al.*, 2014), while emergent DTs are subsumed under the DARQ acronym (i.e., distributed ledger, artificial intelligence, extended reality, and quantum computing) (Daugherty, 2020).

## 2.2 Business Process Management and Improvement

BPM is the science and practice of overseeing business processes to ensure consistent outcomes and that improvement opportunities are seized (Dumas *et al.*, 2018). BPM drives corporate success through efficient and effective business processes, both of which are relevant success criteria of PDPs (Schmiedel *et al.*, 2020; Morana *et al.*, 2019). Operationally speaking, PDPs must advance cost, flexibility, quality, time, and/or customer satisfaction (Reijers and Limam Mansar, 2005; Kreuzer *et al.*, 2020). Process digitalization increases efficiency and quality. The dependence of processes on engineered devices also gives rise to concerns about their safety and integrity (Khan *et al.*, 2021). Emergent technologies play an important role in increasing process safety (Ahmed, 2021; Sajid *et al.*, 2021), for example, through DT-assisted process fault prognosis (Arunthavanathan *et al.*, 2021;

Adumene *et al.*, 2021). From a lifecycle perspective, BPM includes activities such as process identification, discovery, analysis, implementation, execution, monitoring, controlling, and improvement (Recker and Mendling, 2016; Kerpedzhiev *et al.*, 2020). Combining knowledge from the management sciences and information technology (van der Aalst, 2013), BPM enables organizations to leverage DTs for process improvement and innovation (Denner *et al.*, 2018; Mendling *et al.*, 2020).

Among the activities from the BPM lifecycle, process improvement and innovation are considered the most value-adding ones (Denner *et al.*, 2018; Rosemann and Vom Brocke, 2015). An important distinction in this context is that between continuous business process improvement (BPI) and business process reengineering (BPR) (Trkman, 2010). Another distinction is that between exploitative and explorative process change (Grisold *et al.*, 2019). Exploitative process change applies methods from BPI and BPR to reactively fix problems of existing processes with the redesigned processes featuring either the same or an enhanced value proposition. Explorative process change seizes opportunities to implement so far non-existent value propositions in new or existing processes. In the latter case, reengineered processes feature either the same or an enhanced value proposition. Exploitative and explorative process change typically make use of DTs. Our PDP definition presented in the introduction covers DT-enabled exploitative process change as well as DT-enabled explorative BPM that seizes opportunities to reengineer existing processes. We restricted our definition that way, as explorative process change with a focus on the creation of new processes is hardly supported by appropriate methods so far (Vom Brocke *et al.*, 2020). Hence, there is no related literature on PDP success that could have been analyzed.

## 2.3 Project and Project Portfolio Management

Process change usually happens through projects (Lehnert *et al.*, 2016), i.e., punctuated efforts of interrelated tasks undertaken to achieve predefined objectives within a concrete timeframe (Archibald, 2003). PM involves activities such as planning, monitoring, execution, and control as well as the motivation of project participants within defined time, cost, and quality (Clarke, 2016; Kerzner, 2013; Pellegrinelli *et al.*, 2015). Analogous to processes, project success is commonly assessed via effectiveness and efficiency (Drucker, 2007; Beer *et al.*, 2013). While PM ensures the success of single projects (Cooke-Davies, 2002), project portfolio management (PPM) focuses on multiple interdependent projects (Martinsuo *et al.*, 2014) The portfolio perspective is key, as organizations typically implement multiple interdependent projects at the same time with resources being scarce for simultaneous project implementation (de Reyck *et al.*, 2005). This applies to projects in general and to PDPs.

# 3 Research Design

Our research design, which details the Figure 1, included the following steps: (1) structured database search, (2) code extraction from the literature and building of the *ex-ante* list of candidate SFs, (3) semi-structured expert interviews, (4) code extraction from the interviews and building of the *ex-post* list of candidate SFs. Finally, we (5) compiled the *PDP Success Model*. The research process is summarized in Table 1. Note that, in line with the exploratory nature of our work, all SFs included in the *PDP Success Model* are to be treated as candidates.

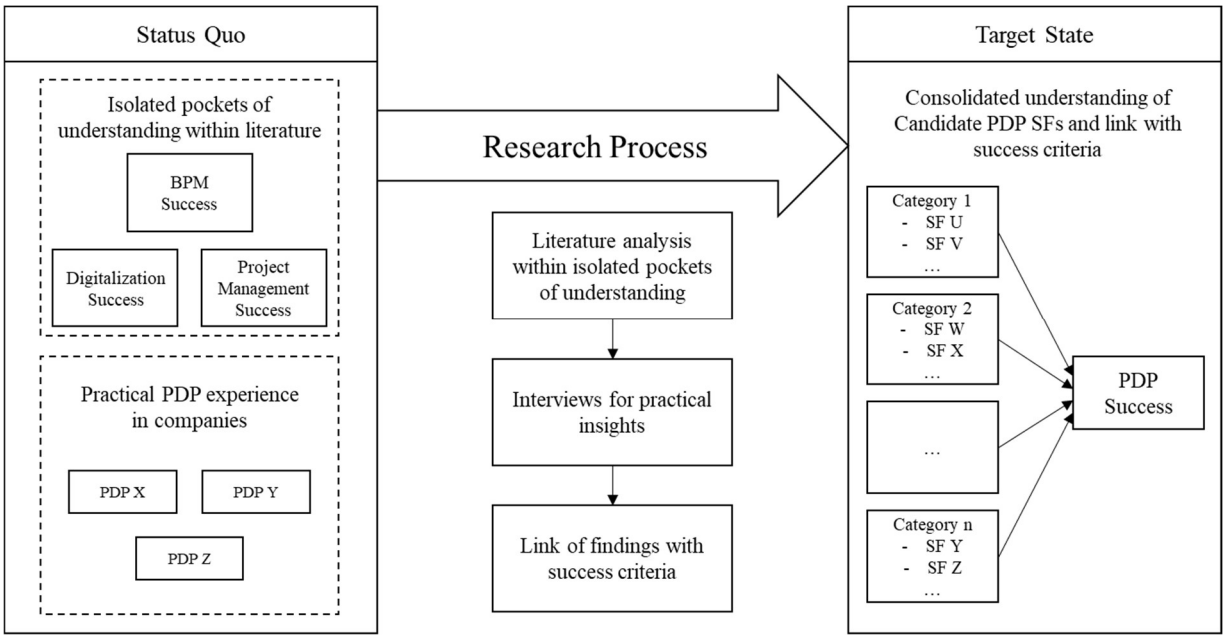


**Fig. 1** Research process of the paper

**Table 1** Research Design

| # | Step | Action | Result |
|---|---|---|---|
| 1 | Literature review | Database search and systematic literature review | 645 identified papers, 40 selected papers |
| 2 | Code extraction and building of the *ex-ante* list | Text analysis | 1034 initial SF codes, 30 candidate SFs, 7 SF categories |
| 3 | Expert interviews | Semi-structured interviews with experts from real-world PDPs | 21 interviewees with experts from 7 PDPs and 4 companies |
| 4 | Code extraction and building of the *ex-post* list | Interview analysis | 7 additional candidate SFs, 2 refined candidate SFs resulting in 3 new ones, 9 SFs without supporting empirical evidence |
| 5 | Compilation of the *PDP Success Model* | Linking of independent and dependent variables | 38 candidate SFs, 7 SF categories, 2 dependent variables |

We conducted the structured database search (step 1), following the recommendations of Vom Brocke *et al.* (2015). We searched the databases of the AIS electronic Library, EBSCOhost, and ScienceDirect and checked the 'Senior Scholars' Basket of Journals' from the IS discipline. All selected studies included a combination of the following terms in the title, abstract, or keywords: *("Success*" OR "Fail*") AND "Factor*" AND ("Digit*" OR "Digital Transformation" OR "Process Improvement" OR "Process Reengineering" OR "Project Management" OR "Project Portfolio Management")*. The search yielded 645 studies including 110 duplicates. To identify the studies appropriate for the in-depth analysis, two co-authors independently screened all abstracts and rated the studies as appropriate, questionable, or inappropriate (Wolfswinkel *et al.*, 2013). In the case of different ratings, all co-authors read the related studies and resolved conflicts. The research team excluded studies that did not support the aim of building an *ex-ante* list of candidate PDP SFs. A lack of relevance to PDPs as well as insufficient transferability served as exclusion criteria. Levi *et al.* (2003), for example, was part of the sample due to its mention of the search terms 'success factor' and 'digitalizability' in the abstract. However, the study is about electronic exchange in the B2B area, a circumstance that led to the exclusion of the paper. As we read the studies, we continuously augmented our literature base through forward and backward search (Webster and Watson, 2002). The 101 studies rated as appropriate for in-depth analysis were read end-to-end. During the in-depth analysis, we excluded 52 studies initially rated as appropriate due to a lack of relevance for our purposes. We further excluded eleven papers that did not fit the PDP context. In the end, 40 papers provided the foundation for the next step (see Appendix A for the complete list of the papers analyzed).

While conducting our in-depth analysis (step 2), we noted explicitly and implicitly mentioned factors. First, we extracted the factors explicitly mentioned in the literature (e.g., in tables or the text). We then screened the full-texts, marked all passages pointing to potential success or failure factors, and compiled the results (Webster and Watson, 2002). Next, we interpreted the marked passages to extract factors implicitly indicated to contribute to success or failure (Krippendorff, 2013). Kirsch and Slaughter (2013), for example, stressed the link between maturity of software development processes and project performance. Hence, we derived 'maturity of software' as a success code and later inferred the SF candidate 'technology maturity' from this as well as from other success codes. After this, we synthesized general information about the studies, along with categories such as the authors' names, publication date, and meta-information about the study context. Overall, we extracted 1034 codes, of which

237 related to implicitly mentioned factors (see Appendix B for the complete list of success codes). Moreover, we did not exclude results related to failure factors (157 codes) but rephrased them to align their polarity.[1]

Using a protocol to code the extracted factors (Corbin and Strauss, 1990), we built the *ex-ante* list of candidate SFs. To measure inter-coder reliability, we used Krippendorff's (2013) Alpha. In a first step, two co-authors used open coding to build 53 candidate SFs from the 1034 codes (Corbin and Strauss, 1990). Another co-author allocated 360 randomly ordered codes to the previously established candidate SFs, thereby meeting the required sample size to validly calculate an alpha of 0.8 or higher (Krippendorff, 2013). The final inter-coder reliability scored 0.8360, representing satisfactory inter-coder reliability (Krippendorff, 2013). Between all coding steps, the co-authors discussed the candidate SFs and their definitions to align the level of abstraction and to merge similar SFs. This led to 30 candidate SFs in the *ex-ante* list. For each candidate, the author team developed a single-sentence definition based on related papers from the literature review. These definitions can be found in Table 3.

To obtain an unbiased assessment of inter-coder reliability, an external coder from the IS field analyzed the 1034 codes and matched them to the candidate SFs, yielding a Krippendorff's Alpha between the co-authors and the external coder of 0.7333. As our efforts resulted in a large number of candidate SFs, the low Alpha value is not surprising, and it is common practice for researchers to use Alphas of 0.7 for hypotheses such as candidate SFs (Krippendorff, 2013). Thus, we proceeded with the developed candidate SFs. Next, selective coding helped us to develop categories for grouping the SF candidates included in the *ex-ante* list (Webster and Watson, 2002; Wolfswinkel *et al.*, 2013). In total, we identified seven SF categories based on an analysis of existing frameworks from literature. More details regarding the development of these categories are presented in Section 4.1.

To validate, extend, and refine the literature-based *ex-ante* list of candidate SFs, we conducted semi-structured expert interviews (step 3) (Galliers and Huang, 2012; Heidt *et al.*, 2019; Myers and Newman, 2007). As outlined justified in the introduction, this step enabled us to see "the world through the eyes of the actors doing the acting" (Greener, 2008, p. 17) and to gain access to first-hand PDP experience. Moreover, expert interviews are frequently used to explore and challenge candidate SFs (Lange *et al.*, 2016). During the interviews, we presented the

[1] Hughes *et al.* (2017), for instance, find that poor goals and evaluation stages (code no. 786) lead to IS project failure. We concluded that sophisticated objectives and evaluation stages lead to reduced levels of failure and, thereby, greater levels of success.

definitions of the candidate SFs from the *ex-ante* list to the experts. After 21 interviews with experts from seven PDPs conducted in four manufacturing companies, we arrived at consistent results regarding the support and refinement of candidate SFs. Therefore, we deemed no further contribution through additional interviews since theoretical saturation had been reached (Marshall *et al.*, 2013). To obtain a valid picture of the PDPs in focus, we interviewed at least three experts per company. These experts had different roles, such as project manager, project sponsor, and as an employee with technical or functional background. The reasons for targeting these groups were that project sponsors oversee the definition of PDP goals, while project managers are responsible for operational planning and monitoring. Employees are responsible for the implementation of the PDP. On the aggregate, we sought to cover various personal and professional backgrounds, as PDPs are interdisciplinary and complex (Bhattacherjee, 2012). Moreover, a sample size of around 20 experts is common for this kind of research (Abdelkafi and Pero, 2018; Heidt *et al.*, 2019; Reif *et al.*, 2019). It supports establishing a trusted atmosphere with the interviewees, which in turn leads to in-depth and valid insights (Crouch and McKenzie, 2006).

To compile the interview circle, we identified experts with substantial experience in process digitalization by being actively involved in or leading PDPs (Myers and Newman, 2007) (Appendix C depicts the whole expert sample). Moreover, we decided to focus on experts working for manufacturing companies for four reasons: First, PDPs play an important role in the industrial sector. Second, our industry network has distinguished outreach in the manufacturing domain, which enabled us to cover diverse contexts, companies, and PDPs. Third, we thereby reduced the complexity of understanding sector-specific mechanisms (Davis and Hufnagel, 2007). Fourth, the PDPs typically performed in manufacturing companies fit our PDP definition quite well, covering exploitative DT-enabled process change as well as explorative DT-enabled process change with a focus on reengineering existing processes. As our focus on manufacturing companies may limit the transferability of our results, we get back to this limitation in Section 5. The PDPs in which the interviewees were involved were performed in four companies: *Polymer* (P), *Automotive* (A), *Healthcare* (H), and *Textile* (T). We selected companies that actively engaged in process digitalization and interviewed members of the PDP teams who met our selection criteria. Overall, the experts were involved in seven PDPs (P1, P2, A1, H1, H2, H3, T1). Table 2 provides a short overview of the PDPs. Details on each PDP can be found in Appendix D. Further details on the operational interview process are provided in Appendix E.

Based on the interviews, we created the *ex-post* list by validating, extending, and refining the candidate SFs from the *ex-ante* list (step 4). Finally, we linked the candidate SFs from the *ex-post* list as independent variables with relevant PDP success criteria as dependent variables (step 5). This resulted in the *PDP Success Model*.

**Table 2** Overview of the PDPs Investigated Expert Interviews

| Company | PDP | Description |
|---|---|---|
| Polymer (P) | Digital flow production (P1) | Implementation of digital flow production to replace the manual material logistics |
| | IoT platform (P2) | Introduction of an IoT platform for production processes and products |
| Automotive (A) | Industrial IoT application (A1) | Introduction of an industrial IoT application, replacing manual quality control through automated quality control measures based on sensor data |
| Healthcare (H) | IoT platform (H1) | Introduction of an IoT platform connecting smart devices, the manufacturing enterprise system, and enterprise resource planning |
| | Predictive Maintenance (H2) | Introduction of a predictive maintenance solution to redesign the process of plant maintenance |
| | Big data analytics (H3) | Introduction of big data analytics of energy generation and consumption data |
| Textile (T) | Robotic process automation (T1) | Introduction of robotic process automation in the sales department |

# 4 Results

In this section, we first present the *ex-ante* list of candidate PDP SFs (Section 4.1) After that, we present the *ex-post* list of candidate PDP SFs (Section 4.2) and the final *PDP Success Model* (Section 4.3).

## 4.1 Ex-Ante List of Candidate Success Factors

To group the candidate PDP SFs extracted from the literature, we first considered seminal IS success models from the literature. As none of these models specifically covers the PDP context, we reverted to frameworks from related fields such as work systems theory, BPM, and PM, which fit the interdisciplinary and socio-technical nature of our research (i.e., Aladwani, 2002; Alter, 2013; Davis, 1989; Petter *et al.*, 2013; Rosemann and Vom Brocke, 2015). For example, Alter (2013) defines work systems as including customers, environment, information, infrastructure, participants, processes and activities, products and services, strategies, and technologies. Moreover, Petter *et al.* (2013) proposed a model of independent factors of IS success relying on task, project, organizational, user, and social characteristics. Rosemann and Vom Brocke (2015) introduced the six core elements of BPM (i.e., culture, governance, information technology, methods, people, and strategic alignment), which are also referred to as SFs of BPM on the enterprise level. Finally, Aladwani (2002) presents a model for IS project success, which

highlights organizational, people, process, project, task, and technology characteristics, while Davis (1989) introduce factors affecting user acceptance of technology through perceived usefulness and ease of use.

As the categories used in these frameworks are highly overlapping, we decided to group the candidate SFs within the author team according to categories backed by multiple frameworks. To assign the identified candidate SFs to categories, we proceeded in the same way as when grouping the success codes to candidate SFs, following the proposed approach of Krippendorff (2013). Having compared multiple alternatives, we came up with a configuration of seven categories. These categories are: *culture* (Rosemann and Vom Brocke, 2015; Petter *et al.*, 2013), *process* (Alter, 2013; Aladwani, 2002), *project* (Aladwani, 2002; Petter *et al.*, 2013), *people* (Rosemann and Vom Brocke, 2015; Petter *et al.*, 2013; Aladwani, 2002; Alter, 2013), *strategy* (Rosemann and Vom Brocke, 2015; Alter, 2013), *structure* (Aladwani, 2002; Petter *et al.*, 2013; Alter, 2013), and *technology* ( Aladwani, 2002; Alter, 2013; Davis, 1989; Rosemann and Vom Brocke, 2015). The mapping of candidate SFs to these categories resulted in the *ex-ante* list. Table 3 not only lists the candidate SFs, but also their definitions, justificatory references, and a rationale why the respective SFs may drive PDP success.

Overall, the *strategy* category (2 SFs; 7%) includes factors addressing the clarity of goals and the integration of departmental digitalization strategies. *Structure* (2 SFs, 7%) relies on infrastructural and organizational agility, whereas *culture* (5 SFs, 16%) comprises factors referring to the working environment as well as the attitudes of different roles and individuals. The *people* category (7 SFs, 23%) covers factors influencing human knowledge and skills in different areas relevant for PDPs. The *process* category (2 SFs, 7%) includes selected activities from the BPM lifecycle, which were found to positively affect PDP success, while the *project* category (10 SFs, 33%) emphasizes the influence of communication and selected PM activities. Finally, the *technology* category (2 SFs, 7%) accounts for SF candidates that depend on the DTs employed. Overall, the *project* category contains the most candidate SFs followed by *people* and *culture*. The strategy, structure, process, and technology categories only contain two SFs each. Appendix F provides an overview of all success codes and justificatory references.

**Table 3** The Ex-Ante List of Candidate PDP SFs Structured into Seven Categories

| Category | Name | Definition | Justificatory References | Success Rationale |
|---|---|---|---|---|
| **Strategy** | Goal Clarity | Transparency and consistency of organizational goals | Pankratz and Loebbecke (2011) | Enables the effective and efficient execution of the PDP |
| | Strategy Integration | Alignment of the organization's business, IT, and digital strategy | Rodríguez *et al.* (2020b) | Reduces inefficiencies within the PDP through implementing |

| | | | | |
|---|---|---|---|---|
| | | | | different strategies in an organization |
| **Structure** | Infrastructural Agility | Extendibility, compatibility, and robustness of the organization's infrastructure | Holotuik and Beimborn (2017) | Ensures adaptability to unexpected infrastructural changes within the PDP |
| | Organizational Agility | The organization's overall ability and willingness to cope with new conditions | Jugdev and Müller (2005) | Ensures adaptability to unexpected organizational changes within the PDP |
| **Culture** | Employee Agility | Employees' ability and willingness to cope with new conditions | Abdolvand *et al.* (2008) | Enables adapting to new situations that emerge during the PDP |
| | Innovation Attitude | The organization's open-mindedness toward new developments | Malinova *et al.* (2014) | Enables beneficiating from new developments and opportunities that can be used to promote the PDP |
| | Management Agility | Management's ability and willingness to cope with new conditions | Jugdev and Müller (2005) | Enables adapting strategies and the manner of leading when necessary for the PDP success |
| | Resource Agility | The organization's ability and willingness to dynamically re-allocate resources | Gomes and Romão (2016) | Enables in- and decreasing, or shifting resources affecting the business process in focus for new situations |
| | Risk Attitude | The organization's willingness to take risks and to experiment | Costantino *et al.* (2015) | Allows for improving effectiveness and efficiency of the business process in focus by grasping opportunities |
| **People** | Customer Knowledge | Knowledge about the customers of the business process affected by the PDP | Holotuik and Beimborn (2017) | Enables customer-centric implementation of the business process in focus and increases customer satisfaction |
| | Employee Domain Knowledge | Employees' knowledge about and experience with the domain affected by the PDP | Pankratz and Loebbecke (2011) | Ensures knowledge required to correctly analyze the context of the PDP |
| | Employee Technology Knowledge | Employees' knowledge about and experience with the technologies used in the PDP | Dezdar and Ainin (2011) | Ensures knowledge required to correctly use the DT affecting the business process in focus |
| | Management Domain Knowledge | Management's knowledge about and experience with the domain affected by the PDP | Irvine and Hall (2015) | Ensures management knowledge required to correctly analyze the context of the PDP |
| | Management Technology Knowledge | Management's knowledge about and experience with the technologies used in the PDP | Hughes *et al.* (2017) | Ensures management knowledge required about the DT affecting the business process in focus |
| | Process Improvement Skills | Ability to analyze and improve business processes | Abollado *et al.* (2017) | Ensures methodical knowledge required to improve the business process in focus |
| | Process Knowledge | Knowledge about the business process affected by the PDP | Malinova *et al.* (2014) | Enables improving effectiveness or efficiency of the affected business process |
| **Process** | Process Design | Availability of a model for the business process affected by the PDP | Holotuik and Beimborn (2017) | Discloses potentials for digitalization by visualizing the affected business process |
| | Process Monitoring | Continuous monitoring of the business process affected by the PDP | Pankratz and Loebbecke (2011) | Discloses potentials for improvement of the affected business process |
| **Project** | Customer Integration | Integration of customers into the PDP | Fowler and Horan (2007) | Enables early adaptation of the business process in focus to a customer's needs |

| | | | | |
|---|---|---|---|---|
| | Employee Support | Employees' commitment toward the PDP | Abdolvand *et al.* (2008) | Increases performance and reduces friction with employees affected by the PDP |
| | External Communication | Information and knowledge sharing beyond the PDP | Ram *et al.* (2013) | Improves decision-making affecting the business process in focus contingent on external information |
| | Internal Communication | Information and knowledge sharing within the PDP | Kirsch and Slaughter (2013) | Improves decision-making affecting the business process in focus contingent on internal information |
| | Partner Integration | Integration of partners into the PDP | Ram *et al.* (2013) | Allows for beneficiating from a partner's knowledge and skills about the DT or business process in focus |
| | Project Monitoring | Continuous monitoring of the PDP's performance and progress | Frey and Buxmann (2012) | Enables adjustments during the PDP to increase performance and foster the PDP's progress |
| | Project Preparation | Detailed planning of the PDP | Kirsch and Slaughter (2013) | Improves the later execution of the PDP and anticipation of challenges and opportunities of the PDP |
| | Team Portfolio | The PDP team's compilation of individual skills and personal relations | Ram *et al.* (2013) | Ensures the fit of the knowledge and skills of the PDP's team members |
| | Team Support | The PDP team's motivation in and championing of the PDP | Gomes and Romão (2016) | Increases performance and reduces friction within the PDP |
| | Top Management Support | Management's commitment to and championing of the PDP | Costantino *et al.* (2015) | Fosters employee's motivation and enables a holistic assessment of the PDP |
| **Technology** | Technology Complexity | Effort needed to implement, run, and execute the technologies used in the PDP | Hughes *et al.* (2017) | Reduces skillset and preparation needed to implement the DT in focus |
| | Technology Maturity | Readiness-for-use of the technologies used in the PDP | Irvine and Hall (2015) | Reduces efforts needed to implement the DT in focus |

## 4.2 Ex-Post List of Candidate Success Factors

While conducting the interviews, we *identified* seven new candidate SFs and *refined* two further candidates into three new ones. Moreover, we found preliminarily support for the influence of 19 candidate SFs from the *ex-ante* list, as these candidate SFs have been actively mentioned by the interviewees. Interestingly, there were nine candidate SFs identified from the literature for which we did not find any empirical support. Based on the refinement and validation of the *ex-ante* list, we included the supported, new, and refined SFs into the *ex-post* list. We also included the SF candidates for which we could not find empirical support owing to the exploratory nature of our research, i.e., we cannot exclude a positive effect on PDP success with certainty only based on the interviews. Table 4 provides an overview. In case of new and refined SFs, it also includes the (refined) definition and justificatory references, which we identified while critically reflecting on these findings. Details on new SFs as well as the refinement of existing SFs can be found in Appendix G (new SFs) and Appendix H (refined SFs).

**Table 4** New, Refined, and Candidate PDP SFs without Supporting Evidence

| Category | Name | Attribute | (Refined) Definition | Justificatory References | Success Rationale |
|---|---|---|---|---|---|
| **Strategy** | Digital Ambition | New | Continuous focus on the digitalization of the organization and its processes | Gartner (2017) | Enhances team members motivation and commitment and increases the PDP's effectiveness and efficiency |
| **Structure** | Organizational Agility | No supporting evidence found | - | - | |
| **Culture** | Digitalization Attitude | New | PDP members' willingness-to-change and open-mindedness toward DTs | Koleva (2019) | Facilitates the integration of the DT into the business process in focus |
| | Partner Agility | New | Partners' ability and willingness to cope with new conditions | Ren *et al.* (2005) | Enables adapting to new situations within PDP's processes that involve partners |
| **People** | Data Analysis | New | Usage of analytical and decision-making capabilities for diagnostic, descriptive, prescriptive, and predictive purposes | Porter and Heppelmann (2015) | Facilitates beneficial usage of data analysis technologies in the business process in focus |
| | Partner Domain Knowledge | New | Partners' knowledge about and experience with the domain affected by the PDP | Yayavaram *et al.* (2018) | Ensures partner knowledge required to correctly analyze the context of the PDP |
| | Partner Technology Knowledge | New | Partners' knowledge about and experience with the technologies used in the PDP | Flor *et al.* (2018) | Ensures partner knowledge required about the DT affecting the business process in focus |
| | Customer Knowledge | No supporting evidence found | - | - | |
| | Management Domain Knowledge | No supporting evidence found | - | - | |
| | Management Technology Knowledge | No supporting evidence found | - | - | |
| **Process** | Process Goal Clarity | Refined | Transparency and consistency of the goals of the business process affected by the PDP | Peralta *et al.* (2015) | Facilitates modifying the business process in focus in such a way that it brings the desired outcome to the company |
| | Process Design | No supporting evidence found | - | - | |
| | Process Monitoring | No supporting evidence found | - | - | |
| **Project** | Project Goal Clarity | Refined | Transparency and consistency of the PDP goals | Raziq *et al.* (2018) | Facilitates finding a lean and efficient path to the PDP's goal |
| | Project Monitoring | No supporting evidence found | - | - | |
| **Technology** | Technology Comprehensibility | New | The level of abstractness of the DT used in the PDP | Flor *et al.* (2018) | Enables understanding the functionality of the DT in focus and how to use it in the affected business process |

| | | | | |
|---|---|---|---|---|
| Infrastructural Readiness | Refined | Extendibility, compatibility, and robustness of the organization's technological infrastructure | Haddad *et al.* (2018) | Facilitates successful implementation of the DT in focus within the existing infrastructure |
| Technology Complexity | No Supporting Evidence found | - | - | |
| Technology Maturity | No Supporting Evidence found | - | - | |

## 4.3 PDP Success Model

In line with the results from the expert interviews, we built the *ex-post* list of candidate PDP SFs. The final step was to compile the *PDP Success Model* by linking the candidate PDP SFs from the *ex-post* list as independent variables with PDP success criteria as dependent variables. For our purposes, we used project efficiency and project effectiveness as success criteria, as they are commonly used in the general PM literature (Drucker, 2007; Beer *et al.*, 2013) as well as for measuring the success of process change initiatives (Bandara *et al.*, 2005; Schmiedel *et al.*, 2020). Moreover, effectiveness and efficiency are specifically well-known in the exploitative BPM literature (Grisold *et al.*, 2019), which is why they fit our PDP definition very well. The final *PDP Success Model*, which includes 38 SFs structured according to seven categories, is presented in Figure 2.

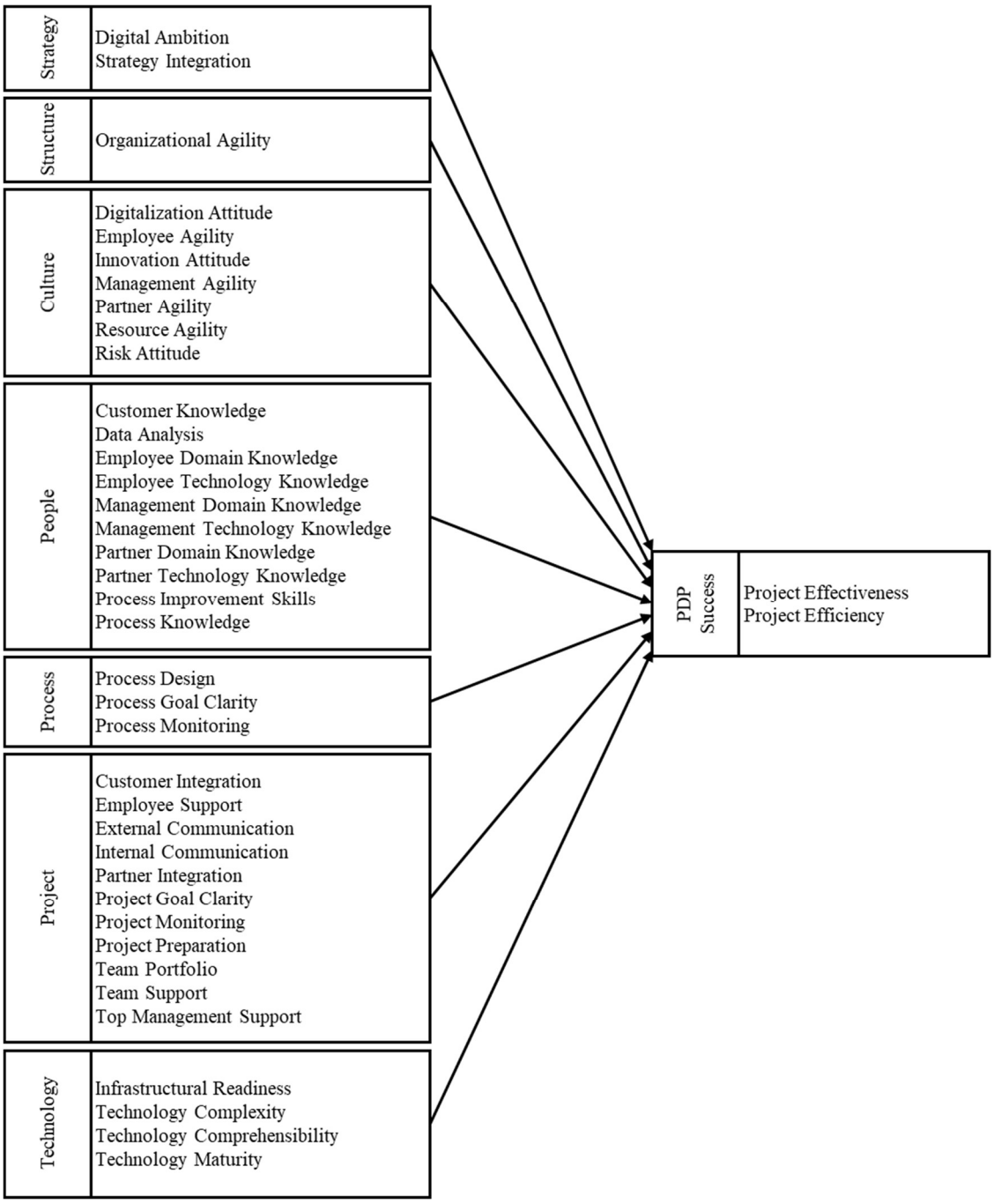


**Fig. 2** The PDP Success Model

# 5 Discussion and Conclusion

## 5.1 Contribution

Our study was motivated by the lack of knowledge on how organizations can leverage DTs to improve and innovate business processes. While there are methods and tools for identifying process digitalization ideas and projects, guidance on the successful implementation of PDPs is missing. Hence, we set out to explore factors that drive PDP success. We conducted a structured literature review to integrate isolated pockets of understanding as well as semi-structured interviews to validate, refine, and extend these results based on first-hand insights. Our key contribution is the *PDP Success Model*, which links 38 candidate SFs distributed across seven literature-backed categories with PDP success criteria. We also provided preliminary success rationales that support the sense-making process and can be used as foundation for future research.

## 5.2 Theoretical Implications

From a theoretical perspective, our study is the first to link the BPM, PM, and digitalization fields, whereas the intersection of pairs of these fields has already been studied, e.g., the intersection of BPM and PM (Lehnert *et al.*, 2016; Limam Mansar *et al.*, 2009; Darmani and Hanafizadeh, 2013) or the intersection of BPM and digitalization (Kerpedzhiev *et al.*, 2020; Beverungen *et al.*, 2020; Baiyere *et al.*, 2020). Moreover, our study is the first to investigate SFs for PDPs, which is essential given the impact of digitalization on BPM (Kerpedzhiev *et al.*, 2020) and the importance of business process digitalization for corporate success (Denner *et al.*, 2018; Rosemann, 2020).

The *PDP Success Model* implies that the SFs currently discussed in the BPM, PM, and digitalization literature need refinement and extension to cover the particularities of PDPs. This becomes manifest in the high number of newly identified and refined candidate SFs. Ten out of the 38 candidate SFs from the *ex-post* list across all categories emerged during the interviews (e.g., digital ambition, partner agility, and partner analysis), meaning that they were not discussed in relation to process digitalization so far. Moreover, nine candidate SFs from the *ex-ante* list remained without empirical support (e.g., organizational agility, management technology knowledge, and process design). This circumstance indicates that the originally found effect of these candidate SFs may not apply to PDPs – at least not to those from our sample. At the same time, 28 candidate SFs from the *PDP Success Model* are already backed by the literature. Hence, digitalization questions existing knowledge but it does not render it

obsolete. Moreover, PDPs require a unique set of SFs, which combine established and hitherto underrepresented knowledge from the BPM, PM, and digitalization fields.

Our results foster the understanding of PDP success and extend papers that already dealt with business process digitalization. First, the *PDP Success Model* complements methods and tools for identifying process digitalization ideas and PDPs (Denner *et al.*, 2018; Rosemann, 2020). By nature, such approaches neglect the implementation phase of PDPs. Our results also complement studies focusing on BPM SFs (Trkman, 2010; Rosemann and Vom Brocke, 2015; Castro *et al.*, 2020), which take an enterprise-level perspective abstracting from individual projects. Most specifically, our results build on, update, and extend those studies that investigated SFs on the level of individual projects (Al-Mashari and Zairi, 1999; McLean and Antony, 2014). Owing to their publication date, these works do not account for the challenges and opportunities brought about by digitalization (Legner *et al.*, 2017). Our findings comply with Kerpedzhiev *et al.* (2020), who stated that BPM in the digital age calls for different capabilities, while we found that capabilities on the project level have changed as well. In addition, some existing works focus on SFs and pitfalls of specific activities within process projects, such as process modeling (Bandara *et al.*, 2005; Rosemann, 2006). Compared to these papers, the *PDP Success Model* is not limited to specific activities and takes a broad perspective as expressed in terms of the covered categories.

## 5.3 Managerial Implications

From a managerial perspective, the *PDP Success Model* has the potential to guide PDP managers and their teams when planning and conducting PDPs. This leads to the following operational implications:

*Managers should account for relevant SFs when conducting PDP and assess their PDPs accordingly.* PDP teams can use the *PDP Success Model* as a foundation for fit/gap analyses and self-assessments. Using a SWOT analysis, for example, managers can monitor their PDP to exploit strengths and opportunities as well as eliminate threats and weaknesses. These insights can also be used for continuous benefits management. PDP managers can also use the *PDP Success Model* to assess the extent to which certain candidate SFs can be influenced to sensibly allocate scarce team resources and management attention. If such activities are performed repeatedly, PDP teams can develop an awareness of relevant PDP SFs and become consciously competent in successfully completing PDPs.

*Managers should be sensitive to new findings and overcome old patterns of thought.* Using open innovation methods, managers can integrate external knowledge and identify new ideas as well as SFs for the successful

implementation of PDPs. The fact that one quarter of the candidate SFs from the *PDP Success Model* emerged during the interviews and that we could not find empirical support for another nine SFs during the interviews should sensitize PDP teams that they must not blindly trust their experience and what they have learned in the past. Rather, PDP teams should pay particular attention to the newly identified candidate SFs and those without empirical support. It is regarding these SFs where existing PM routines must be adjusted.

*Managers should understand the interplay of BPM, PM, and digitalization to prepare for new requirements.* As digitalization brings about new challenges and opportunities, hitherto established ways of realizing process change need refinement. Our study showed that current SFs from the literature may not be applicable to PDPs anymore. During the interviews, we identified that three out of seven new SF candidates relate to digitalization (i.e., digital ambition, digitalization attitude, and data analysis). Digitalization offers new ways to design business processes and evaluate their performance. Hence, managers should consider these aspects related to digitalization when planning for the successful implementation of PDPs.

## 5.3 Limitations and Future Research

Our findings must be interpreted considering certain limitations, which also stimulate future research. First, to fully understand PDP success, it is important to also account for interactions among SFs. This is worthwhile, as research in related fields discovered relations among SFs (Petter *et al.*, 2013; Guimaraes, 1997). For the purposes of our exploratory study, we treated the candidate SFs as independent and equally important. Furthermore, we kept candidate SFs from the literature in the presented *PDP Success Model* even if we could not find empirical evidence for them during the interviews. The reason is that we cannot exclude a positive effect on PDP success with certainty owing to the exploratory nature of our research. Hence, the number of candidate SFs included in the *PDP Success Model* is rather high. In line with our exploratory approach, we used the literature from BPM, PM, and digitalization as central source of evidence. Although we conducted the literature review with due care, we cannot guarantee that we did not miss out single studies. Moreover, to group the identified SF candidates, we drew from well-established frameworks. We examined the categorization qualitatively and quantitatively and tested different alternatives. However, the final categorization has been made by the author team, which is why future research may investigate alternative groupings of the SF candidates.

Second, our definition of PDPs covers exploitative process change and explorative BPM that seizes opportunities to reengineer existing processes. It excludes explorative BPM geared toward the opportunity-led creation of novel processes. Accordingly, we chose the PDPs covered in the interviews to fit this definition. Hence, the transferability of our results may be limited in this regard. As explorative process change features a close relationship with innovation management and does not build on existing processes, related PDPs may require different SFs and maybe even different success criteria. Finally, the PDPs covered during the interviews were limited to the business-to-business domain. While we searched the related BPM, PM, and digitalization literature without restrictions, we limited ourselves to the manufacturing domain for the expert interviews. Although this was a deliberate design decision of the author team, we cannot exclude whether interviews in other domains would have led us to identify different new candidate SFs.

Future research should address the limitations and take our results one step further. As for the limitations, future research should challenge the *PDP Success Model* through literature reviews and interviews in other domains. Related findings may provide useful hints for contextualizing the *PDP Success Model*. Moreover, future research should investigate SFs and success criteria for explorative PDPs with a focus on the creation of new business processes. As our research had an exploratory focus, the explanatory power of the *PDP Success Model* yet needs to be investigated through confirmatory research (e.g., surveys). To that end, future research should account for potential interactions among SFs within the same category and across categories. To account for the diverse domains in which PDPs are performed, *context* should be included as a moderating variable. To that end, future research may leverage the BPM context framework (Vom Brocke *et al.*, 2016), which has been successfully used for BPM method assessment and selection (Vom Brocke *et al.*, 2020), as well as the characteristics of digital technologies to account for different types of DTs (Berger *et al.*, 2018; Benbya *et al.*, 2020). Finally, future research may take a closer look at those candidate SFs for which we could not find supporting empirical evidence during the interviews, as they need special scrutiny whether they really apply to PDPs. Even more, the same holds true for those SF candidates that emerged during the interviews. Their definitions should be substantiated, and it should be investigated whether they also shape up useful in domains beyond PDPs.

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# Appendix A: Success Codes extracted from the Literature

This table shows the total number of mentions per success factor received in a respective study retrieved in the structured database search. Used abbreviations are:

- SF: Coding of the candidate PDP Success Factor
- SFC: Coding of the category of PDP Success Factors
- RF: Research field
- Digit*: all fields related to Digitalization
- BPI: Business Process Improvement
- BPR: Business Process Reengineering
- PM: Project Management
- PPM: Project Portfolio Management

| | | SFC | Culture | Culture | Culture | Culture | Process | Process | Project | Project | Project | Project | Project | Project | Project | Project | People | People | People | People | People | People | People | People | People | Strategy | Strategy | Structure | Structure | Technology | Technology | Technology | Technology |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Source | RF | SF | Employee Agility | Innovation Attitude | Management Agility | Risk Attitude | Customer Knowledge | Process Knowledge | Customer Integration | Employee Support | External Communication | Internal Communication | Partner Integration | Resource Agility | Team Support | Top Management Support | Employee Domain Knowledge | Management Domain Knowledge | Process Improvement | Process Design | Process Performance Management | Project Performance Management | Project Preparation | Team Portfolio | Goal Clarity | Strategy Integration | Infrastructural Agility | Organizational Agility | Employee Technology Knowledge | Management Technology Knowledge | Technology Complexity | Technology Maturity |
| Abollado *et al.* (2017) | Digit* | ∑=23 | 1 | | 1 | | | 3 | 1 | 1 | | 2 | 1 | | | 2 | | | | | 3 | | 2 | | | | 5 | | | | | 1 |
| Holotuik and Beimborn (2017) | Digit* | ∑=41 | | 9 | 2 | 2 | 1 | | 3 | | | | 2 | 1 | | | | 3 | 2 | 1 | | | | 3 | | 3 | 5 | 4 | | | | |
| Siegel and Madni (2014) | Digit* | ∑=6 | | 1 | | 2 | | | | | | | | | | 1 | | | | | | 1 | 1 | | | | | | | | | |
| Antony *et al.* (2012) | BPI | ∑=16 | | | | | | | 2 | | | 3 | | 1 | 1 | 1 | | 1 | | | | 1 | 1 | | 3 | | 1 | 1 | | | | |
| Malinova *et al.* (2014) | BPI | ∑=22 | | 1 | 1 | 1 | 2 | 5 | 1 | | | 3 | | | | | 1 | | 5 | | 1 | | | | | | 1 | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| McLean and Antony (2014) | BPI | ∑=8 | | | | | | | | 1 | | 2 | | | | 1 | | 1 | | | | | 1 | | 1 | | | 1 | | | | |
| Siha and Saad (2008) | BPI | ∑=53 | | 1 | | | 2 | 2 | 1 | 2 | | 4 | 2 | | | 4 | | 3 | 6 | 3 | 2 | | 1 | 3 | 6 | 6 | 1 | 3 | | | | 1 |
| Abdolvand *et al.* (2008) | BPR | ∑=24 | | 2 | | 1 | | 1 | | 1 | | 3 | | | 1 | | | 2 | | | | 1 | | 1 | 2 | | | 6 | | | | 3 |
| Al-Mashari and Zairi (1999) | BPR | ∑=51 | | 5 | | | | | | 2 | 3 | 5 | | 4 | 1 | 4 | 2 | 1 | 4 | | | | 4 | 3 | 2 | 3 | 4 | 2 | | 1 | | 1 |
| Dezdar (2012) | BPR | ∑=5 | | | | | | | | | | 2 | 1 | | | 1 | | 1 | | | | | | | | | | | | | | |
| Dezdar and Ainin (2011) | BPR | ∑=11 | | | | | | | | | | | 2 | | | | 1 | 2 | | | | 1 | 2 | 1 | 1 | | | | 1 | | | |
| Guimaraes (1997) | BPR | ∑=32 | | 2 | | | 2 | | 1 | | 1 | 4 | 1 | | 2 | 2 | | 1 | 5 | 3 | | | 1 | 1 | 3 | 1 | 1 | 1 | | | | |
| Paper and Chang (2005) | BPR | ∑=37 | 1 | 2 | 1 | 2 | | 2 | 2 | 2 | | 6 | | 1 | 2 | 3 | 2 | 1 | | | 1 | | 1 | 2 | | 2 | 1 | 1 | 2 | | | | |
| Umble *et al.* (2003) | BPR | ∑=15 | | 1 | | | | | | 1 | | 1 | | | | 2 | | 1 | | | 1 | | 2 | 1 | 2 | | 2 | | 1 | | | |
| Beringer *et al.* (2013) | PPM | ∑=7 | | | | | | | | | | | | | 1 | 3 | | | | | | | | 2 | | 1 | | | | | | |
| Costantino *et al.* (2015) | PPM | ∑=16 | | | | 3 | 1 | | 1 | | 1 | | | 1 | | 1 | | 1 | | | | 1 | 2 | 2 | | | | 1 | 1 | | | |
| Frey and Buxmann (2012) | PPM | ∑=10 | | | | 1 | | | | | | | | 1 | | 1 | | | | | | 1 | 3 | | 1 | 2 | | | | | | |
| Allen *et al.* (2014) | PM | ∑=12 | | | | | | 1 | 1 | | | 1 | | | 1 | | | | | | 1 | | 2 | | 1 | | | 4 | | | | |
| Avital (2003) | PM | ∑=40 | | 2 | | | 1 | 2 | 2 | | 1 | 9 | | 1 | 2 | 2 | 3 | 1 | | | | | | 3 | 4 | 1 | 1 | 4 | | | | 1 |
| Bai and Sarkis (2013) | PM | ∑=12 | | | | | | | 1 | | | 1 | | | | 2 | | 2 | | | 1 | | | | | 1 | 1 | 3 | | | | |
| Besteiro *et al.* (2015) | PM | ∑=23 | | | | 1 | | | | 2 | 1 | 3 | | 2 | | | | 2 | | | | | 5 | 1 | 4 | | | 2 | | | | |
| Bradley (2005) | PM | ∑=5 | | | | | | | | | 1 | 1 | | | | 1 | | | | | | | | 1 | | | | | 1 | | | |
| Clarke (1999) | PM | ∑=12 | | | 1 | | | 1 | | | | 4 | | | | | | 1 | | | | 1 | 2 | | 2 | | | | | | | |
| Cooke-Davies (2002) | PM | ∑=12 | | 1 | | 3 | | | | | | 2 | | | | | | | | | 1 | 1 | 1 | | | 1 | | 2 | | | | |
| Dvir *et al.* (1998) | PM | ∑=97 | | 1 | 1 | 1 | 1 | 2 | 3 | | 3 | 8 | | 2 | 3 | 3 | 2 | 8 | 3 | 3 | 6 | 7 | 13 | 5 | 4 | | 4 | 5 | 2 | 1 | 2 | 4 |
| Fowler and Horan (2007) | PM | ∑=12 | | | | | 1 | | 2 | 2 | | 1 | | | | 2 | 2 | 2 | | | | | | | | | | | | | | |
| Gomes and Romão (2016) | PM | ∑=8 | | | | 1 | 2 | | | | | | | 2 | 1 | 1 | | | | | | 1 | | | | | | | | | | |
| Irvine and Hall (2015) | PM | ∑=47 | 2 | 1 | | 1 | | | 2 | 3 | 1 | 2 | | 1 | 1 | 2 | | 5 | | | 1 | 2 | 10 | 6 | 6 | | | | | | | 1 |
| Hughes *et al.* (2017) | PM | ∑=67 | | 1 | 3 | 3 | 1 | 2 | 3 | 2 | | 5 | 1 | 5 | 4 | 4 | | 8 | 1 | | | 3 | 12 | 1 | 1 | | | 3 | | 2 | 1 | 1 |
| Ika (2009) | PM | ∑=2 | | | | | | | | | | | | | | | | 1 | | | | | 1 | | | | | | | | | |
| Jugdev and Müller (2005) | PM | ∑=58 | | 1 | 3 | | 3 | 1 | 2 | | 4 | 3 | 2 | | | 5 | 1 | 4 | 1 | | 1 | 1 | 5 | 3 | 6 | 6 | 1 | 3 | | | 1 | 1 |
| Kirsch and Slaughter (2013) | PM | ∑=15 | | | | | 1 | | | | | 1 | | | | | | 2 | | | 2 | | 2 | 2 | 1 | | 1 | 2 | | | | 1 |
| Lam *et al.* (2013) | PM | ∑=58 | 1 | | 1 | 1 | 1 | | 6 | 1 | | 4 | | 1 | 2 | 4 | 1 | 4 | 1 | | | 1 | 7 | 4 | 4 | | 1 | 10 | | | 2 | 1 |
| Pankratz and Loebbecke (2011) | PM | ∑=58 | 1 | | | 2 | | | 4 | | | 1 | 1 | | 3 | 5 | 1 | 6 | 1 | | 4 | 5 | 6 | 3 | 6 | 2 | | 5 | | | 2 | |
| Ram *et al.* (2013) | PM | ∑=31 | | 1 | | | | | 1 | | 3 | 5 | 3 | | | 2 | | 2 | 2 | | 1 | 1 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Remus (2007) | PM | ∑=42 | 1 | 2 | | | 1 | | | | 1 | 4 | 3 | 2 | | 3 | | 2 | 3 | | | 1 | 6 | 3 | 3 | 2 | 2 | 1 | 1 | | | 1 |
| Shenhar *et al.* (2002) | PM | ∑=18 | | | | | | 2 | 1 | | | | | 1 | | | | 2 | | 1 | 1 | 2 | 2 | 1 | 1 | | | 4 | | | | |
| Varajão and Trigo (2016) | PM | ∑=16 | | | | | 4 | | 3 | | | | | 1 | 1 | | | | | | | 1 | 3 | | 1 | 2 | | | | | | |
| Rodríguez *et al.* (2020b) | BPI | ∑=35 | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | 1 | | | |
| Rodriguez *et al.* (2020a) | BPR | ∑=66 | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | | | 1 | |

# Appendix B: List of Success Codes and respective Coding

Two co-authors coded the success codes by assigning them to previously built success factor constructs. Then, an external coder assigned the success codes to the constructs as well. This table shows all extracted success codes numbered consecutively and coded as further explicated in the manuscript. Used abbreviations are:

- SC: Success Code
- SF: Coding of the candidate PDP Success Factor
- SCF: Coding of the Category of PDP Success Factors
- AX: Co-Author X
- EC: External Coder
- RF: Research Field
- Digit*: all fields related to Digitalization
- BPI: Business Process Improvement
- BPR: Business Process Reengineering
- PM: Project Management
- PPM: Project Portfolio Management
- SF number: 1=Employee Agility, 2=Innovation Attitude, 3=Management Agility,4=Risk Attitude, 5=Customer Knowledge, 6=Process Knowledge, 7=Customer Integration, 8=Employee Support, 9=External Communication, 10=Internal Communication, 11=Partner Integration, 12=Resource Agility, 13=Team Support, 14=Top Management Support, 15=Employee Domain Knowledge, 16=Management Domain Knowledge, 17=Process Improvement, 18=Process Design, 19=Process Performance Management, 20=Project Performance Management, 21=Project Preparation, 22=Team Portfolio, 23=Goal Clarity, 24=Strategy Integration, 25=Infrastructural Agility, 26=Organizational Agility, 27=Employee Technology Knowledge, 28=Management Technology Knowledge, 29=Technology Complexity, 30=Technology Maturity.
- SFC number: 1=Culture, 2=Process, 3=Project, 4=People, 5=Strategy, 6=Structure, 7=Technology.

| SC No. | SC | A1 SFC | A1 SF | A2 SFC | A2 SF | EC SFC | EC SF | RF | Source | Year | Success/ Failure | Explicit/ Implicit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Risk management - Effectiveness | 1 | 5 | 1 | 5 | 1 | 5 | PM | Irvine and Hall | 2015 | success | explicit |
| 2 | Project team dynamics | 1 | 1 | 1 | 1 | 1 | 1 | PM | Irvine and Hall | 2015 | success | explicit |
| 3 | Incremental organizational change | 1 | 2 | 1 | 2 | 1 | 2 | PM | Irvine and Hall | 2015 | failure | explicit |
| 4 | Staff turnover | 1 | 1 | 1 | 1 | 3 | 9 | PM | Irvine and Hall | 2015 | failure | explicit |
| 5 | Project team - Competence | 4 | 24 | 4 | 24 | 4 | 24 | PM | Irvine and Hall | 2015 | success | explicit |
| 6 | Client/host organization - Staff turnover | 4 | 24 | 4 | 24 | 4 | 24 | PM | Irvine and Hall | 2015 | success | explicit |
| 7 | Project team - Competence/fit with project | 4 | 24 | 4 | 24 | 4 | 24 | PM | Irvine and Hall | 2015 | success | explicit |
| 8 | Project manager - Experience | 4 | 17 | 4 | 17 | 4 | 17 | PM | Irvine and Hall | 2015 | success | explicit |
| 9 | Project team - Competence/technical | 4 | 24 | 4 | 24 | 4 | 24 | PM | Irvine and Hall | 2015 | success | explicit |
| 10 | Project team - Experience | 4 | 24 | 4 | 24 | 4 | 24 | PM | Irvine and Hall | 2015 | success | explicit |
| 11 | Project planning - Effectiveness | 4 | 23 | 4 | 23 | 4 | 23 | PM | Irvine and Hall | 2015 | success | explicit |
| 12 | Project management - Effectiveness | 4 | 17 | 4 | 17 | 4 | 17 | PM | Irvine and Hall | 2015 | success | explicit |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | Change control - Effectiveness | 4 | 21 | 4 | 21 | 1 | 2 | PM | Irvine and Hall | 2015 | success | explicit |
| 14 | Project control - Effectiveness | 4 | 22 | 4 | 22 | 4 | 22 | PM | Irvine and Hall | 2015 | success | explicit |
| 15 | Project monitoring - Effectiveness | 4 | 22 | 4 | 22 | 4 | 22 | PM | Irvine and Hall | 2015 | success | explicit |
| 16 | Project - Size | 4 | 23 | 4 | 23 | 4 | 23 | PM | Irvine and Hall | 2015 | success | explicit |
| 17 | Estimating - Effectiveness | 4 | 23 | 4 | 23 | 4 | 23 | PM | Irvine and Hall | 2015 | success | explicit |
| 18 | Project - Complexity | 4 | 23 | 4 | 23 | 4 | 23 | PM | Irvine and Hall | 2015 | success | explicit |
| 19 | Requirements - Fitness for purpose | 4 | 23 | 4 | 23 | 4 | 23 | PM | Irvine and Hall | 2015 | success | explicit |
| 20 | Estimates - Fitness for purpose | 4 | 23 | 4 | 23 | 4 | 23 | PM | Irvine and Hall | 2015 | success | explicit |
| 21 | Requirements - Completeness | 4 | 23 | 4 | 23 | 4 | 23 | PM | Irvine and Hall | 2015 | success | explicit |
| 22 | Project manager's leadership style | 4 | 17 | 4 | 24 | 4 | 17 | PM | Irvine and Hall | 2015 | success | explicit |
| 23 | Project manager's use of vision | 4 | 17 | 4 | 24 | 4 | 17 | PM | Irvine and Hall | 2015 | success | explicit |
| 24 | Project planning practices | 4 | 23 | 4 | 23 | 4 | 23 | PM | Irvine and Hall | 2015 | success | explicit |
| 25 | Quality of planning | 4 | 23 | 4 | 23 | 4 | 23 | PM | Irvine and Hall | 2015 | success | explicit |
| 26 | Risk management | 4 | 17 | 1 | 5 | 1 | 5 | PM | Irvine and Hall | 2015 | success | explicit |
| 27 | Project size | 4 | 23 | 4 | 23 | 4 | 23 | PM | Irvine and Hall | 2015 | failure | explicit |
| 28 | Developer input to project estimates | 4 | 24 | 4 | 24 | 3 | 10 | PM | Irvine and Hall | 2015 | success | explicit |
| 29 | End users - involvement | 3 | 8 | 3 | 8 | 3 | 8 | PM | Irvine and Hall | 2015 | success | explicit |
| 30 | Project board - Supportiveness | 3 | 15 | 3 | 15 | 3 | 15 | PM | Irvine and Hall | 2015 | success | explicit |
| 31 | Communication - Effectiveness | 3 | 10 | 3 | 10 | 3 | 10 | PM | Irvine and Hall | 2015 | success | explicit |
| 32 | Common knowledge (end users and project team) | 3 | 11 | 3 | 11 | 3 | 10 | PM | Irvine and Hall | 2015 | success | explicit |
| 33 | End user involvement | 3 | 8 | 3 | 8 | 3 | 8 | PM | Irvine and Hall | 2015 | success | explicit |
| 34 | Executive management support | 3 | 15 | 3 | 15 | 3 | 15 | PM | Irvine and Hall | 2015 | success | explicit |
| 35 | Organizational support | 3 | 9 | 3 | 9 | 3 | 9 | PM | Irvine and Hall | 2015 | success | explicit |
| 36 | Project commitment | 3 | 9 | 3 | 14 | 3 | 9 | PM | Irvine and Hall | 2015 | success | explicit |
| 37 | Project communications | 3 | 11 | 3 | 11 | 3 | 11 | PM | Irvine and Hall | 2015 | success | explicit |
| 38 | Project sponsorship | 3 | 13 | 3 | 13 | 3 | 8 | PM | Irvine and Hall | 2015 | success | explicit |
| 39 | Project team motivation | 3 | 14 | 3 | 14 | 3 | 14 | PM | Irvine and Hall | 2015 | success | explicit |
| 40 | Supportive organizational environment | 3 | 9 | 3 | 9 | 6 | 28 | PM | Irvine and Hall | 2015 | success | explicit |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 41 | Requirements - Stability | 5 | 25 | 5 | 25 | 5 | 25 | PM | Irvine and Hall | 2015 | success | explicit |
| 42 | Requirements - Clarity | 5 | 25 | 5 | 25 | 5 | 25 | PM | Irvine and Hall | 2015 | success | explicit |
| 43 | Project vision | 5 | 25 | 5 | 25 | 5 | 25 | PM | Irvine and Hall | 2015 | success | explicit |
| 44 | Requirements engineering | 5 | 25 | 5 | 25 | 5 | 25 | PM | Irvine and Hall | 2015 | success | explicit |
| 45 | Goal changes | 5 | 25 | 1 | 3 | 5 | 25 | PM | Irvine and Hall | 2015 | failure | explicit |
| 46 | Project volatility | 5 | 25 | 5 | 25 | 5 | 25 | PM | Irvine and Hall | 2015 | failure | explicit |
| 47 | Project deliverable/technology - Maturity | 7 | 33 | 7 | 33 | 7 | 33 | PM | Irvine and Hall | 2015 | success | explicit |
| 48 | Agility to reallocate resources and reorganize rapidly | 1 | 3 | 1 | 3 | 6 | 28 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 49 | Change management for radical and rapid change | 1 | 2 | 1 | 2 | 1 | 2 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 50 | Long-term orientation but short, intense sprints to change | 1 | 2 | 1 | 2 | 1 | 2 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 51 | Create and foster digital mindset with a digital agenda | 1 | 2 | 1 | 2 | 1 | 2 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 52 | Accept failure | 1 | 5 | 1 | 5 | 1 | 5 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 53 | Encourage new to grow success | 1 | 2 | 1 | 2 | 1 | 2 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 54 | Innovation and adaptive culture with evolvable goals | 1 | 2 | 1 | 2 | 1 | 2 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 55 | Commitment to transformation in strategy and culture | 1 | 2 | 1 | 2 | 1 | 2 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 56 | Rethinking of C-level roles (CDO, CIO) | 1 | 3 | 1 | 3 | 1 | 3 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 57 | Capability to reinvent value chain and to challenge status quo | 1 | 2 | 1 | 2 | 1 | 2 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 58 | Foster faster innovation / rapid prototyping | 1 | 2 | 1 | 2 | 1 | 2 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 59 | Look what is laying left and right | 1 | 2 | 1 | 2 | 1 | 2 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 60 | Bold experimentation | 1 | 5 | 1 | 5 | 1 | 5 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 61 | Analytics to customize and create productsandservices | 4 | 19 | 4 | 19 | 4 | 19 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 62 | Digital skills, know-how, and talent | 4 | 24 | 4 | 24 | 4 | 24 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 63 | Capability to design new business models | 4 | 17 | 4 | 17 | 4 | 17 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 64 | New assets and capabilities | 4 | 24 | 1 | 2 | 1 | 2 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 65 | Leaders have to identify new HR potentials | 4 | 17 | 4 | 17 | 4 | 17 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 66 | Acquire, retain, and attract new talents | 4 | 17 | 4 | 24 | 4 | 17 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 67 | Tight feedback loops and aspiration to improvements | 4 | 19 | 4 | 19 | 4 | 19 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 68 | Data-driven and digitally automated process | 4 | 20 | 4 | 20 | 4 | 19 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 69 | Blending human and digital resources | 4 | 24 | 4 | 24 | 4 | 24 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 70 | Outstanding customer experience and satisfaction | 2 | 6 | 2 | 6 | 2 | 6 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 71 | Digitalization of customer interaction and productsandservices | 3 | 8 | 3 | 8 | 3 | 8 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 72 | Direct contact for customer centricity | 3 | 8 | 3 | 8 | 3 | 8 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 73 | Customer integration with open innovation | 3 | 8 | 3 | 8 | 3 | 8 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 74 | Provide financial resources | 3 | 13 | 3 | 13 | 3 | 13 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 75 | Network effects with open systems and partner integration | 3 | 12 | 3 | 12 | 3 | 12 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 76 | External partners | 3 | 12 | 3 | 12 | 3 | 12 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 77 | Organizational alignment towards digital | 5 | 26 | 5 | 26 | 5 | 26 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 78 | Common set of values with digital as value creation | 5 | 26 | 5 | 26 | 5 | 26 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 79 | Not just business but operating models change | 5 | 26 | 5 | 26 | 1 | 1 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 80 | Seamlessly integrated offline(physical) and online (digital) channels | 6 | 27 | 6 | 27 | 6 | 27 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 81 | Multi-level and multi-speed organization for faster reaction | 6 | 28 | 6 | 28 | 6 | 28 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 82 | Organizational separation --> Spin-off | 6 | 28 | 6 | 28 | 6 | 28 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 83 | Lean decision-making | 6 | 28 | 6 | 28 | 6 | 28 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 84 | Establish a clear vision with future positioning | 6 | 28 | 6 | 28 | 6 | 28 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 85 | Use data and information from central source | 6 | 27 | 6 | 27 | 6 | 27 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 86 | Fundamentally different role of IT with two-speed IT | 6 | 27 | 6 | 27 | 6 | 27 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 87 | Real-time and large-scale data processing | 6 | 27 | 6 | 27 | 6 | 27 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 88 | Modular IT platform | 6 | 27 | 6 | 27 | 6 | 27 | Digit* | Holotiuk and Beimborn | 2017 | success | explicit |
| 89 | [Benchmarking] Is limited in ambition by the best in practice which may not be best in a changing world | 1 | 2 | 1 | 2 | 1 | 2 | BPI | Siha and Saad | 2008 | failure | explicit |
| 90 | Strategic selection of six sigma projects and participants | 4 | 17 | 4 | 17 | 4 | 17 | BPI | Siha and Saad | 2008 | success | explicit |
| 91 | Focus on improve of functional area which does not lead to profit increase | 4 | 23 | 4 | 23 | 2 | 7 | BPI | Siha and Saad | 2008 | failure | explicit |
| 92 | Use of 6sigma assumes the process is sound and just needs improvement, yet the process may need redesign, and creative orientation that | 4 | 19 | 4 | 19 | 4 | 19 | BPI | Siha and Saad | 2008 | failure | explicit |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | six sigma is not equipped to fulfil | | | | | | | | | | | |
| 93 | Ease of monitoring one dimensional gap analysis | 4 | 19 | 4 | 19 | 4 | 19 | BPI | Siha and Saad | 2008 | success | explicit |
| 94 | Mgt. of proprietary info. and antitrust laws can pose problems | 4 | 17 | 4 | 17 | 4 | 17 | BPI | Siha and Saad | 2008 | failure | explicit |
| 95 | Deployment of the most talented, competent and creative people in the project | 4 | 24 | 4 | 24 | 4 | 24 | BPI | Siha and Saad | 2008 | success | explicit |
| 96 | Negligence of the work environment aspects of the design process | 4 | 20 | 4 | 20 | 4 | 20 | BPI | Siha and Saad | 2008 | failure | explicit |
| 97 | Consideration of human factors as cost that needs to be reduced, rather than a resource to be developed | 4 | 17 | 4 | 17 | 4 | 17 | BPI | Siha and Saad | 2008 | failure | explicit |
| 98 | The focus on the measures of process success | 4 | 21 | 4 | 21 | 4 | 21 | BPI | Siha and Saad | 2008 | success | explicit |
| 99 | Focus on both the process's efficiency and effectiveness | 4 | 19 | 4 | 19 | 4 | 21 | BPI | Siha and Saad | 2008 | success | explicit |
| 100 | Accuracy in collecting the process data | 4 | 19 | 4 | 19 | 4 | 19 | BPI | Siha and Saad | 2008 | success | explicit |
| 101 | Creation of autonomous and cross-functional teams accountable for the results | 4 | 24 | 4 | 24 | 6 | 28 | BPI | Siha and Saad | 2008 | success | explicit |
| 102 | The inclusion of the decision points which are a key to effective analysis | 4 | 19 | 4 | 19 | 4 | 19 | BPI | Siha and Saad | 2008 | success | explicit |
| 103 | Failure to define a beginning and end to the process | 4 | 20 | 4 | 20 | 4 | 20 | BPI | Siha and Saad | 2008 | failure | explicit |
| 104 | Inability of defining the process boundaries; its beginning and end | 4 | 20 | 4 | 20 | 4 | 20 | BPI | Siha and Saad | 2008 | failure | explicit |
| 105 | Process improvement | 4 | 19 | 4 | 19 | 4 | 19 | BPI | Siha and Saad | 2008 | success | implicit |
| 106 | Human resources | 4 | 24 | 4 | 24 | 4 | 24 | BPI | Siha and Saad | 2008 | success | implicit |
| 107 | Performance measures | 4 | 21 | 4 | 21 | 4 | 22 | BPI | Siha and Saad | 2008 | success | implicit |
| 108 | Lack of direct impact on customer | 2 | 6 | 2 | 6 | 2 | 6 | BPI | Siha and Saad | 2008 | failure | explicit |
| 109 | Questioning the fundamental assumptions of a process | 2 | 7 | 2 | 7 | 2 | 7 | BPI | Siha and Saad | 2008 | success | explicit |
| 110 | The process chosen for reengineering should be in the center of the organization for the improvement to be felt | 2 | 7 | 2 | 7 | 5 | 25 | BPI | Siha and Saad | 2008 | success | explicit |
| 111 | The focus on the customer | 2 | 6 | 2 | 6 | 2 | 6 | BPI | Siha and Saad | 2008 | success | explicit |
| 112 | Management involvement | 3 | 15 | 3 | 15 | 3 | 15 | BPI | Siha and Saad | 2008 | success | explicit |
| 113 | Training on six sigma methodology, tools and project mgt. skills | 3 | 11 | 3 | 11 | 3 | 11 | BPI | Siha and Saad | 2008 | success | explicit |
| 114 | Use of appropriate incentive systems and training | 3 | 9 | 3 | 9 | 3 | 9 | BPI | Siha and Saad | 2008 | success | explicit |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 115 | Failure to involve both suppliers and customers | 3 | 8 | 3 | 8 | 3 | 8 | BPI | Siha and Saad | 2008 | failure | explicit |
| 116 | Sharing forums among comparative firms proves very effective for improving practice | 3 | 12 | 3 | 12 | 3 | 12 | BPI | Siha and Saad | 2008 | success | explicit |
| 117 | Linking best practice to the delivery of corporate objectives | 3 | 11 | 3 | 11 | 3 | 11 | BPI | Siha and Saad | 2008 | success | explicit |
| 118 | Emphasis of knowledge sharing and communication | 3 | 11 | 3 | 11 | 3 | 11 | BPI | Siha and Saad | 2008 | success | explicit |
| 119 | Lack of top mgt. support | 3 | 15 | 3 | 15 | 3 | 15 | BPI | Siha and Saad | 2008 | failure | explicit |
| 120 | It requires the cooperation among varies companies | 3 | 12 | 3 | 12 | 3 | 12 | BPI | Siha and Saad | 2008 | failure | explicit |
| 121 | Total commitment of the leadership | 3 | 15 | 3 | 15 | 3 | 15 | BPI | Siha and Saad | 2008 | success | explicit |
| 122 | Strong communication among the participating team | 3 | 11 | 3 | 11 | 3 | 11 | BPI | Siha and Saad | 2008 | success | explicit |
| 123 | Assuring full participation of every one in the process | 3 | 9 | 3 | 9 | 3 | 9 | BPI | Siha and Saad | 2008 | success | explicit |
| 124 | Top management | 3 | 15 | 3 | 15 | 3 | 15 | BPI | Siha and Saad | 2008 | success | implicit |
| 125 | Linking six sigma to the corp. strategy, human resources, customers and suppliers | 5 | 26 | 5 | 26 | 5 | 26 | BPI | Siha and Saad | 2008 | success | explicit |
| 126 | Set Challenging goals for six sigma | 5 | 25 | 5 | 25 | 5 | 25 | BPI | Siha and Saad | 2008 | success | explicit |
| 127 | No linkage with to overall business goals and objectives | 5 | 26 | 5 | 26 | 5 | 26 | BPI | Siha and Saad | 2008 | failure | explicit |
| 128 | Viewing it as a tool, not as a complete PI methodology | 5 | 26 | 5 | 26 | 4 | 23 | BPI | Siha and Saad | 2008 | failure | explicit |
| 129 | Lack of clear association between benchmarking and profit increase | 5 | 25 | 5 | 25 | 5 | 25 | BPI | Siha and Saad | 2008 | failure | explicit |
| 130 | benchmarking's focus is on the tactical issues not on the issues that affect the entire business | 5 | 26 | 5 | 26 | 5 | 26 | BPI | Siha and Saad | 2008 | failure | explicit |
| 131 | Integration of BPR with the Corp. Strategy | 5 | 26 | 5 | 26 | 5 | 26 | BPI | Siha and Saad | 2008 | success | explicit |
| 132 | The ambitious goals of the reengineering process | 5 | 25 | 5 | 25 | 5 | 25 | BPI | Siha and Saad | 2008 | success | explicit |
| 133 | The importance of BPR projects | 5 | 25 | 5 | 25 | 5 | 26 | BPI | Siha and Saad | 2008 | failure | explicit |
| 134 | Emphasis on achieving the company’s goals | 5 | 25 | 5 | 25 | 5 | 25 | BPI | Siha and Saad | 2008 | success | explicit |
| 135 | Failure to link the goal of PI to the organization competitive priorities | 5 | 25 | 5 | 25 | 5 | 25 | BPI | Siha and Saad | 2008 | failure | explicit |
| 136 | Strategic alignment | 5 | 26 | 5 | 26 | 5 | 26 | BPI | Siha and Saad | 2008 | success | implicit |
| 137 | Adjustment of culture and employees’ attitude | 6 | 28 | 6 | 28 | 6 | 28 | BPI | Siha and Saad | 2008 | success | explicit |
| 138 | A supporting infrastructure | 6 | 27 | 6 | 27 | 6 | 27 | BPI | Siha and Saad | 2008 | success | explicit |
| 139 | The rigidity of the infrastructure system | 6 | 28 | 6 | 28 | 6 | 28 | BPI | Siha and Saad | 2008 | failure | explicit |

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| 140 | Business environment | 6 | 28 | 6 | 28 | 6 | 28 | BPI | Siha and Saad | 2008 | success | implicit |
| 141 | The effective use of information and communication technology | 7 | 33 | 7 | 33 | 6 | 27 | BPI | Siha and Saad | 2008 | success | explicit |
| 142 | Company-wide education on risk management | 1 | 5 | 1 | 5 | 1 | 5 | PPM | Costantino et al. | 2015 | success | implicit |
| 143 | Organization's processes for assigning ownership of risks | 1 | 5 | 1 | 5 | 1 | 5 | PPM | Costantino et al. | 2015 | success | implicit |
| 144 | Risk register | 1 | 5 | 1 | 5 | 1 | 5 | PPM | Costantino et al. | 2015 | success | implicit |
| 145 | Project schedule/plan | 4 | 23 | 4 | 23 | 4 | 23 | PPM | Costantino et al. | 2015 | success | explicit |
| 146 | Personnel | 4 | 24 | 4 | 24 | 4 | 24 | PPM | Costantino et al. | 2015 | success | explicit |
| 147 | Monitoring and feedback | 4 | 22 | 4 | 22 | 3 | 11 | PPM | Costantino et al. | 2015 | success | explicit |
| 148 | Troubleshooting | 4 | 17 | 1 | 5 | 1 | 5 | PPM | Costantino et al. | 2015 | success | explicit |
| 149 | Human resource management | 4 | 24 | 4 | 24 | 4 | 24 | PPM | Costantino et al. | 2015 | success | implicit |
| 150 | Up-to-date risk management plan | 4 | 23 | 4 | 23 | 4 | 23 | PPM | Costantino et al. | 2015 | success | implicit |
| 151 | Client acceptance | 2 | 6 | 2 | 6 | 2 | 6 | PPM | Costantino et al. | 2015 | success | explicit |
| 152 | Top management support | 3 | 15 | 3 | 15 | 3 | 15 | PPM | Costantino et al. | 2015 | success | explicit |
| 153 | Client consultation | 3 | 8 | 3 | 8 | 3 | 8 | PPM | Costantino et al. | 2015 | success | explicit |
| 154 | Communication | 3 | 10 | 3 | 10 | 3 | 10 | PPM | Costantino et al. | 2015 | success | explicit |
| 155 | Project sponsorship | 3 | 13 | 3 | 13 | 3 | 13 | PPM | Costantino et al. | 2015 | success | implicit |
| 156 | Project mission | 6 | 28 | 6 | 28 | 6 | 28 | PPM | Costantino et al. | 2015 | success | explicit |
| 157 | Technical tasks | 7 | 29 | 7 | 29 | 7 | 29 | PPM | Costantino et al. | 2015 | success | explicit |
| 158 | Risk management | 1 | 5 | 1 | 5 | 1 | 5 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 159 | Agile development | 1 | 1 | 1 | 1 | 6 | 28 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 160 | Safety in Project | 1 | 5 | 1 | 5 | 5 | 25 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 161 | Size and value of a project | 4 | 23 | 4 | 23 | 4 | 23 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 162 | Uniqueness of project activities | 4 | 23 | 4 | 23 | 4 | 23 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 163 | Team member's skills | 4 | 16 | 4 | 16 | 4 | 24 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 164 | Project manager's skills | 4 | 17 | 4 | 17 | 4 | 17 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 165 | Project manager skills and competencies | 4 | 17 | 4 | 17 | 4 | 17 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 166 | Performance measurement systems | 4 | 22 | 4 | 22 | 4 | 22 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 167 | Start on the right foot | 4 | 23 | 4 | 23 | 4 | 23 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 168 | Maintain momentum | 4 | 17 | 4 | 17 | 1 | 3 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 169 | Track progress | 4 | 21 | 4 | 21 | 4 | 22 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 170 | Make smart decisions | 4 | 17 | 4 | 17 | 4 | 17 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 171 | Insitutionalize post-mortem analyses | 4 | 19 | 4 | 19 | 3 | 11 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 172 | Management practices | 4 | 17 | 4 | 17 | 4 | 17 | PM | Pankratz and Loebbecke | 2011 | success | implicit |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 173 | Metrics | 4 | 21 | 4 | 21 | 4 | 22 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 174 | Control of the development process | 4 | 21 | 4 | 21 | 4 | 21 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 175 | Staged delivery | 4 | 22 | 4 | 22 | 4 | 23 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 176 | Planning maturity | 4 | 23 | 4 | 23 | 4 | 23 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 177 | Formal definition and measurement of IS project success | 4 | 22 | 4 | 22 | 4 | 22 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 178 | Control mechanisms in internal and outsourced IS projects | 4 | 22 | 4 | 22 | 4 | 22 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 179 | Efficiency of Project Performance | 4 | 22 | 4 | 22 | 4 | 22 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 180 | Team Members' Qualification | 4 | 24 | 4 | 24 | 4 | 24 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 181 | Right Mix of Team Members | 4 | 24 | 4 | 24 | 4 | 24 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 182 | Team Members' Responsibility | 4 | 24 | 4 | 24 | 4 | 24 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 183 | Monitoring, Controls | 4 | 21 | 4 | 21 | 4 | 22 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 184 | Planning | 4 | 23 | 4 | 23 | 4 | 23 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 185 | Systematic Approach | 4 | 23 | 4 | 23 | 4 | 23 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 186 | Project Manager's Characteristics | 4 | 17 | 4 | 24 | 4 | 17 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 187 | Project characteristics | 2 | 7 | 2 | 7 | 4 | 23 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 188 | Work processes | 2 | 7 | 2 | 7 | 2 | 7 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 189 | Standards and procedures | 2 | 7 | 2 | 7 | 2 | 7 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 190 | Assuring Product Quality | 2 | 6 | 4 | 22 | 4 | 22 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 191 | Top management support | 3 | 15 | 3 | 15 | 3 | 15 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 192 | Supporting management practices | 3 | 15 | 3 | 15 | 3 | 15 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 193 | Team dynamics | 3 | 14 | 3 | 14 | 3 | 14 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 194 | Senior management support for strategic projects | 3 | 15 | 3 | 15 | 3 | 15 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 195 | User participation | 3 | 8 | 3 | 8 | 3 | 8 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 196 | Joint application development | 3 | 12 | 3 | 12 | 3 | 8 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 197 | User partnering | 3 | 8 | 3 | 8 | 3 | 11 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 198 | (End-user) training | 3 | 8 | 3 | 8 | 3 | 11 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 199 | Top management support | 3 | 15 | 3 | 15 | 3 | 15 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 200 | Relationship Client – Contractor | 3 | 8 | 3 | 8 | 2 | 6 | PM | Pankratz and Loebbecke | 2011 | success | explicit |

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| 201 | Relationship Management–Project | 3 | 15 | 3 | 15 | 3 | 15 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 202 | Team Members' Motivation | 3 | 14 | 3 | 14 | 3 | 14 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 203 | Team Members' Focus on Project | 3 | 14 | 3 | 14 | 3 | 9 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 204 | Communication in Project | 3 | 11 | 3 | 11 | 3 | 11 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 205 | Urgency of a project outcome | 5 | 25 | 5 | 25 | 5 | 25 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 206 | Political factors | 5 | 26 | 5 | 26 | 5 | 26 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 207 | Economic factors | 5 | 26 | 5 | 26 | 5 | 26 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 208 | Different project goals | 5 | 25 | 5 | 25 | 5 | 25 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 209 | Management of user expectations | 5 | 25 | 5 | 25 | 3 | 8 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 210 | Management of Team Members' Expectations | 5 | 25 | 5 | 25 | 4 | 17 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 211 | Clear Objective | 5 | 25 | 5 | 25 | 5 | 25 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 212 | Transparency in Project | 5 | 25 | 5 | 25 | 5 | 25 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 213 | Social factors | 6 | 28 | 6 | 28 | 6 | 28 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 214 | Organizational structures at the project level | 6 | 28 | 6 | 28 | 6 | 28 | PM | Pankratz and Loebbecke | 2011 | success | explicit |
| 215 | Organizational characteristics | 6 | 28 | 6 | 28 | 6 | 28 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 216 | Organizational practices | 6 | 28 | 6 | 28 | 6 | 28 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 217 | Social integration | 6 | 28 | 6 | 28 | 6 | 28 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 218 | Technology characteristics | 7 | 32 | 7 | 32 | 7 | 33 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 219 | Tools and technology | 7 | 32 | 7 | 33 | 7 | 32 | PM | Pankratz and Loebbecke | 2011 | success | implicit |
| 220 | Missing role clarity | 4 | 24 | 4 | 24 | 6 | 28 | PPM | Beringer et al. | 2013 | failure | implicit |
| 221 | Role Clarity | 4 | 24 | 4 | 24 | 6 | 28 | PPM | Beringer et al. | 2013 | success | implicit |
| 222 | Increased engagement in the PPM process | 3 | 15 | 3 | 15 | 3 | 9 | PPM | Beringer et al. | 2013 | success | implicit |
| 223 | Engagement on project success | 3 | 14 | 3 | 14 | 3 | 15 | PPM | Beringer et al. | 2013 | success | implicit |
| 224 | Engagement on success of projects that are personally important to the senior manager | 3 | 15 | 3 | 15 | 3 | 15 | PPM | Beringer et al. | 2013 | failure | implicit |
| 225 | Engagement in portfolio structuring in terms of missing knowledge of the PPManager | 3 | 15 | 3 | 15 | 3 | 15 | PPM | Beringer et al. | 2013 | failure | implicit |
| 226 | Positive influence on strategic fit | 5 | 26 | 5 | 26 | 5 | 26 | PPM | Beringer et al. | 2013 | success | implicit |
| 227 | aware of changes in scheduling, new requirements or guideline updates | 1 | 3 | 1 | 3 | 1 | 3 | DT | Abollado et al. | 2017 | success | implicit |
| 228 | Workflow Automation | 1 | 1 | 1 | 1 | 4 | 19 | DT | Abollado et al. | 2017 | success | explicit |

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| 229 | Workflow status tracking tool | 4 | 21 | 4 | 21 | 3 | 11 | DT | Abollado et al. | 2017 | success | explicit |
| 230 | Error-proofed, pre-filled forms | 4 | 23 | 4 | 23 | 3 | 11 | DT | Abollado et al. | 2017 | success | explicit |
| 231 | Workflow progress tracking tool | 4 | 21 | 4 | 21 | 4 | 21 | DT | Abollado et al. | 2017 | success | explicit |
| 232 | Workflow Management Software | 4 | 21 | 4 | 21 | 4 | 21 | DT | Abollado et al. | 2017 | success | explicit |
| 233 | Implement in phases | 4 | 23 | 4 | 23 | 4 | 23 | DT | Abollado et al. | 2017 | success | explicit |
| 234 | Use metrics | 4 | 21 | 4 | 21 | 4 | 21 | DT | Abollado et al. | 2017 | success | explicit |
| 235 | Analysis of the underlying process and improve it where necessary, prior to digitising the process | 2 | 7 | 4 | 19 | 4 | 19 | DT | Abollado et al. | 2017 | success | implicit |
| 236 | choosing the right processes to be digitised | 2 | 7 | 2 | 7 | 2 | 7 | DT | Abollado et al. | 2017 | failure | implicit |
| 237 | Focus first on processes that are fully understood | 2 | 7 | 2 | 7 | 2 | 7 | DT | Abollado et al. | 2017 | success | explicit |
| 238 | Embedding bad practices on the system while digitising the process | 3 | 11 | 3 | 11 | 3 | 11 | DT | Abollado et al. | 2017 | failure | implicit |
| 239 | Automatic Notifications | 3 | 11 | 3 | 11 | 6 | 27 | DT | Abollado et al. | 2017 | success | explicit |
| 240 | to map the process heavily depends on employees' commitment | 3 | 9 | 3 | 9 | 3 | 9 | DT | Abollado et al. | 2017 | failure | implicit |
| 241 | Involving the right people from the beginning | 3 | 12 | 3 | 12 | 3 | 12 | DT | Abollado et al. | 2017 | success | implicit |
| 242 | managing the business and technical aspects of the system will create additional work | 3 | 15 | 3 | 15 | 3 | 15 | DT | Abollado et al. | 2017 | failure | implicit |
| 243 | support of senior management | 3 | 15 | 3 | 15 | 3 | 15 | DT | Abollado et al. | 2017 | success | explicit |
| 244 | Get the support of end users | 3 | 8 | 3 | 8 | 3 | 8 | DT | Abollado et al. | 2017 | success | explicit |
| 245 | Workflow Automation | 6 | 27 | 6 | 27 | 4 | 19 | DT | Abollado et al. | 2017 | success | explicit |
| 246 | Role assignment tool | 6 | 27 | 6 | 27 | 6 | 27 | DT | Abollado et al. | 2017 | success | explicit |
| 247 | allow data to be pulled from an upstream process or task, to use it as input for another activity located downstream | 6 | 27 | 6 | 27 | 4 | 20 | DT | Abollado et al. | 2017 | success | implicit |
| 248 | Tool and databases integration | 6 | 27 | 6 | 27 | 6 | 27 | DT | Abollado et al. | 2017 | success | explicit |
| 249 | Integrate the digital workflow with current systems | 6 | 27 | 6 | 27 | 6 | 27 | DT | Abollado et al. | 2017 | success | explicit |
| 250 | workflow management as a way of reducing their decision-making power | 7 | 33 | 7 | 33 | 7 | 33 | DT | Abollado et al. | 2017 | failure | implicit |
| 251 | Urgency | 4 | 23 | 5 | 25 | 4 | 23 | PPM | Ika | 2009 | success | explicit |
| 252 | characteristics of the project team leader | 4 | 17 | 4 | 17 | 4 | 17 | PPM | Ika | 2009 | success | explicit |
| 253 | selecting a development approach that fits the characteristics of the project | 4 | 23 | 4 | 23 | 4 | 23 | PM | Kirsch and Slaughter | 2013 | success | explicit |
| 254 | understanding success factors of projects that are large, complex, and uncertain | 4 | 17 | 4 | 17 | 4 | 17 | PM | Kirsch and Slaughter | 2013 | failure | explicit |
| 255 | poorly understood or ill-structured project requirements | 4 | 23 | 4 | 23 | 4 | 23 | PM | Kirsch and Slaughter | 2013 | failure | explicit |
| 256 | power differences | 4 | 24 | 4 | 24 | 6 | 28 | PM | Kirsch and Slaughter | 2013 | failure | explicit |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 257 | Experience | 4 | 24 | 4 | 24 | 4 | 24 | PM | Kirsch and Slaughter | 2013 | success | implicit |
| 258 | Formal and informal control | 4 | 21 | 4 | 21 | 4 | 21 | PM | Kirsch and Slaughter | 2013 | success | implicit |
| 259 | Coordination mechanisms | 4 | 21 | 4 | 21 | 4 | 21 | PM | Kirsch and Slaughter | 2013 | success | implicit |
| 260 | Methodologies | 4 | 17 | 4 | 17 | 4 | 17 | PM | Kirsch and Slaughter | 2013 | success | implicit |
| 261 | the number and diversity of stakeholders | 2 | 6 | 2 | 6 | 2 | 6 | PM | Kirsch and Slaughter | 2013 | failure | explicit |
| 262 | ineffective communication behaviors | 3 | 11 | 3 | 11 | 3 | 11 | PM | Kirsch and Slaughter | 2013 | failure | explicit |
| 263 | differences in priorities, goals, and agendas of project stakeholders | 5 | 25 | 5 | 25 | 5 | 25 | PM | Kirsch and Slaughter | 2013 | failure | explicit |
| 264 | Uncertain project environment | 6 | 28 | 6 | 28 | 6 | 28 | PM | Kirsch and Slaughter | 2013 | success | implicit |
| 265 | Complex project environment | 6 | 28 | 6 | 28 | 6 | 28 | PM | Kirsch and Slaughter | 2013 | success | implicit |
| 266 | Computer-aided software engineering tools | 6 | 27 | 6 | 27 | 6 | 27 | PM | Kirsch and Slaughter | 2013 | success | implicit |
| 267 | Maturity of Software | 7 | 30 | 7 | 30 | 7 | 30 | PM | Kirsch and Slaughter | 2013 | success | implicit |
| 268 | Time Compliance | 4 | 23 | 4 | 23 | 4 | 22 | PM | Varajão and Trigo | 2016 | success measures | explicit |
| 269 | Scope Compliance | 4 | 23 | 5 | 25 | 4 | 22 | PM | Varajão and Trigo | 2016 | success measures | explicit |
| 270 | Key Performance Indicators | 4 | 22 | 4 | 22 | 4 | 22 | PM | Varajão and Trigo | 2016 | success measures | explicit |
| 271 | details on the requirements that are not well perceived at the initial stages of project | 4 | 23 | 4 | 22 | 5 | 25 | PM | Varajão and Trigo | 2016 | failure | implicit |
| 272 | compliance with the client's business objectives | 2 | 6 | 2 | 6 | 2 | 6 | PM | Varajão and Trigo | 2016 | success measures | explicit |
| 273 | user satisfaction | 2 | 6 | 2 | 6 | 2 | 6 | PM | Varajão and Trigo | 2016 | success measures | explicit |
| 274 | customer satisfaction | 2 | 6 | 2 | 6 | 2 | 6 | PM | Varajão and Trigo | 2016 | success measures | explicit |
| 275 | quality of resulting products/services (deliverables) | 2 | 6 | 2 | 6 | 2 | 6 | PM | Varajão and Trigo | 2016 | success measures | explicit |
| 276 | Budget Compliance | 3 | 13 | 3 | 13 | 3 | 13 | PM | Varajão and Trigo | 2016 | success measures | explicit |
| 277 | operational team satisfaction | 3 | 14 | 3 | 14 | 3 | 14 | PM | Varajão and Trigo | 2016 | success measures | explicit |
| 278 | sponsor satisfaction | 3 | 8 | 3 | 8 | 2 | 6 | PM | Varajão and Trigo | 2016 | success measures | explicit |
| 279 | use of IS solutions by the customer | 3 | 8 | 7 | 31 | 3 | 7 | PM | Varajão and Trigo | 2016 | success measures | explicit |
| 280 | changes in the scope requested by the customer | 3 | 8 | 3 | 8 | 3 | 8 | PM | Varajão and Trigo | 2016 | failure | implicit |
| 281 | compliance with the business goals set for the project | 5 | 26 | 5 | 26 | 5 | 26 | PM | Varajão and Trigo | 2016 | success measures | explicit |
| 282 | contribution to the development of the organization | 5 | 26 | 5 | 26 | 3 | 11 | PM | Varajão and Trigo | 2016 | success measures | explicit |
| 283 | intangible benefits (for example, improvement of company's market image) | 5 | 25 | 5 | 25 | 7 | 33 | PM | Varajão and Trigo | 2016 | success measures | explicit |

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| 284 | Adequacy of company-wide education on the concepts of risk management | 1 | 5 | 1 | 5 | 1 | 5 | PM | Cooke-Davis | 2002 | success | explicit |
| 285 | Adequacy with which a visible risk register is maintained | 1 | 5 | 1 | 5 | 1 | 5 | PM | Cooke-Davis | 2002 | success | explicit |
| 286 | Adequacy of an up-to-date risk management plan | 1 | 5 | 1 | 5 | 1 | 5 | PM | Cooke-Davis | 2002 | success | explicit |
| 287 | Allow changes to scope only through a mature scope change control process | 1 | 2 | 1 | 2 | 4 | 22 | PM | Cooke-Davis | 2002 | success | explicit |
| 288 | Keep project (or project stage duration) as far below 3 years as possible (1 year is better) | 4 | 23 | 4 | 23 | 4 | 23 | PM | Cooke-Davis | 2002 | success | explicit |
| 289 | Maintain the integrity of the performance measurement baseline | 4 | 21 | 4 | 22 | 4 | 22 | PM | Cooke-Davis | 2002 | success | explicit |
| 290 | A suite of project, programme and portfolio metrics that provides direct ‘‘line of sight’’ feedback on current project performance, and anticipated future success, so that project, portfolio and corporate decisions can be aligned | 4 | 22 | 4 | 22 | 5 | 26 | PM | Cooke-Davis | 2002 | success | explicit |
| 291 | Adequacy of documentation of organisational responsibilities on the project | 3 | 11 | 1 | 5 | 3 | 11 | PM | Cooke-Davis | 2002 | success | explicit |
| 292 | An effective means of ‘‘learning from experience’’ on projects, that combines explicit knowledge with tacit knowledge in a way that encourages people to learn and to embed that learning into continuous improvement of project management processes and practices | 3 | 11 | 3 | 11 | 3 | 11 | PM | Cooke-Davis | 2002 | success | explicit |
| 293 | Portfolio- and programme management practices that allow the enterprise to resource fully a suite of projects that are thoughtfully and dynamically matched to the corporate strategy and business objectives | 5 | 26 | 5 | 26 | 5 | 26 | PM | Cooke-Davis | 2002 | success | explicit |
| 294 | Maturity of an organisation’s processes for assigning ownership of risks | 6 | 28 | 6 | 28 | 6 | 28 | PM | Cooke-Davis | 2002 | success | explicit |
| 295 | The existence of an effective benefits delivery and management process that involves the mutual co-operation of project management and line management functions | 6 | 28 | 6 | 28 | 6 | 28 | PM | Cooke-Davis | 2002 | success | explicit |
| 296 | using project plans as living documents | 1 | 3 | 1 | 3 | 3 | 11 | PM | Jugdev and Müller | 2005 | success | implicit |
| 297 | change management | 1 | 2 | 1 | 2 | 1 | 2 | PM | Jugdev and Müller | 2005 | success | implicit |
| 298 | agile requirements | 1 | 3 | 1 | 3 | 5 | 25 | PM | Jugdev and Müller | 2005 | success | implicit |

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| 299 | The project manager should be empowered with flexibility to deal with unforeseen circumstances as they see best, and with the owner giving guidance as to how they think the project should be best achieved | 1 | 3 | 1 | 3 | 1 | 3 | PM | Jugdev and Müller | 2005 | success | explicit |
| 300 | project scope is managed | 4 | 17 | 5 | 25 | 4 | 23 | PM | Jugdev and Müller | 2005 | success | implicit |
| 301 | team | 4 | 24 | 4 | 24 | 4 | 24 | PM | Jugdev and Müller | 2005 | success | implicit |
| 302 | project manager selection criteria | 4 | 24 | 4 | 24 | 4 | 24 | PM | Jugdev and Müller | 2005 | success | implicit |
| 303 | project manager leadership style | 4 | 17 | 4 | 17 | 4 | 17 | PM | Jugdev and Müller | 2005 | success | implicit |
| 304 | commitment to planning | 4 | 23 | 4 | 23 | 4 | 23 | PM | Jugdev and Müller | 2005 | success | implicit |
| 305 | commitment to control | 4 | 21 | 4 | 21 | 4 | 21 | PM | Jugdev and Müller | 2005 | success | implicit |
| 306 | Project schedule/plan | 4 | 23 | 4 | 23 | 4 | 23 | PM | Jugdev and Müller | 2005 | success | explicit |
| 307 | Personnel | 4 | 24 | 4 | 24 | 3 | 9 | PM | Jugdev and Müller | 2005 | success | explicit |
| 308 | Monitoring and feedback | 4 | 22 | 4 | 22 | 3 | 11 | PM | Jugdev and Müller | 2005 | success | explicit |
| 309 | Troubleshooting Expertise | 4 | 17 | 1 | 5 | 4 | 19 | PM | Jugdev and Müller | 2005 | success | explicit |
| 310 | experienced project managers | 4 | 17 | 4 | 24 | 4 | 17 | PM | Jugdev and Müller | 2005 | success | implicit |
| 311 | minimizing scope | 4 | 23 | 4 | 23 | 4 | 23 | PM | Jugdev and Müller | 2005 | success | implicit |
| 312 | formal methodology | 4 | 23 | 4 | 23 | 4 | 23 | PM | Jugdev and Müller | 2005 | success | implicit |
| 313 | reliable estimates | 4 | 23 | 4 | 23 | 4 | 23 | PM | Jugdev and Müller | 2005 | success | implicit |
| 314 | skilled staff | 4 | 16 | 4 | 24 | 4 | 16 | PM | Jugdev and Müller | 2005 | success | implicit |
| 315 | process improvement using software development capability maturity models | 4 | 19 | 4 | 19 | 4 | 19 | PM | Jugdev and Müller | 2005 | success | implicit |
| 316 | client satisfaction | 2 | 6 | 3 | 8 | 2 | 6 | PM | Jugdev and Müller | 2005 | success | implicit |
| 317 | Customer satisfaction | 2 | 6 | 2 | 6 | 2 | 6 | PM | Jugdev and Müller | 2005 | success | implicit |
| 318 | Client acceptance | 2 | 6 | 3 | 8 | 3 | 8 | PM | Jugdev and Müller | 2005 | success | explicit |
| 319 | regenerative projects | 2 | 7 | 4 | 23 | 3 | 11 | PM | Jugdev and Müller | 2005 | success | implicit |
| 320 | management support | 3 | 15 | 3 | 15 | 3 | 15 | PM | Jugdev and Müller | 2005 | success | implicit |
| 321 | stakeholder satisfaction | 3 | 12 | 3 | 12 | 2 | 6 | PM | Jugdev and Müller | 2005 | success | implicit |
| 322 | staff training and education | 3 | 11 | 3 | 11 | 3 | 11 | PM | Jugdev and Müller | 2005 | success | implicit |
| 323 | dedicated resources | 3 | 13 | 3 | 13 | 3 | 13 | PM | Jugdev and Müller | 2005 | success | implicit |

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| 324 | strong leadership and management | 3 | 15 | 3 | 15 | 6 | 28 | PM | Jugdev and Müller | 2005 | success | implicit |
| 325 | concurrent development of the individual | 3 | 11 | 3 | 11 | 3 | 9 | PM | Jugdev and Müller | 2005 | success | implicit |
| 326 | effective communication | 3 | 10 | 3 | 10 | 3 | 10 | PM | Jugdev and Müller | 2005 | success | implicit |
| 327 | corporate understanding of project management by everyone involved | 3 | 11 | 3 | 11 | 3 | 11 | PM | Jugdev and Müller | 2005 | success | implicit |
| 328 | executive commitment to project management | 3 | 15 | 3 | 15 | 3 | 15 | PM | Jugdev and Müller | 2005 | success | implicit |
| 329 | Top management support | 3 | 15 | 3 | 15 | 3 | 15 | PM | Jugdev and Müller | 2005 | success | explicit |
| 330 | Client consultation | 3 | 8 | 3 | 8 | 3 | 8 | PM | Jugdev and Müller | 2005 | success | explicit |
| 331 | Channels of Communication | 3 | 10 | 3 | 10 | 3 | 10 | PM | Jugdev and Müller | 2005 | success | explicit |
| 332 | user involvement | 3 | 8 | 3 | 8 | 3 | 8 | PM | Jugdev and Müller | 2005 | success | implicit |
| 333 | executive management support | 3 | 15 | 3 | 15 | 3 | 15 | PM | Jugdev and Müller | 2005 | success | implicit |
| 334 | Communication the the right level | 3 | 10 | 3 | 10 | 3 | 10 | PM | Jugdev and Müller | 2005 | success | implicit |
| 335 | Communication with the right people | 3 | 10 | 3 | 10 | 3 | 10 | PM | Jugdev and Müller | 2005 | success | implicit |
| 336 | A collaborative working relationship should be maintained between the project owner (or sponsor) and project manager, with both viewing the project as a partnership | 3 | 12 | 4 | 24 | 3 | 11 | PM | Jugdev and Müller | 2005 | success | explicit |
| 337 | clear mission | 5 | 25 | 5 | 25 | 6 | 28 | PM | Jugdev and Müller | 2005 | success | implicit |
| 338 | clear objective and scope | 5 | 25 | 5 | 25 | 5 | 25 | PM | Jugdev and Müller | 2005 | success | implicit |
| 339 | dividing the project into manageable components | 5 | 25 | 4 | 23 | 4 | 23 | PM | Jugdev and Müller | 2005 | success | implicit |
| 340 | alignment between project management and strategic management | 5 | 26 | 5 | 26 | 5 | 26 | PM | Jugdev and Müller | 2005 | success | implicit |
| 341 | Project mission | 5 | 25 | 5 | 25 | 4 | 23 | PM | Jugdev and Müller | 2005 | success | explicit |
| 342 | clear business objectives | 5 | 25 | 5 | 25 | 5 | 25 | PM | Jugdev and Müller | 2005 | success | implicit |
| 343 | strategically managed projects | 5 | 26 | 5 | 26 | 5 | 26 | PM | Jugdev and Müller | 2005 | success | implicit |
| 344 | aligned projects | 5 | 26 | 5 | 26 | 5 | 26 | PM | Jugdev and Müller | 2005 | success | implicit |
| 345 | projects that involve transitional management | 5 | 26 | 5 | 26 | 1 | 3 | PM | Jugdev and Müller | 2005 | success | implicit |
| 346 | Success criteria should be agreed on the stakeholders before the start of the project, and repeatedly at configuration review points thoughout the project | 5 | 25 | 4 | 23 | 3 | 8 | PM | Jugdev and Müller | 2005 | success | explicit |

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| 347 | The owner should take an interest in the performance of the project | 5 | 26 | 3 | 14 | 3 | 15 | PM | Jugdev and Müller | 2005 | success | explicit |
| 348 | understanding of project management as a strategic asset | 5 | 26 | 5 | 26 | 4 | 17 | PM | Jugdev and Müller | 2005 | success | implicit |
| 349 | organization | 6 | 28 | 6 | 28 | 6 | 28 | PM | Jugdev and Müller | 2005 | success | implicit |
| 350 | organizational effectiveness | 6 | 28 | 6 | 28 | 6 | 28 | PM | Jugdev and Müller | 2005 | success | implicit |
| 351 | organizational adaptability | 6 | 28 | 6 | 28 | 6 | 28 | PM | Jugdev and Müller | 2005 | success | implicit |
| 352 | standard software infrastructure | 6 | 27 | 6 | 27 | 6 | 27 | PM | Jugdev and Müller | 2005 | success | implicit |
| 353 | good tools | 7 | 32 | 7 | 32 | 7 | 32 | PM | Jugdev and Müller | 2005 | success | implicit |
| 354 | Technology to Support the Project | 7 | 33 | 7 | 33 | 7 | 33 | PM | Jugdev and Müller | 2005 | success | explicit |
| 355 | Assisted in early trouble-shooting | 1 | 5 | 1 | 5 | 1 | 5 | PM | Dvir et al. | 1998 | success | explicit |
| 356 | Encouraging new ideas | 1 | 2 | 1 | 2 | 1 | 2 | PM | Dvir et al. | 1998 | success | explicit |
| 357 | Willingness to consider changes and new approaches | 1 | 3 | 1 | 3 | 1 | 2 | PM | Dvir et al. | 1998 | success | explicit |
| 358 | Criteria for operational effectiveness | 4 | 21 | 4 | 21 | 4 | 22 | PM | Dvir et al. | 1998 | success | explicit |
| 359 | Method for use in battle | 4 | 23 | 4 | 23 | 4 | 23 | PM | Dvir et al. | 1998 | success | explicit |
| 360 | Check for existence of alternatives | 4 | 23 | 4 | 23 | 1 | 2 | PM | Dvir et al. | 1998 | success | explicit |
| 361 | Operational specifications | 4 | 23 | 4 | 23 | 4 | 23 | PM | Dvir et al. | 1998 | success | explicit |
| 362 | Reliability specifications | 4 | 22 | 4 | 23 | 4 | 23 | PM | Dvir et al. | 1998 | success | explicit |
| 363 | Project plan | 4 | 23 | 4 | 23 | 4 | 23 | PM | Dvir et al. | 1998 | success | explicit |
| 364 | Cost estimation for the entire project | 4 | 23 | 4 | 23 | 3 | 13 | PM | Dvir et al. | 1998 | success | explicit |
| 365 | Negotiations with alternative contractors | 4 | 23 | 4 | 23 | 3 | 12 | PM | Dvir et al. | 1998 | success | explicit |
| 366 | Detailed payment milestones | 4 | 21 | 4 | 23 | 4 | 23 | PM | Dvir et al. | 1998 | success | explicit |
| 367 | Key personnel stayed throughout the project | 4 | 24 | 4 | 24 | 3 | 9 | PM | Dvir et al. | 1998 | success | explicit |
| 368 | Overall responsibility for project success | 4 | 22 | 3 | 14 | 6 | 28 | PM | Dvir et al. | 1998 | success | explicit |
| 369 | High professionell qualifications | 4 | 24 | 4 | 24 | 4 | 16 | PM | Dvir et al. | 1998 | success | explicit |
| 370 | Organizational and logistic preparations | 4 | 23 | 4 | 23 | 6 | 28 | PM | Dvir et al. | 1998 | success | explicit |
| 371 | Risk management | 4 | 17 | 1 | 5 | 1 | 5 | PM | Dvir et al. | 1998 | success | explicit |
| 372 | Resources and schedule control | 4 | 21 | 4 | 21 | 4 | 22 | PM | Dvir et al. | 1998 | success | explicit |
| 373 | Quality and reliability assurance | 4 | 21 | 4 | 21 | 4 | 22 | PM | Dvir et al. | 1998 | success | explicit |
| 374 | Test management | 4 | 19 | 4 | 23 | 4 | 17 | PM | Dvir et al. | 1998 | success | explicit |
| 375 | Personnel management | 4 | 24 | 4 | 24 | 4 | 17 | PM | Dvir et al. | 1998 | success | explicit |
| 376 | Decision-making procedures | 4 | 17 | 4 | 17 | 6 | 28 | PM | Dvir et al. | 1998 | success | explicit |
| 377 | Conceptual prototype | 4 | 23 | 4 | 23 | 4 | 23 | PM | Dvir et al. | 1998 | success | explicit |
| 378 | Prototype of field tests | 4 | 23 | 4 | 23 | 4 | 23 | PM | Dvir et al. | 1998 | success | explicit |
| 379 | For the whole system | 4 | 19 | 4 | 19 | 4 | 19 | PM | Dvir et al. | 1998 | success | explicit |
| 380 | Producibility | 4 | 20 | 4 | 20 | 4 | 20 | PM | Dvir et al. | 1998 | success | explicit |

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| 381 | Maintainability | 4 | 20 | 4 | 20 | 4 | 20 | PM | Dvir et al. | 1998 | success | explicit |
| 382 | Quality and reliability | 4 | 20 | 4 | 20 | 4 | 20 | PM | Dvir et al. | 1998 | success | explicit |
| 383 | Human engineering | 4 | 16 | 4 | 23 | 4 | 16 | PM | Dvir et al. | 1998 | success | explicit |
| 384 | Final system requirements | 4 | 23 | 4 | 23 | 4 | 23 | PM | Dvir et al. | 1998 | success | explicit |
| 385 | System concept | 4 | 23 | 4 | 23 | 4 | 23 | PM | Dvir et al. | 1998 | success | explicit |
| 386 | System configuration | 4 | 16 | 4 | 16 | 4 | 16 | PM | Dvir et al. | 1998 | success | explicit |
| 387 | Subsystem specifications | 4 | 23 | 4 | 23 | 4 | 23 | PM | Dvir et al. | 1998 | success | explicit |
| 388 | Presentation of prototype | 4 | 23 | 4 | 23 | 4 | 23 | PM | Dvir et al. | 1998 | success | explicit |
| 389 | Design freeze | 4 | 19 | 4 | 23 | 4 | 23 | PM | Dvir et al. | 1998 | success | explicit |
| 390 | Qualification tests | 4 | 22 | 4 | 22 | 4 | 22 | PM | Dvir et al. | 1998 | success | explicit |
| 391 | Final test and delivery | 4 | 22 | 4 | 22 | 4 | 22 | PM | Dvir et al. | 1998 | success | explicit |
| 392 | Schedule and milestones | 4 | 21 | 4 | 23 | 4 | 22 | PM | Dvir et al. | 1998 | success | explicit |
| 393 | Configuration control | 4 | 21 | 4 | 23 | 4 | 22 | PM | Dvir et al. | 1998 | success | explicit |
| 394 | Used as a tool for senior management | 4 | 22 | 3 | 15 | 4 | 22 | PM | Dvir et al. | 1998 | success | explicit |
| 395 | Day-to-day follow-up | 4 | 22 | 4 | 22 | 4 | 22 | PM | Dvir et al. | 1998 | success | explicit |
| 396 | Personal supervision of performance | 4 | 17 | 4 | 24 | 4 | 17 | PM | Dvir et al. | 1998 | success | explicit |
| 397 | Involvement with workers | 4 | 17 | 4 | 17 | 3 | 11 | PM | Dvir et al. | 1998 | success | explicit |
| 398 | Involving workers in decision-making | 4 | 17 | 4 | 17 | 3 | 11 | PM | Dvir et al. | 1998 | success | explicit |
| 399 | Frequent updating of status | 4 | 22 | 3 | 11 | 3 | 11 | PM | Dvir et al. | 1998 | success | explicit |
| 400 | Key personnel in the project for its entire duration | 4 | 24 | 4 | 24 | 4 | 24 | PM | Dvir et al. | 1998 | success | explicit |
| 401 | Key personnel with strong managerial qualifications | 4 | 17 | 4 | 24 | 4 | 24 | PM | Dvir et al. | 1998 | success | explicit |
| 402 | Some team members with operational experience | 4 | 24 | 4 | 24 | 4 | 24 | PM | Dvir et al. | 1998 | success | explicit |
| 403 | Professionally experienced | 4 | 17 | 4 | 17 | 4 | 17 | PM | Dvir et al. | 1998 | success | explicit |
| 404 | Extensive managerial experience | 4 | 17 | 4 | 24 | 4 | 17 | PM | Dvir et al. | 1998 | success | explicit |
| 405 | Recognition of need by end-user | 2 | 6 | 2 | 6 | 3 | 8 | PM | Dvir et al. | 1998 | success | explicit |
| 406 | Detailed contract documents | 2 | 7 | 4 | 23 | 3 | 12 | PM | Dvir et al. | 1998 | success | explicit |
| 407 | Specifications | 2 | 7 | 4 | 23 | 4 | 22 | PM | Dvir et al. | 1998 | success | explicit |
| 408 | level of authority entrusted to the project manager | 3 | 15 | 4 | 24 | 6 | 28 | PM | Dvir et al. | 1998 | success | implicit |
| 409 | integration of numerous management functions | 3 | 15 | 3 | 15 | 6 | 28 | PM | Dvir et al. | 1998 | success | implicit |
| 410 | Project acknowledged as being urgent | 3 | 15 | 3 | 15 | 4 | 23 | PM | Dvir et al. | 1998 | success | explicit |
| 411 | Team includes end-user representatives | 3 | 8 | 4 | 24 | 4 | 24 | PM | Dvir et al. | 1998 | success | explicit |
| 412 | Active participation in development activities | 3 | 8 | 3 | 8 | 3 | 8 | PM | Dvir et al. | 1998 | success | explicit |
| 413 | Main contractor involved in system definition | 3 | 10 | 3 | 10 | 3 | 12 | PM | Dvir et al. | 1998 | success | explicit |
| 414 | Communication with customer | 3 | 8 | 3 | 8 | 3 | 8 | PM | Dvir et al. | 1998 | success | explicit |
| 415 | Communication and reports | 3 | 11 | 3 | 11 | 3 | 11 | PM | Dvir et al. | 1998 | success | explicit |
| 416 | Design to cost | 3 | 13 | 3 | 13 | 3 | 13 | PM | Dvir et al. | 1998 | success | explicit |
| 417 | Budget utilization | 3 | 13 | 4 | 23 | 4 | 22 | PM | Dvir et al. | 1998 | success | explicit |
| 418 | Profit and loss report | 3 | 11 | 3 | 11 | 3 | 11 | PM | Dvir et al. | 1998 | success | explicit |
| 419 | Cash-flow report | 3 | 11 | 3 | 11 | 3 | 11 | PM | Dvir et al. | 1998 | success | explicit |

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| 420 | With all subcontractors | 3 | 10 | 3 | 10 | 3 | 10 | PM | Dvir et al. | 1998 | success | explicit |
| 421 | To higher management | 3 | 11 | 3 | 11 | 3 | 11 | PM | Dvir et al. | 1998 | success | explicit |
| 422 | Existence of unit spirit | 3 | 14 | 3 | 14 | 6 | 28 | PM | Dvir et al. | 1998 | success | explicit |
| 423 | Social activities out of working hours | 3 | 14 | 3 | 14 | 3 | 14 | PM | Dvir et al. | 1998 | success | explicit |
| 424 | Room for professional growth | 3 | 11 | 3 | 11 | 3 | 11 | PM | Dvir et al. | 1998 | success | explicit |
| 425 | Possibilities for consulting with experienced professionals | 3 | 10 | 3 | 10 | 3 | 11 | PM | Dvir et al. | 1998 | success | explicit |
| 426 | Acts to increase workers' motivation | 3 | 14 | 3 | 14 | 3 | 14 | PM | Dvir et al. | 1998 | success | explicit |
| 427 | Open communication | 3 | 10 | 3 | 10 | 3 | 10 | PM | Dvir et al. | 1998 | success | explicit |
| 428 | Involvement of manager in day-to-day problem solving | 3 | 11 | 3 | 11 | 3 | 11 | PM | Dvir et al. | 1998 | success | explicit |
| 429 | Application of lessons learned during project execution | 3 | 11 | 3 | 11 | 3 | 11 | PM | Dvir et al. | 1998 | success | explicit |
| 430 | Detailed operational requirements | 5 | 25 | 5 | 25 | 5 | 25 | PM | Dvir et al. | 1998 | success | explicit |
| 431 | Technical specifications | 5 | 25 | 4 | 23 | 7 | 29 | PM | Dvir et al. | 1998 | success | explicit |
| 432 | Criteria for acceptance | 5 | 25 | 4 | 23 | 2 | 6 | PM | Dvir et al. | 1998 | success | explicit |
| 433 | Exact specification of tasks | 5 | 25 | 5 | 25 | 3 | 11 | PM | Dvir et al. | 1998 | success | explicit |
| 434 | Definition of organizational structure | 6 | 28 | 4 | 23 | 6 | 28 | PM | Dvir et al. | 1998 | success | explicit |
| 435 | Type of organizational structure | 6 | 28 | 4 | 23 | 6 | 28 | PM | Dvir et al. | 1998 | success | explicit |
| 436 | Fit of organizational structure | 6 | 28 | 4 | 23 | 6 | 28 | PM | Dvir et al. | 1998 | success | explicit |
| 437 | Infrastructure from earlier projects | 6 | 27 | 6 | 27 | 6 | 27 | PM | Dvir et al. | 1998 | success | explicit |
| 438 | Acquired from external sources | 6 | 27 | 7 | 32 | 7 | 33 | PM | Dvir et al. | 1998 | success | explicit |
| 439 | System integration | 6 | 27 | 6 | 27 | 6 | 27 | PM | Dvir et al. | 1998 | success | explicit |
| 440 | Planning of activities with Work Breakdown Structure | 6 | 27 | 4 | 23 | 4 | 23 | PM | Dvir et al. | 1998 | success | explicit |
| 441 | Managers as role models | 6 | 28 | 6 | 28 | 6 | 28 | PM | Dvir et al. | 1998 | success | explicit |
| 442 | Setting general policy and goals | 6 | 28 | 6 | 28 | 5 | 25 | PM | Dvir et al. | 1998 | success | explicit |
| 443 | Higher operational value than other systems | 7 | 33 | 6 | 27 | 2 | 6 | PM | Dvir et al. | 1998 | success | explicit |
| 444 | Technical feasibility checked | 7 | 32 | 4 | 23 | 7 | 32 | PM | Dvir et al. | 1998 | success | explicit |
| 445 | Alternative technical solution checked | 7 | 32 | 4 | 23 | 7 | 32 | PM | Dvir et al. | 1998 | success | explicit |
| 446 | Proposal based on existing technological infrastructure | 7 | 33 | 4 | 23 | 6 | 27 | PM | Dvir et al. | 1998 | success | explicit |
| 447 | Developed during the project's execution | 7 | 33 | 7 | 33 | 6 | 27 | PM | Dvir et al. | 1998 | success | explicit |
| 448 | Technical issues managed | 7 | 29 | 7 | 30 | 7 | 29 | PM | Dvir et al. | 1998 | success | explicit |
| 449 | Constant follow-up of technological developments | 7 | 33 | 7 | 33 | 3 | 11 | PM | Dvir et al. | 1998 | success | explicit |
| 450 | High technical level | 7 | 29 | 7 | 29 | 7 | 29 | PM | Dvir et al. | 1998 | success | explicit |
| 451 | A technical leader | 7 | 30 | 7 | 30 | 7 | 30 | PM | Dvir et al. | 1998 | success | explicit |
| 452 | Revising reward and motivation systems | 1 | 2 | 1 | 2 | 1 | 2 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 453 | Creating an effective culture for organisational change | 1 | 2 | 1 | 2 | 1 | 2 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 454 | Stimulating the organisation's receptiveness to change | 1 | 2 | 1 | 2 | 1 | 2 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 455 | Lack of organisational readiness for change | 1 | 2 | 1 | 2 | 1 | 2 | BPR | Al-Mashari and Zairi | 1999 | failure | explicit |
| 456 | Problems related to creating a culture for change | 1 | 2 | 1 | 2 | 1 | 2 | BPR | Al-Mashari and Zairi | 1999 | failure | explicit |
| 457 | effective management of risks | 4 | 17 | 1 | 5 | 1 | 5 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 458 | Effective BPR teams | 4 | 24 | 4 | 24 | 4 | 24 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 459 | Effective planning and use of project management techniques | 4 | 23 | 4 | 23 | 4 | 17 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 460 | Appropriate use of methodology | 4 | 23 | 4 | 23 | 4 | 23 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 461 | Effective process redesign | 4 | 19 | 4 | 19 | 4 | 19 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 462 | Integrating BPR with other improvement approaches | 4 | 19 | 4 | 19 | 4 | 19 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 463 | Adequate identification of BPR values | 4 | 19 | 4 | 19 | 5 | 25 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 464 | The effective re-engineering of legacy IS | 4 | 16 | 4 | 16 | 7 | 29 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 465 | Ineffective BPR teams | 4 | 24 | 4 | 24 | 4 | 24 | BPR | Al-Mashari and Zairi | 1999 | failure | explicit |
| 466 | Problems related to the integration mechanism, job definition, and allocation of responsibilities | 4 | 24 | 4 | 24 | 6 | 28 | BPR | Al-Mashari and Zairi | 1999 | failure | explicit |
| 467 | Problems related to planning and project management | 4 | 23 | 4 | 23 | 4 | 23 | BPR | Al-Mashari and Zairi | 1999 | failure | explicit |
| 468 | Ineffective process redesign | 4 | 19 | 4 | 19 | 4 | 20 | BPR | Al-Mashari and Zairi | 1999 | failure | explicit |
| 469 | Unrealistic expectations | 4 | 23 | 5 | 25 | 3 | 9 | BPR | Al-Mashari and Zairi | 1999 | failure | explicit |
| 470 | Ineffective re-engineering of legacy IS | 4 | 16 | 4 | 16 | 7 | 29 | BPR | Al-Mashari and Zairi | 1999 | failure | explicit |
| 471 | Effective communication | 3 | 10 | 3 | 10 | 3 | 10 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 472 | Empowerment of both individuals and teams | 3 | 14 | 3 | 14 | 3 | 14 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 473 | Human involvement | 3 | 9 | 3 | 9 | 3 | 9 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 474 | Training and education | 3 | 11 | 3 | 11 | 3 | 11 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 475 | top management support and commitment | 3 | 15 | 3 | 15 | 3 | 15 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 476 | championship and sponsorship | 3 | 15 | 3 | 15 | 4 | 24 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 477 | Adequate resources | 3 | 13 | 3 | 13 | 3 | 13 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 478 | External orientation and learning | 3 | 10 | 3 | 10 | 3 | 10 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 479 | Effective use of consultants | 3 | 10 | 3 | 10 | 3 | 10 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 480 | Adequate IT investment and sourcing decisions | 3 | 13 | 3 | 13 | 3 | 13 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 481 | Increasing the IT function competency | 3 | 11 | 3 | 11 | 6 | 27 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 482 | Problems in communication | 3 | 11 | 3 | 11 | 3 | 11 | BPR | Al-Mashari and Zairi | 1999 | failure | explicit |
| 483 | Organisational resistance | 3 | 9 | 3 | 9 | 3 | 9 | BPR | Al-Mashari and Zairi | 1999 | failure | explicit |
| 484 | Lack of training and education | 3 | 11 | 3 | 14 | 3 | 11 | BPR | Al-Mashari and Zairi | 1999 | failure | explicit |
| 485 | Problems related to commitment, support, and leadership | 3 | 15 | 3 | 15 | 3 | 15 | BPR | Al-Mashari and Zairi | 1999 | failure | explicit |
| 486 | Problems related to championship and sponsorship | 3 | 15 | 3 | 15 | 4 | 24 | BPR | Al-Mashari and Zairi | 1999 | failure | explicit |
| 487 | Problems related to BPR resources | 3 | 13 | 3 | 13 | 3 | 13 | BPR | Al-Mashari and Zairi | 1999 | failure | explicit |
| 488 | Ineffective use of consultants | 3 | 10 | 3 | 10 | 3 | 10 | BPR | Al-Mashari and Zairi | 1999 | failure | explicit |
| 489 | Problems related to IT investment and sourcing decisions | 3 | 13 | 3 | 13 | 3 | 13 | BPR | Al-Mashari and Zairi | 1999 | failure | explicit |
| 490 | Aligning BPR strategy with corporate strategy | 5 | 26 | 5 | 26 | 5 | 26 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 491 | Building a BPR vision | 5 | 26 | 5 | 26 | 6 | 28 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 492 | Adequate alignment of IT infrastructure and BPR strategy | 5 | 26 | 5 | 26 | 5 | 26 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 493 | Problems related to goals and measures | 5 | 25 | 5 | 25 | 5 | 25 | BPR | Al-Mashari and Zairi | 1999 | failure | explicit |
| 494 | Inadequate focus and objectives | 5 | 25 | 4 | 19 | 5 | 25 | BPR | Al-Mashari and Zairi | 1999 | failure | explicit |
| 495 | An adequate job integration approach | 6 | 28 | 6 | 28 | 6 | 28 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 496 | Appropriate job definitions and allocation of responsibilities | 6 | 28 | 6 | 28 | 6 | 28 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 497 | Building an effective IT infrastructure | 6 | 27 | 6 | 27 | 6 | 27 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 498 | Adequate measurement of IT infrastructure effectiveness on BPR | 6 | 27 | 6 | 27 | 6 | 27 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 499 | Proper IS integration | 6 | 27 | 6 | 27 | 6 | 27 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 500 | Improper IS integration | 6 | 27 | 6 | 27 | 6 | 27 | BPR | Al-Mashari and Zairi | 1999 | failure | explicit |
| 501 | Effective use of software tools | 7 | 33 | 7 | 33 | 6 | 27 | BPR | Al-Mashari and Zairi | 1999 | success | explicit |
| 502 | Inadequate IS development | 7 | 30 | 7 | 30 | 6 | 27 | BPR | Al-Mashari and Zairi | 1999 | failure | explicit |
| 503 | Risk analysis / portfolio balance | 1 | 5 | 1 | 5 | 1 | 5 | PPM | Frey and Buxmann | 2012 | success | explicit |
| 504 | Consideration of project interdependencies | 4 | 23 | 4 | 23 | 4 | 23 | PPM | Frey and Buxmann | 2012 | success | explicit |
| 505 | Portfolio segmented by asset classes | 4 | 23 | 4 | 23 | 4 | 23 | PPM | Frey and Buxmann | 2012 | success | explicit |
| 506 | Measurement of costs and benefits | 4 | 22 | 4 | 22 | 4 | 22 | PPM | Frey and Buxmann | 2012 | success | explicit |
| 507 | Consideration of multiple constraints (budget capacity, staff capabilities, etc.) | 4 | 23 | 4 | 17 | 4 | 23 | PPM | Frey and Buxmann | 2012 | success | explicit |

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| 508 | Financial analysis | 3 | 13 | 4 | 23 | 3 | 13 | PPM | Frey and Buxmann | 2012 | success | explicit |
| 509 | Top-leadership commitment | 3 | 15 | 3 | 15 | 3 | 15 | PPM | Frey and Buxmann | 2012 | success | explicit |
| 510 | Strategic fit / Strategic alignment | 5 | 26 | 5 | 26 | 5 | 26 | PPM | Frey and Buxmann | 2012 | success | explicit |
| 511 | Centralized view | 5 | 26 | 5 | 26 | 6 | 28 | PPM | Frey and Buxmann | 2012 | success | explicit |
| 512 | Accountability for results | 5 | 25 | 4 | 23 | 6 | 28 | PPM | Frey and Buxmann | 2012 | success | explicit |
| 513 | Experiment with or explore new technology | 1 | 2 | 1 | 2 | 1 | 2 | PM | Avital | 2003 | success | explicit |
| 514 | Creative, innovative, visionary thinking is encouraged | 1 | 2 | 1 | 2 | 1 | 2 | PM | Avital | 2003 | success | explicit |
| 515 | Managing scope and priorities | 4 | 17 | 4 | 17 | 4 | 23 | PM | Avital | 2003 | success | explicit |
| 516 | Dedicated hard-working staff | 4 | 24 | 4 | 24 | 4 | 24 | PM | Avital | 2003 | success | explicit |
| 517 | People getting along with likeable coworkers | 4 | 24 | 4 | 24 | 3 | 12 | PM | Avital | 2003 | success | explicit |
| 518 | Focus on objectives to get job done | 4 | 16 | 4 | 16 | 4 | 16 | PM | Avital | 2003 | success | explicit |
| 519 | Being able to make a difference | 4 | 16 | 4 | 16 | 4 | 16 | PM | Avital | 2003 | success | explicit |
| 520 | Overcoming a challenge, solving puzzles, solving problems | 4 | 16 | 4 | 16 | 4 | 16 | PM | Avital | 2003 | success | explicit |
| 521 | Diversity of roles and responsibilities, doing something "new" | 4 | 24 | 4 | 24 | 6 | 28 | PM | Avital | 2003 | success | explicit |
| 522 | Structured process/competent planning | 2 | 7 | 4 | 23 | 4 | 23 | PM | Avital | 2003 | success | explicit |
| 523 | Knowledge of the business process affected by the project | 2 | 7 | 2 | 7 | 2 | 7 | PM | Avital | 2003 | success | explicit |
| 524 | Being recognized as valuable by users | 2 | 6 | 3 | 8 | 2 | 6 | PM | Avital | 2003 | success | explicit |
| 525 | Top management sponsorship and commitment | 3 | 15 | 3 | 15 | 3 | 15 | PM | Avital | 2003 | success | explicit |
| 526 | Top management involvement | 3 | 15 | 3 | 15 | 3 | 15 | PM | Avital | 2003 | success | explicit |
| 527 | Funds availability | 3 | 13 | 3 | 13 | 3 | 13 | PM | Avital | 2003 | success | explicit |
| 528 | Ongoing communication between IT and users | 3 | 11 | 3 | 11 | 3 | 10 | PM | Avital | 2003 | success | explicit |
| 529 | Ongoing users' involvement and IT ownership | 3 | 8 | 3 | 8 | 3 | 8 | PM | Avital | 2003 | success | explicit |
| 530 | Working together as a Team | 3 | 11 | 4 | 24 | 3 | 14 | PM | Avital | 2003 | success | explicit |
| 531 | Ongoing communication among and within IT teams | 3 | 11 | 3 | 11 | 3 | 11 | PM | Avital | 2003 | success | explicit |
| 532 | Spirit of mutual support, sharing, and collaboration | 3 | 11 | 3 | 14 | 3 | 11 | PM | Avital | 2003 | success | explicit |
| 533 | Users' buy in, organizational-wide commitment | 3 | 8 | 3 | 8 | 3 | 8 | PM | Avital | 2003 | success | explicit |
| 534 | Trust among stakeholders | 3 | 10 | 3 | 10 | 3 | 8 | PM | Avital | 2003 | success | explicit |
| 535 | Personal growth potential | 3 | 11 | 3 | 11 | 3 | 9 | PM | Avital | 2003 | success | explicit |
| 536 | Career development opportunities | 3 | 11 | 3 | 11 | 6 | 28 | PM | Avital | 2003 | success | explicit |
| 537 | Learning new things | 3 | 11 | 3 | 11 | 3 | 11 | PM | Avital | 2003 | success | explicit |
| 538 | Having a sense of satisfaction and achievement | 3 | 14 | 3 | 14 | 3 | 9 | PM | Avital | 2003 | success | explicit |

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| 539 | Being recognized as valuable for and needed to the company | 3 | 14 | 6 | 28 | 6 | 28 | PM | Avital | 2003 | success | explicit |
| 540 | Ongoing training and professional skills development | 3 | 11 | 3 | 11 | 3 | 11 | PM | Avital | 2003 | success | explicit |
| 541 | Learning of any kind is encouraged and supported | 3 | 11 | 1 | 2 | 3 | 11 | PM | Avital | 2003 | success | explicit |
| 542 | Focus on business objectives (as opposed to technical objectives) | 5 | 25 | 4 | 17 | 5 | 25 | PM | Avital | 2003 | success | explicit |
| 543 | Clear objectives and strategic goals | 5 | 25 | 5 | 25 | 5 | 25 | PM | Avital | 2003 | success | explicit |
| 544 | Task has a clear and explicit contribution or impact on the business | 5 | 25 | 5 | 25 | 5 | 25 | PM | Avital | 2003 | success | explicit |
| 545 | Well-defined and bounded task having clear deliverables | 5 | 25 | 5 | 25 | 4 | 23 | PM | Avital | 2003 | success | explicit |
| 546 | Sense of partnership between IT and business | 5 | 26 | 5 | 26 | 3 | 8 | PM | Avital | 2003 | success | explicit |
| 547 | Infrastructure in place to support the developers | 6 | 27 | 6 | 27 | 6 | 27 | PM | Avital | 2003 | success | explicit |
| 548 | Proper space conducive to work | 6 | 28 | 6 | 28 | 6 | 28 | PM | Avital | 2003 | success | explicit |
| 549 | Freedom to question, challenge or disagree | 6 | 28 | 6 | 28 | 6 | 28 | PM | Avital | 2003 | success | explicit |
| 550 | having the ability and opportunity to make a difference in the organization | 6 | 28 | 6 | 28 | 6 | 28 | PM | Avital | 2003 | success | explicit |
| 551 | Stimulating environment, continuous stimulation | 6 | 28 | 6 | 28 | 6 | 28 | PM | Avital | 2003 | success | explicit |
| 552 | Knowledge of the technology in use | 7 | 33 | 7 | 33 | 7 | 32 | PM | Avital | 2003 | success | explicit |
| 553 | manage risk | 1 | 5 | 1 | 5 | 1 | 5 | BPM | Malinova et al. | 2014 | success | implicit |
| 554 | adapt to external changes | 1 | 3 | 1 | 3 | 1 | 3 | BPM | Malinova et al. | 2014 | success | implicit |
| 555 | introduce new products | 1 | 2 | 1 | 2 | 1 | 2 | BPM | Malinova et al. | 2014 | success | implicit |
| 556 | optimize processes | 4 | 19 | 4 | 19 | 4 | 19 | BPM | Malinova et al. | 2014 | success | implicit |
| 557 | reduce costs | 4 | 19 | 4 | 19 | 4 | 21 | BPM | Malinova et al. | 2014 | success | implicit |
| 558 | reduce time | 4 | 19 | 4 | 19 | 4 | 21 | BPM | Malinova et al. | 2014 | success | implicit |
| 559 | assure continious [sic!] improvement | 4 | 19 | 4 | 19 | 4 | 19 | BPM | Malinova et al. | 2014 | success | implicit |
| 560 | raise productivity | 4 | 16 | 4 | 16 | 4 | 16 | BPM | Malinova et al. | 2014 | success | implicit |
| 561 | consolidate process inputs | 4 | 19 | 2 | 7 | 4 | 21 | BPM | Malinova et al. | 2014 | success | implicit |
| 562 | measure | 4 | 21 | 4 | 21 | 4 | 22 | BPM | Malinova et al. | 2014 | success | implicit |
| 563 | identify and understand weaknesses of your processes | 2 | 7 | 4 | 19 | 4 | 19 | BPM | Malinova et al. | 2014 | success | implicit |
| 564 | increase satisfaction | 2 | 6 | 2 | 6 | 3 | 8 | BPM | Malinova et al. | 2014 | success | implicit |
| 565 | increase quality | 2 | 6 | 2 | 6 | 4 | 21 | BPM | Malinova et al. | 2014 | success | implicit |
| 566 | increase process awareness | 2 | 7 | 2 | 7 | 2 | 7 | BPM | Malinova et al. | 2014 | success | implicit |
| 567 | standardize | 2 | 7 | 2 | 7 | 2 | 7 | BPM | Malinova et al. | 2014 | success | implicit |
| 568 | comply to standards | 2 | 7 | 2 | 7 | 2 | 7 | BPM | Malinova et al. | 2014 | success | implicit |
| 569 | identify new processes | 2 | 7 | 2 | 7 | 2 | 7 | BPM | Malinova et al. | 2014 | success | implicit |
| 570 | faciliate employee communication | 3 | 11 | 3 | 11 | 3 | 11 | BPM | Malinova et al. | 2014 | success | implicit |
| 571 | increase BPM knowledge | 3 | 11 | 4 | 19 | 4 | 16 | BPM | Malinova et al. | 2014 | success | implicit |
| 572 | increase transparency | 3 | 11 | 3 | 11 | 3 | 11 | BPM | Malinova et al. | 2014 | success | implicit |

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| 573 | achieve proactivity | 3 | 8 | 3 | 8 | 3 | 8 | BPM | Malinova et al. | 2014 | success | implicit |
| 574 | support information system | 6 | 27 | 6 | 27 | 6 | 27 | BPM | Malinova et al. | 2014 | success | implicit |
| 575 | Organizational change management | 1 | 2 | 1 | 2 | 1 | 2 | BPR | Umble et al. | 2003 | success | explicit |
| 576 | Excellent project management | 4 | 17 | 4 | 17 | 4 | 17 | BPR | Umble et al. | 2003 | success | explicit |
| 577 | A great implementation team | 4 | 24 | 4 | 24 | 4 | 24 | BPR | Umble et al. | 2003 | success | explicit |
| 578 | Focused performance measures | 4 | 21 | 4 | 21 | 4 | 21 | BPR | Umble et al. | 2003 | success | explicit |
| 579 | System / Software selection process | 4 | 23 | 4 | 23 | 4 | 23 | BPR | Umble et al. | 2003 | success | explicit |
| 580 | poor planning or poor management | 4 | 23 | 4 | 23 | 4 | 23 | BPR | Umble et al. | 2003 | failure | implicit |
| 581 | Commitment by top management | 3 | 15 | 3 | 15 | 3 | 15 | BPR | Umble et al. | 2003 | success | explicit |
| 582 | Extensive education and training | 3 | 11 | 3 | 11 | 3 | 11 | BPR | Umble et al. | 2003 | success | explicit |
| 583 | lack of business management support | 3 | 15 | 3 | 15 | 3 | 15 | BPR | Umble et al. | 2003 | failure | implicit |
| 584 | User resistance | 3 | 9 | 3 | 9 | 3 | 9 | BPR | Umble et al. | 2003 | failure | implicit |
| 585 | Clear understanding of strategic goals | 5 | 25 | 5 | 25 | 5 | 25 | BPR | Umble et al. | 2003 | success | explicit |
| 586 | change in business goals during the project | 5 | 25 | 5 | 25 | 5 | 25 | BPR | Umble et al. | 2003 | failure | implicit |
| 587 | Data accuracy | 6 | 27 | 6 | 27 | 6 | 27 | BPR | Umble et al. | 2003 | success | explicit |
| 588 | the technology is deployed in a vacuum | 6 | 27 | 6 | 27 | 7 | 32 | BPR | Umble et al. | 2003 | failure | implicit |
| 589 | Multi-site issues | 7 | 29 | 7 | 29 | 7 | 29 | BPR | Umble et al. | 2003 | success | explicit |
| 590 | New reward system | 1 | 2 | 1 | 2 | 1 | 2 | BPR | Abdolvant et al. | 2008 | success | explicit |
| 591 | Middle management fear of losing authority | 1 | 5 | 1 | 5 | 1 | 5 | BPR | Abdolvant et al. | 2008 | failure | explicit |
| 592 | Feeling uncomfortable with new working environment | 1 | 2 | 1 | 2 | 3 | 9 | BPR | Abdolvant et al. | 2008 | failure | explicit |
| 593 | Constructive use of subordinates' idea | 4 | 17 | 4 | 17 | 3 | 11 | BPR | Abdolvant et al. | 2008 | success | explicit |
| 594 | Teamwork performance | 4 | 24 | 4 | 24 | 3 | 14 | BPR | Abdolvant et al. | 2008 | success | explicit |
| 595 | Performance measurement | 4 | 22 | 4 | 22 | 4 | 21 | BPR | Abdolvant et al. | 2008 | success | explicit |
| 596 | Management performance | 4 | 17 | 4 | 17 | 4 | 17 | BPR | Abdolvant et al. | 2008 | success | implicit |
| 597 | Sufficient knowledge about the BPR projects | 2 | 7 | 2 | 7 | 2 | 7 | BPR | Abdolvant et al. | 2008 | success | explicit |
| 598 | Open communication | 3 | 10 | 3 | 10 | 3 | 10 | BPR | Abdolvant et al. | 2008 | success | explicit |
| 599 | Frequent communication with BPR team and users | 3 | 11 | 3 | 11 | 3 | 11 | BPR | Abdolvant et al. | 2008 | success | explicit |
| 600 | Employee empowerment | 3 | 14 | 3 | 14 | 3 | 9 | BPR | Abdolvant et al. | 2008 | success | explicit |
| 601 | Timely training and education | 3 | 11 | 3 | 11 | 3 | 11 | BPR | Abdolvant et al. | 2008 | success | explicit |
| 602 | Skepticism about project result | 3 | 9 | 3 | 9 | 3 | 9 | BPR | Abdolvant et al. | 2008 | failure | explicit |
| 603 | Shared vision/information | 5 | 25 | 5 | 25 | 3 | 11 | BPR | Abdolvant et al. | 2008 | success | explicit |
| 604 | Realistic expectation of BPR results | 5 | 25 | 5 | 25 | 3 | 9 | BPR | Abdolvant et al. | 2008 | success | explicit |
| 605 | Confidence and trust in subordinates | 6 | 28 | 6 | 28 | 6 | 28 | BPR | Abdolvant et al. | 2008 | success | explicit |
| 606 | Friendly interactions | 6 | 28 | 6 | 28 | 6 | 28 | BPR | Abdolvant et al. | 2008 | success | explicit |
| 607 | Confidence and trust | 6 | 28 | 6 | 28 | 6 | 28 | BPR | Abdolvant et al. | 2008 | success | explicit |
| 608 | Cooperative environment | 6 | 28 | 6 | 28 | 6 | 28 | BPR | Abdolvant et al. | 2008 | success | explicit |
| 609 | Recognition among employees | 6 | 28 | 6 | 28 | 6 | 28 | BPR | Abdolvant et al. | 2008 | success | explicit |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 610 | Employees fear of losing job | 6 | 28 | 1 | 2 | 3 | 9 | BPR | Abdolvant et al. | 2008 | failure | explicit |
| 611 | The role of IT | 7 | 33 | 7 | 33 | 6 | 27 | BPR | Abdolvant et al. | 2008 | success | explicit |
| 612 | Use of up-to-date communication technology | 7 | 33 | 7 | 33 | 7 | 33 | BPR | Abdolvant et al. | 2008 | success | explicit |
| 613 | Adoption of IT | 7 | 33 | 7 | 33 | 7 | 33 | BPR | Abdolvant et al. | 2008 | success | explicit |
| 614 | Effective Project Management | 4 | 17 | 4 | 17 | 4 | 22 | BPR | Dezdar and Ainin | 2011 | success | explicit |
| 615 | assign considerable time prior to starting implementation to prepare a project plan | 4 | 23 | 4 | 23 | 4 | 23 | BPR | Dezdar and Ainin | 2011 | success | implicit |
| 616 | establish the ERP implementation project scope and control it | 4 | 22 | 4 | 22 | 4 | 22 | BPR | Dezdar and Ainin | 2011 | success | implicit |
| 617 | establish the project team and their responsibilities with a clear statement of work and define the performance objectives | 4 | 23 | 4 | 23 | 4 | 23 | BPR | Dezdar and Ainin | 2011 | success | implicit |
| 618 | Team Composition and Competence | 4 | 24 | 4 | 24 | 4 | 24 | BPR | Dezdar and Ainin | 2011 | success | explicit |
| 619 | assign an experienced and reputable project champion/manager to lead the implementation | 4 | 17 | 4 | 17 | 4 | 24 | BPR | Dezdar and Ainin | 2011 | success | implicit |
| 620 | business skills of the project team | 4 | 16 | 4 | 16 | 4 | 16 | BPR | Dezdar and Ainin | 2011 | success | implicit |
| 621 | requires the cooperation and effort of end-users, business professionals and technical experts | 3 | 12 | 3 | 12 | 3 | 12 | BPR | Dezdar and Ainin | 2011 | success | implicit |
| 622 | establish a team consisting of all stakeholders | 3 | 12 | 4 | 24 | 4 | 24 | BPR | Dezdar and Ainin | 2011 | success | implicit |
| 623 | set up a detailed project plan with clear objectives, deliverables, realistic project milestones and end-dates and enforce them with measurable results | 5 | 25 | 4 | 23 | 4 | 23 | BPR | Dezdar and Ainin | 2011 | success | implicit |
| 624 | technical skills of the project team | 7 | 29 | 7 | 29 | 7 | 29 | BPR | Dezdar and Ainin | 2011 | success | implicit |
| 625 | Ensure that projects can be completed within four to six months | 4 | 23 | 4 | 23 | 4 | 23 | BPI | Antony et al. | 2012 | success | implicit |
| 626 | Ensure that a tollgate review must be performed at every stage of the Six Sigma methodology by the LSS deployment champion for ensuring a smooth running of the projects | 4 | 22 | 4 | 22 | 4 | 23 | BPI | Antony et al. | 2012 | success | implicit |
| 627 | Select those projects which have the ability to show measurable improvements in the delivery of quality associated with education, operational costs and timeliness parameters | 4 | 17 | 4 | 23 | 4 | 23 | BPI | Antony et al. | 2012 | success | implicit |
| 628 | Uncompromising top management support and commitment | 3 | 15 | 3 | 15 | 3 | 15 | BPI | Antony et al. | 2012 | success | explicit |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 629 | Effective communication at all levels vertically and horizontally | 3 | 11 | 3 | 11 | 3 | 11 | BPI | Antony et al. | 2012 | success | explicit |
| 630 | commitment of both financial and personnel resources for the initiative | 3 | 13 | 5 | 26 | 5 | 25 | BPI | Antony et al. | 2012 | success | implicit |
| 631 | development of a communication plan | 3 | 11 | 3 | 11 | 3 | 11 | BPI | Antony et al. | 2012 | success | implicit |
| 632 | reward and recognition system | 3 | 14 | 3 | 14 | 3 | 14 | BPI | Antony et al. | 2012 | success | implicit |
| 633 | build human capital by providing education and training to employees | 3 | 11 | 3 | 11 | 3 | 11 | BPI | Antony et al. | 2012 | success | implicit |
| 634 | Projects must be aligned with critical business and customer issues | 3 | 8 | 3 | 8 | 3 | 8 | BPI | Antony et al. | 2012 | success | implicit |
| 635 | organisational culture is all about changing the way we take care of our customers providing them with a world-class experience | 3 | 8 | 6 | 28 | 2 | 6 | BPI | Antony et al. | 2012 | success | implicit |
| 636 | a clear strategic deployment plan showing the tangible objectives and goals of the initiative | 5 | 25 | 5 | 25 | 5 | 25 | BPI | Antony et al. | 2012 | success | implicit |
| 637 | clear direction and guidance on deploying Six Sigma | 5 | 25 | 5 | 25 | 5 | 25 | BPI | Antony et al. | 2012 | success | implicit |
| 638 | Project objectives must be clear to everyone involved in the project | 5 | 25 | 5 | 25 | 5 | 25 | BPI | Antony et al. | 2012 | success | implicit |
| 639 | Developing organisational readiness | 6 | 28 | 6 | 28 | 6 | 28 | BPI | Antony et al. | 2012 | success | explicit |
| 640 | Projects must be feasible to execute from a resource and data standpoint | 6 | 27 | 6 | 27 | 4 | 23 | BPI | Antony et al. | 2012 | success | implicit |
| 641 | Following agile-oriented project management process | 1 | 3 | 2 | 7 | 1 | 3 | PM | Lam et al. | 2013 | success | explicit |
| 642 | Following agile-oriented configuration management process | 1 | 1 | 2 | 7 | 1 | 3 | PM | Lam et al. | 2013 | success | explicit |
| 643 | Project nature being non-life-critical | 1 | 5 | 4 | 23 | 4 | 23 | PM | Lam et al. | 2013 | success | explicit |
| 644 | Lack of agile logistical arrangements | 1 | 4 | 1 | 4 | 1 | 4 | PM | Lam et al. | 2013 | failure | explicit |
| 645 | Team members with high competence and expertise | 4 | 24 | 4 | 24 | 4 | 24 | PM | Lam et al. | 2013 | success | explicit |
| 646 | Managers knowledgeable in agile process | 4 | 17 | 4 | 17 | 1 | 3 | PM | Lam et al. | 2013 | success | explicit |
| 647 | Managers who have light-touch or adaptive management style | 4 | 17 | 4 | 17 | 4 | 17 | PM | Lam et al. | 2013 | success | explicit |
| 648 | Coherent, self-organizing teamwork | 4 | 24 | 4 | 24 | 4 | 24 | PM | Lam et al. | 2013 | success | explicit |
| 649 | Rigorous refactoring activities | 4 | 19 | 4 | 19 | 2 | 7 | PM | Lam et al. | 2013 | success | explicit |
| 650 | Regular delivery of software | 4 | 23 | 7 | 33 | 2 | 7 | PM | Lam et al. | 2013 | success | explicit |
| 651 | Projects with dynamic, accelerated schedule | 4 | 23 | 4 | 23 | 1 | 2 | PM | Lam et al. | 2013 | success | explicit |
| 652 | Projects with small team | 4 | 24 | 4 | 24 | 4 | 23 | PM | Lam et al. | 2013 | success | explicit |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 653 | Projects with up-front cost evaluation done | 4 | 23 | 4 | 23 | 4 | 23 | PM | Lam et al. | 2013 | success | explicit |
| 654 | Projects with up-front risk analysis done | 4 | 23 | 4 | 23 | 1 | 5 | PM | Lam et al. | 2013 | success | explicit |
| 655 | Lack of necessary skill-set | 4 | 16 | 4 | 24 | 4 | 16 | PM | Lam et al. | 2013 | failure | explicit |
| 656 | Lack of project management competence | 4 | 17 | 4 | 17 | 4 | 17 | PM | Lam et al. | 2013 | failure | explicit |
| 657 | Lack of team work | 4 | 24 | 4 | 24 | 3 | 14 | PM | Lam et al. | 2013 | failure | explicit |
| 658 | Ill-defined project scope | 4 | 23 | 4 | 23 | 4 | 23 | PM | Lam et al. | 2013 | failure | explicit |
| 659 | Ill-defined project planning | 4 | 23 | 4 | 23 | 4 | 23 | PM | Lam et al. | 2013 | failure | explicit |
| 660 | Lack of agile progress tracking mechanism | 4 | 22 | 4 | 21 | 4 | 21 | PM | Lam et al. | 2013 | failure | explicit |
| 661 | Project Management Process | 4 | 17 | 4 | 17 | 4 | 17 | PM | Lam et al. | 2013 | success | explicit |
| 662 | Project Definition Process | 4 | 23 | 4 | 23 | 4 | 23 | PM | Lam et al. | 2013 | success | explicit |
| 663 | Ill-defined customer role | 2 | 6 | 3 | 8 | 2 | 6 | PM | Lam et al. | 2013 | failure | explicit |
| 664 | Strong executive support | 3 | 15 | 3 | 15 | 3 | 15 | PM | Lam et al. | 2013 | success | explicit |
| 665 | Committed sponsor or manager | 3 | 15 | 3 | 15 | 3 | 15 | PM | Lam et al. | 2013 | success | explicit |
| 666 | Oral culture placing high value on face-to-face communication | 3 | 11 | 3 | 11 | 3 | 11 | PM | Lam et al. | 2013 | success | explicit |
| 667 | Collocation of the whole team | 3 | 14 | 4 | 24 | 4 | 24 | PM | Lam et al. | 2013 | success | explicit |
| 668 | Team members with great motivation | 3 | 14 | 3 | 14 | 3 | 14 | PM | Lam et al. | 2013 | success | explicit |
| 669 | Good customer relationship | 3 | 8 | 3 | 8 | 2 | 6 | PM | Lam et al. | 2013 | success | explicit |
| 670 | Strong communication focus with daily face-to-face meetings | 3 | 11 | 3 | 11 | 3 | 11 | PM | Lam et al. | 2013 | success | explicit |
| 671 | Strong customer commitment and presence | 3 | 8 | 3 | 8 | 3 | 8 | PM | Lam et al. | 2013 | success | explicit |
| 672 | Customer having full authority | 3 | 8 | 3 | 8 | 3 | 8 | PM | Lam et al. | 2013 | success | explicit |
| 673 | Right amount of documentation | 3 | 11 | 3 | 11 | 2 | 7 | PM | Lam et al. | 2013 | success | explicit |
| 674 | Appropriate technical training to team | 3 | 11 | 3 | 11 | 3 | 11 | PM | Lam et al. | 2013 | success | explicit |
| 675 | Lack of executive sponsorship | 3 | 13 | 3 | 13 | 3 | 15 | PM | Lam et al. | 2013 | failure | explicit |
| 676 | Lack of management commitment | 3 | 15 | 3 | 15 | 3 | 15 | PM | Lam et al. | 2013 | failure | explicit |
| 677 | Resistance from groups or individuals | 3 | 9 | 3 | 9 | 3 | 9 | PM | Lam et al. | 2013 | failure | explicit |
| 678 | Bad customer relationship | 3 | 8 | 3 | 8 | 2 | 6 | PM | Lam et al. | 2013 | failure | explicit |
| 679 | Lack of customer presence | 3 | 8 | 3 | 8 | 3 | 8 | PM | Lam et al. | 2013 | failure | explicit |
| 680 | Customer Involvement | 3 | 8 | 3 | 8 | 3 | 8 | PM | Lam et al. | 2013 | success | explicit |
| 681 | Management Commitment | 3 | 15 | 3 | 15 | 3 | 15 | PM | Lam et al. | 2013 | success | explicit |
| 682 | Following agile-oriented requirement management process | 5 | 25 | 2 | 7 | 1 | 3 | PM | Lam et al. | 2013 | success | explicit |
| 683 | Delivering most important features first | 5 | 25 | 4 | 23 | 2 | 7 | PM | Lam et al. | 2013 | success | explicit |
| 684 | Project type being of variable scope with emergent requirement | 5 | 25 | 4 | 23 | 4 | 23 | PM | Lam et al. | 2013 | success | explicit |
| 685 | Ill-defined project requirements | 5 | 25 | 4 | 23 | 5 | 25 | PM | Lam et al. | 2013 | failure | explicit |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 686 | Cooperative organizational culture instead of hierarchal | 6 | 28 | 6 | 28 | 6 | 28 | PM | Lam et al. | 2013 | success | explicit |
| 687 | Organizations where agile methodology is universally accepted | 6 | 28 | 6 | 28 | 6 | 28 | PM | Lam et al. | 2013 | success | explicit |
| 688 | Facility with proper agile-style work environment | 6 | 28 | 6 | 28 | 6 | 28 | PM | Lam et al. | 2013 | success | explicit |
| 689 | Reward system appropriate for agile | 6 | 28 | 6 | 28 | 3 | 14 | PM | Lam et al. | 2013 | success | explicit |
| 690 | Honoring regular working schedule – no overtime | 6 | 28 | 3 | 14 | 3 | 9 | PM | Lam et al. | 2013 | success | explicit |
| 691 | Well-defined coding standards up front | 6 | 27 | 6 | 27 | 2 | 7 | PM | Lam et al. | 2013 | success | explicit |
| 692 | Projects with no multiple independent teams | 6 | 28 | 4 | 24 | 4 | 23 | PM | Lam et al. | 2013 | success | explicit |
| 693 | Organizational culture too traditional | 6 | 28 | 6 | 28 | 6 | 28 | PM | Lam et al. | 2013 | failure | explicit |
| 694 | Organizational culture too political | 6 | 28 | 6 | 28 | 6 | 28 | PM | Lam et al. | 2013 | failure | explicit |
| 695 | Organizational size too large | 6 | 28 | 6 | 28 | 6 | 28 | PM | Lam et al. | 2013 | failure | explicit |
| 696 | Lack of complete set of correct agile practices | 6 | 28 | 6 | 28 | 6 | 28 | PM | Lam et al. | 2013 | failure | explicit |
| 697 | Pursuing simple design | 7 | 32 | 7 | 32 | 2 | 7 | PM | Lam et al. | 2013 | success | explicit |
| 698 | Correct integration testing | 7 | 32 | 7 | 32 | 7 | 32 | PM | Lam et al. | 2013 | success | explicit |
| 699 | Inappropriateness of technology and tools | 7 | 33 | 6 | 27 | 6 | 27 | PM | Lam et al. | 2013 | failure | explicit |
| 700 | avoid the selection of traditional thinkers as team members | 1 | 2 | 4 | 24 | 4 | 24 | BPR | Guimaraes | 1997 | success | implicit |
| 701 | be completely open about what you are doing, when and why | 1 | 2 | 1 | 2 | 1 | 2 | BPR | Guimaraes | 1997 | success | implicit |
| 702 | Use resources effectively | 4 | 17 | 4 | 17 | 4 | 21 | BPR | Guimaraes | 1997 | success | explicit |
| 703 | Implement new processes as planned and on schedule | 4 | 20 | 4 | 22 | 4 | 22 | BPR | Guimaraes | 1997 | success | explicit |
| 704 | use of project champions | 4 | 24 | 4 | 24 | 4 | 24 | BPR | Guimaraes | 1997 | success | implicit |
| 705 | Utilize hands-on experience in reengineering diverse processes | 4 | 20 | 4 | 23 | 4 | 19 | BPR | Guimaraes | 1997 | success | explicit |
| 706 | Use concept design phase to develop a rough-cut design and to identify major issues | 4 | 19 | 4 | 23 | 4 | 23 | BPR | Guimaraes | 1997 | success | explicit |
| 707 | Determine all setup details, tooling, scheduling, maintenance, storage, replenishment, quality, etc. before implementation | 4 | 23 | 4 | 23 | 4 | 23 | BPR | Guimaraes | 1997 | success | explicit |
| 708 | Simplify material flow, logistics, planning, and other distinct operations by using group technology | 4 | 20 | 6 | 27 | 7 | 29 | BPR | Guimaraes | | success | explicit |
| 709 | Use process mapping to distinguish productive activities from non-value-added activities | 4 | 19 | 4 | 19 | 4 | 19 | BPR | Guimaraes | | success | explicit |
| 710 | Reduce cost and response times by automation | 4 | 19 | 4 | 19 | 4 | 19 | BPR | Guimaraes | 1997 | success | explicit |

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| 711 | Desire for continuous performance improvement | 4 | 19 | 4 | 19 | 4 | 19 | BPR | Guimaraes | 1997 | success | explicit |
| 712 | Use surveys to determine what's working and what's not | 4 | 19 | 4 | 19 | 3 | 11 | BPR | Guimaraes | 1997 | success | explicit |
| 713 | BPR motivated by customer demands and competitive pressures | 2 | 6 | 2 | 6 | 3 | 8 | BPR | Guimaraes | 1997 | success | explicit |
| 714 | Focus on the outcome rather than task | 2 | 6 | 2 | 6 | 2 | 6 | BPR | Guimaraes | 1997 | success | explicit |
| 715 | Use industry specialists and outside assistance | 3 | 10 | 3 | 10 | 3 | 10 | BPR | Guimaraes | 1997 | success | explicit |
| 716 | Reeducate and retrain workers on what BPR actually is | 3 | 11 | 3 | 11 | 3 | 11 | BPR | Guimaraes | 1997 | success | explicit |
| 717 | improve relationships with suppliers | 3 | 12 | 3 | 12 | 3 | 12 | BPR | Guimaraes | 1997 | success | implicit |
| 718 | education and re-education | 3 | 11 | 3 | 11 | 3 | 11 | BPR | Guimaraes | 1997 | success | implicit |
| 719 | reconsider mechanisms for reward and recognition | 3 | 14 | 3 | 14 | 3 | 14 | BPR | Guimaraes | 1997 | success | implicit |
| 720 | Share and exchange information willingly | 3 | 11 | 3 | 11 | 3 | 11 | BPR | Guimaraes | 1997 | success | explicit |
| 721 | Schedule meetings between project manager and each level of project structure regularly | 3 | 11 | 3 | 11 | 3 | 11 | BPR | Guimaraes | | success | explicit |
| 722 | Revise procedures that focus on satisfying internal demands rather than the marketplace | 3 | 8 | 2 | 7 | 3 | 8 | BPR | Guimaraes | 1997 | success | explicit |
| 723 | Empower workers so that doers are decision makers | 3 | 14 | 3 | 11 | 3 | 9 | BPR | Guimaraes | 1997 | success | explicit |
| 724 | BPR initiated and led from the top-down by senior-level management | 3 | 15 | 3 | 15 | 3 | 15 | BPR | Guimaraes | 1997 | success | explicit |
| 725 | BPR motivated by chief executive willing to be held accountable for project success | 3 | 15 | 3 | 15 | 3 | 15 | BPR | Guimaraes | | success | explicit |
| 726 | Develop and communicate clear written mission and vision statements | 5 | 25 | 5 | 25 | 5 | 25 | BPR | Guimaraes | 1997 | success | explicit |
| 727 | Target only a few critical (though cross-functional) business processes | 5 | 25 | 2 | 7 | 1 | 2 | BPR | Guimaraes | 1997 | success | explicit |
| 728 | Create an enabling charter that describes the BPR program and support of management | 5 | 25 | 5 | 25 | 3 | 15 | BPR | Guimaraes | | success | explicit |
| 729 | Adopt an integrated approach to IT and business planning | 5 | 26 | 5 | 26 | 5 | 26 | BPR | Guimaraes | 1997 | success | explicit |
| 730 | Develop a defined project organization | 6 | 28 | 4 | 23 | 6 | 28 | BPR | Guimaraes | 1997 | success | explicit |
| 731 | View technology as an enabler, not as a solution | 6 | 27 | 6 | 27 | 6 | 27 | BPR | Guimaraes | 1997 | success | explicit |
| 732 | establishment and utilization of a formal experimental methodology | 1 | 5 | 1 | 5 | 4 | 23 | Digit* | Siegel and Madni | 2014 | success | explicit |
| 733 | empowerment of the development team to implement a number of methodological innovations, in conjunction with | 1 | 2 | 5 | 26 | 3 | 9 | Digit* | Siegel and Madni | 2014 | success | explicit |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | all of the technological innovations | | | | | | | | | | | |
| 734 | willingness to push experiments to the point of failure, to uncover behavioral boundaries | 1 | 5 | 1 | 5 | 1 | 5 | Digit* | Siegel and Madni | 2014 | success | explicit |
| 735 | willingness to carry multiple options in the design tradespace for an unusually long time to mitigate a significant portion of each risk item before down-selecting to a single preferred approach | 4 | 23 | 4 | 23 | 1 | 5 | Digit* | Siegel and Madni | 2014 | success | explicit |
| 736 | willingness to manage the program with schedule as the independent variable, and being willing to adjust the order and timing of specific capabilities to keep on schedule | 4 | 22 | 1 | 3 | 5 | 25 | Digit* | Siegel and Madni | 2014 | success | explicit |
| 737 | a strong, top-down commitment | 3 | 15 | 3 | 15 | 3 | 15 | Digit* | Siegel and Madni | 2014 | success | explicit |
| 738 | Using project plans as working documents | 1 | 3 | 3 | 11 | 3 | 11 | PM | Clarke | 1999 | success | explicit |
| 739 | Breaking the project into `bite sized chunks' | 4 | 23 | 4 | 23 | 4 | 23 | PM | Clarke | 1999 | success | explicit |
| 740 | Develop an auditing tool for project management | 4 | 22 | 4 | 22 | 4 | 22 | PM | Clarke | 1999 | success | implicit |
| 741 | Communicate the importance of the final stages in a project | 4 | 17 | 5 | 25 | 5 | 25 | PM | Clarke | 1999 | success | implicit |
| 742 | Define the 'bite sized chunks' at the outset of the project (to counteract the project overload syndrome) | 4 | 23 | 4 | 23 | 4 | 23 | PM | Clarke | 1999 | success | implicit |
| 743 | Focus on key success factors as a first stage to standardisation | 2 | 7 | 2 | 7 | 2 | 7 | PM | Clarke | 1999 | success | implicit |
| 744 | Communication throughout the project | 3 | 11 | 3 | 11 | 3 | 11 | PM | Clarke | 1999 | success | explicit |
| 745 | Improve information flows thoughout the organisation | 3 | 11 | 3 | 11 | 3 | 11 | PM | Clarke | 1999 | success | implicit |
| 746 | Build individualism through effective communication | 3 | 11 | 3 | 11 | 3 | 11 | PM | Clarke | 1999 | success | implicit |
| 747 | Build confidence through better communication | 3 | 11 | 3 | 11 | 3 | 11 | PM | Clarke | 1999 | success | implicit |
| 748 | Clear objectives and scope | 5 | 25 | 5 | 25 | 5 | 25 | PM | Clarke | 1999 | success | explicit |
| 749 | Increase awareness of both perceived and actual benefits | 5 | 25 | 5 | 25 | 5 | 25 | PM | Clarke | 1999 | success | implicit |
| 750 | project management | 4 | 17 | 4 | 17 | 4 | 17 | BPM | Bai and Sarkis | 2013 | success | implicit |
| 751 | Project management | 4 | 17 | 4 | 17 | 4 | 17 | BPM | Bai and Sarkis | 2013 | success | explicit |
| 752 | Performance measurement | 4 | 21 | 4 | 21 | 4 | 21 | BPM | Bai and Sarkis | 2013 | success | explicit |
| 753 | top management support | 3 | 15 | 3 | 15 | 3 | 15 | BPM | Bai and Sarkis | 2013 | success | implicit |
| 754 | communication | 3 | 11 | 3 | 11 | 3 | 11 | BPM | Bai and Sarkis | 2013 | success | implicit |
| 755 | Top management support | 3 | 15 | 3 | 15 | 3 | 15 | BPM | Bai and Sarkis | 2013 | success | explicit |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 756 | User Focus | 3 | 8 | 3 | 8 | 3 | 8 | BPM | Bai and Sarkis | 2013 | success | explicit |
| 757 | Stategic alignment | 5 | 26 | 5 | 26 | 5 | 26 | BPM | Bai and Sarkis | 2013 | success | explicit |
| 758 | inter-departmental cooperation | 6 | 28 | 5 | 26 | 3 | 11 | BPM | Bai and Sarkis | 2013 | success | implicit |
| 759 | Information technology | 6 | 27 | 6 | 27 | 6 | 27 | BPM | Bai and Sarkis | 2013 | success | explicit |
| 760 | Collaborative environment | 6 | 28 | 6 | 28 | 6 | 28 | BPM | Bai and Sarkis | 2013 | success | explicit |
| 761 | Culture | 6 | 28 | 6 | 28 | 6 | 28 | BPM | Bai and Sarkis | 2013 | success | explicit |
| 762 | Organizations inability to be open about IS failure | 1 | 5 | 1 | 5 | 1 | 5 | PM | Hughes et al. | 2017 | failure | explicit |
| 763 | Failure is multi-dimensional with interconnected factors | 1 | 5 | 1 | 5 | 1 | 5 | PM | Hughes et al. | 2017 | failure | explicit |
| 764 | Poor assessment and management of risks | 1 | 5 | 1 | 5 | 1 | 5 | PM | Hughes et al. | 2017 | failure | explicit |
| 765 | Factors relating to Poor Change Management and User Resistance | 1 | 2 | 1 | 2 | 1 | 2 | PM | Hughes et al. | 2017 | failure | explicit |
| 766 | Inadequate Management Structure | 1 | 3 | 6 | 28 | 6 | 28 | PM | Hughes et al. | 2017 | failure | explicit |
| 767 | plan for users changing their minds and ensure the required controls are in place | 1 | 3 | 1 | 3 | 1 | 2 | PM | Hughes et al. | 2017 | success | implicit |
| 768 | plan for users changing their minds and ensure the controls are in place to manage this effectively | 1 | 3 | 1 | 3 | 1 | 2 | PM | Hughes et al. | 2017 | success | implicit |
| 769 | Poor project management is a common failure factor | 4 | 17 | 4 | 17 | 4 | 17 | PM | Hughes et al. | 2017 | failure | explicit |
| 770 | Poor management skills | 4 | 17 | 4 | 17 | 4 | 17 | PM | Hughes et al. | 2017 | failure | explicit |
| 771 | Project too big to fail, exec lacking courage to stop project | 4 | 23 | 4 | 23 | 4 | 17 | PM | Hughes et al. | 2017 | failure | explicit |
| 772 | Difficulties faced by project managers on complex projects | 4 | 17 | 4 | 17 | 4 | 23 | PM | Hughes et al. | 2017 | failure | explicit |
| 773 | Large projects have a virtual zero chance of being successful | 4 | 23 | 4 | 23 | 4 | 23 | PM | Hughes et al. | 2017 | failure | explicit |
| 774 | Lack of PM methodology | 4 | 23 | 4 | 23 | 4 | 23 | PM | Hughes et al. | 2017 | failure | explicit |
| 775 | Elongated time-scales | 4 | 23 | 4 | 23 | 4 | 22 | PM | Hughes et al. | 2017 | failure | explicit |
| 776 | Lack of time devoted to PM based tasks | 4 | 23 | 4 | 23 | 4 | 23 | PM | Hughes et al. | 2017 | failure | explicit |
| 777 | Inaccurate estimating on large projects | 4 | 23 | 4 | 23 | 4 | 23 | PM | Hughes et al. | 2017 | failure | explicit |
| 778 | If organizations paid attention to EWS during first 20% of project lifecycle, probability of successful outcomes is greatly increased | 4 | 22 | 4 | 22 | 4 | 22 | PM | Hughes et al. | 2017 | failure | explicit |
| 779 | Project management and process failings were biggest contributors to failure | 4 | 17 | 4 | 17 | 4 | 17 | PM | Hughes et al. | 2017 | failure | explicit |
| 780 | Failure linked to inability to deliver desired value | 4 | 23 | 2 | 6 | 2 | 6 | PM | Hughes et al. | 2017 | failure | explicit |

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| 781 | Project management seems to have an over reliance on task based activities | 4 | 17 | 4 | 17 | 4 | 17 | PM | Hughes et al. | 2017 | failure | explicit |
| 782 | Poor Project Planning | 4 | 23 | 4 | 23 | 4 | 23 | PM | Hughes et al. | 2017 | failure | explicit |
| 783 | Poor Project Management and Project Planning | 4 | 17 | 4 | 17 | 4 | 23 | PM | Hughes et al. | 2017 | failure | explicit |
| 784 | Project Too Large and Complex | 4 | 23 | 4 | 23 | 4 | 23 | PM | Hughes et al. | 2017 | failure | explicit |
| 785 | Staff Turnover | 4 | 24 | 4 | 24 | 3 | 9 | PM | Hughes et al. | 2017 | failure | explicit |
| 786 | Poor Business Case, Objectives and Evaluation Stage | 4 | 23 | 4 | 23 | 4 | 23 | PM | Hughes et al. | 2017 | failure | explicit |
| 787 | Inadequate Post Mortem Process | 4 | 19 | 4 | 19 | 3 | 11 | PM | Hughes et al. | 2017 | failure | explicit |
| 788 | managerial leadership skills | 4 | 17 | 4 | 17 | 4 | 17 | PM | Hughes et al. | 2017 | failure | explicit |
| 789 | break up the project into smaller separate projects each with their individual business case, infrastructure and resource requirements with defined dependencies to align deliverables and key benefits | 4 | 23 | 4 | 23 | 4 | 23 | PM | Hughes et al. | 2017 | success | implicit |
| 790 | embrace the project audit process and not to resist the process | 4 | 22 | 4 | 22 | 4 | 22 | PM | Hughes et al. | 2017 | success | implicit |
| 791 | Tailor the method to suit the project and organization | 4 | 23 | 4 | 23 | 4 | 23 | PM | Hughes et al. | 2017 | success | implicit |
| 792 | Do not use time, cost and quality as the measure of assessing the success of a project | 4 | 22 | 4 | 22 | 4 | 22 | PM | Hughes et al. | 2017 | success | implicit |
| 793 | have sufficient knowledge and experience of change management principles and processes to ensure the project has the best chance of success | 4 | 17 | 4 | 17 | 1 | 2 | PM | Hughes et al. | 2017 | success | implicit |
| 794 | Key to identify early stage threats to IS project | 2 | 7 | 4 | 21 | 4 | 23 | PM | Hughes et al. | 2017 | failure | explicit |
| 795 | Increasing range of complex issues affecting IS projects | 2 | 7 | 4 | 23 | 5 | 25 | PM | Hughes et al. | 2017 | failure | explicit |
| 796 | Expect users to change their minds | 2 | 6 | 2 | 6 | 2 | 6 | PM | Hughes et al. | 2017 | success | implicit |
| 797 | Poor communication skills | 3 | 11 | 3 | 11 | 3 | 11 | PM | Hughes et al. | 2017 | failure | explicit |
| 798 | Poor project sponsorship is a key factor that leads to failure | 3 | 13 | 3 | 13 | 3 | 13 | PM | Hughes et al. | 2017 | failure | explicit |
| 799 | Assertion that organization put price before quality | 3 | 13 | 6 | 28 | 4 | 23 | PM | Hughes et al. | 2017 | failure | explicit |
| 800 | Incomplete and inconsistent training | 3 | 11 | 3 | 11 | 3 | 11 | PM | Hughes et al. | 2017 | failure | explicit |
| 801 | Over-reliance on an external contractor | 3 | 12 | 3 | 12 | 3 | 12 | PM | Hughes et al. | 2017 | failure | explicit |
| 802 | impact on staff commitment | 3 | 9 | 3 | 9 | 3 | 9 | PM | Hughes et al. | 2017 | failure | explicit |
| 803 | No effort made to fully understand what went wrong | 3 | 11 | 1 | 5 | 3 | 11 | PM | Hughes et al. | 2017 | failure | explicit |
| 804 | Lack of management commitment | 3 | 15 | 3 | 15 | 3 | 15 | PM | Hughes et al. | 2017 | failure | explicit |
| 805 | No effort made to find out what went wrong and learn from past mistakes | 3 | 11 | 1 | 5 | 3 | 11 | PM | Hughes et al. | 2017 | failure | explicit |

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| 806 | Lack of top management commitment | 3 | 15 | 3 | 15 | 3 | 15 | PM | Hughes et al. | 2017 | failure | explicit |
| 807 | Stakeholder support for system is critical | 3 | 8 | 3 | 8 | 7 | 33 | PM | Hughes et al. | 2017 | failure | explicit |
| 808 | Social aspects associated with IS failure ignored | 3 | 14 | 1 | 5 | 3 | 9 | PM | Hughes et al. | 2017 | failure | explicit |
| 809 | Top management support is the key critical factor | 3 | 15 | 3 | 15 | 3 | 15 | PM | Hughes et al. | 2017 | failure | explicit |
| 810 | Risk and Budget Management Failings | 3 | 13 | 3 | 13 | 3 | 13 | PM | Hughes et al. | 2017 | failure | explicit |
| 811 | Poor Executive Support | 3 | 15 | 3 | 15 | 3 | 9 | PM | Hughes et al. | 2017 | failure | explicit |
| 812 | Poor Executive Sponsorship | 3 | 13 | 3 | 13 | 3 | 13 | PM | Hughes et al. | 2017 | failure | explicit |
| 813 | Poor Contractor and Stakeholder Relationship | 3 | 8 | 3 | 12 | 3 | 8 | PM | Hughes et al. | 2017 | failure | explicit |
| 814 | Staff Commitment | 3 | 9 | 3 | 9 | 3 | 9 | PM | Hughes et al. | 2017 | failure | explicit |
| 815 | Staff Motivation | 3 | 14 | 3 | 14 | 3 | 9 | PM | Hughes et al. | 2017 | failure | explicit |
| 816 | strategic client interaction | 3 | 8 | 3 | 8 | 3 | 8 | PM | Hughes et al. | 2017 | failure | explicit |
| 817 | motivational and positive leadership skills | 3 | 14 | 3 | 14 | 4 | 17 | PM | Hughes et al. | 2017 | failure | explicit |
| 818 | ensure that project post mortems form a key element of the project methodology | 3 | 11 | 4 | 23 | 3 | 11 | PM | Hughes et al. | 2017 | success | implicit |
| 819 | Ensure the suitability and experience of the nominated sponsor is assessed at an early stage and work to bridge any gaps quickly | 3 | 13 | 3 | 13 | 4 | 23 | PM | Hughes et al. | 2017 | success | implicit |
| 820 | the people related aspects are fundamental to benefit realization and cannot be ignored | 3 | 14 | 3 | 14 | 3 | 9 | PM | Hughes et al. | 2017 | success | implicit |
| 821 | Poor Requirements Management | 5 | 25 | 5 | 25 | 5 | 25 | PM | Hughes et al. | 2017 | failure | explicit |
| 822 | organizational and political complexities are the key reasons for high failure rates in public sector projects | 6 | 28 | 6 | 28 | 6 | 28 | PM | Hughes et al. | 2017 | failure | explicit |
| 823 | High rates of failure in developing countries due to context gaps and local actuality factors | 6 | 28 | 6 | 28 | 6 | 28 | PM | Hughes et al. | 2017 | failure | explicit |
| 824 | Do not underestimate the importance of experience and pragmatic application of project management to fit with the needs and cultural aspects of the organization | 6 | 28 | 6 | 28 | 4 | 17 | PM | Hughes et al. | 2017 | success | implicit |
| 825 | Exec bias toward more risky technology option | 7 | 30 | 7 | 30 | 1 | 5 | PM | Hughes et al. | 2017 | failure | explicit |
| 826 | No feasibility undertaken | 7 | 32 | 7 | 32 | 4 | 23 | PM | Hughes et al. | 2017 | failure | explicit |
| 827 | Software was incomplete and not stable | 7 | 33 | 7 | 33 | 7 | 33 | PM | Hughes et al. | 2017 | failure | explicit |
| 828 | technical leadership skills | 7 | 30 | 4 | 17 | 7 | 30 | PM | Hughes et al. | 2017 | failure | explicit |
| 829 | Change management | 1 | 2 | 1 | 2 | 1 | 2 | PM | Remus | 2007 | success | explicit |
| 830 | Flexible structure | 1 | 1 | 1 | 1 | 4 | 23 | PM | Remus | 2007 | success | explicit |
| 831 | Change management | 1 | 2 | 1 | 2 | 1 | 2 | PM | Remus | 2007 | success | explicit |
| 832 | Requirements analysis | 4 | 23 | 4 | 23 | 4 | 23 | PM | Remus | 2007 | success | explicit |
| 833 | Project management | 4 | 17 | 4 | 17 | 4 | 17 | PM | Remus | 2007 | success | explicit |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 834 | Prototyping | 4 | 23 | 4 | 23 | 4 | 23 | PM | Remus | 2007 | success | explicit |
| 835 | Team competencies and skills | 4 | 24 | 4 | 24 | 4 | 24 | PM | Remus | 2007 | success | explicit |
| 836 | Defining the portal architecture | 4 | 23 | 4 | 23 | 6 | 27 | PM | Remus | 2007 | success | explicit |
| 837 | Business process reengineering | 4 | 19 | 4 | 19 | 4 | 19 | PM | Remus | 2007 | success | explicit |
| 838 | Portal engineering roadmap | 4 | 23 | 4 | 23 | 4 | 23 | PM | Remus | 2007 | success | explicit |
| 839 | Project monitoring and controlling | 4 | 22 | 4 | 22 | 4 | 22 | PM | Remus | 2007 | success | explicit |
| 840 | Team competencies and skills | 4 | 24 | 4 | 24 | 4 | 24 | PM | Remus | 2007 | success | explicit |
| 841 | Project management | 4 | 17 | 4 | 17 | 4 | 17 | PM | Remus | 2007 | success | explicit |
| 842 | Project champion | 4 | 24 | 4 | 24 | 4 | 24 | PM | Remus | 2007 | success | explicit |
| 843 | Careful package selection | 4 | 23 | 4 | 23 | 4 | 23 | PM | Remus | 2007 | success | explicit |
| 844 | Business Process Reengineering | 4 | 19 | 4 | 19 | 4 | 19 | PM | Remus | 2007 | success | explicit |
| 845 | Minimal customization | 4 | 19 | 2 | 6 | 3 | 8 | PM | Remus | 2007 | success | explicit |
| 846 | Architecture choice | 4 | 23 | 4 | 23 | 6 | 28 | PM | Remus | 2007 | success | explicit |
| 847 | User acceptance | 2 | 6 | 2 | 6 | 2 | 6 | PM | Remus | 2007 | success | explicit |
| 848 | Top management support | 3 | 15 | 3 | 15 | 3 | 15 | PM | Remus | 2007 | success | explicit |
| 849 | Strong communication inwards and outwards | 3 | 10 | 3 | 10 | 3 | 10 | PM | Remus | 2007 | success | explicit |
| 850 | User training and education | 3 | 11 | 3 | 11 | 3 | 11 | PM | Remus | 2007 | success | explicit |
| 851 | Dedicated resources | 3 | 13 | 3 | 13 | 3 | 13 | PM | Remus | 2007 | success | explicit |
| 852 | Top management support | 3 | 15 | 3 | 15 | 3 | 15 | PM | Remus | 2007 | success | explicit |
| 853 | Interdepartmental communication | 3 | 11 | 3 | 11 | 3 | 11 | PM | Remus | 2007 | success | explicit |
| 854 | Vendor support | 3 | 12 | 3 | 12 | 3 | 12 | PM | Remus | 2007 | success | explicit |
| 855 | Dedicated resources | 3 | 13 | 3 | 13 | 3 | 13 | PM | Remus | 2007 | success | explicit |
| 856 | Use of steering committee | 3 | 15 | 3 | 15 | 6 | 28 | PM | Remus | 2007 | success | explicit |
| 857 | User training on software | 3 | 11 | 3 | 11 | 3 | 11 | PM | Remus | 2007 | success | explicit |
| 858 | Education on new business processes | 3 | 11 | 3 | 11 | 3 | 11 | PM | Remus | 2007 | success | explicit |
| 859 | Partnership with vendor | 3 | 12 | 3 | 12 | 3 | 12 | PM | Remus | 2007 | success | explicit |
| 860 | Use of vendors' tools | 3 | 12 | 3 | 12 | 3 | 12 | PM | Remus | 2007 | success | explicit |
| 861 | Clear goals and objectives | 5 | 25 | 5 | 25 | 5 | 25 | PM | Remus | 2007 | success | explicit |
| 862 | Portal strategy | 5 | 26 | 5 | 26 | 5 | 26 | PM | Remus | 2007 | success | explicit |
| 863 | Interdepartmental cooperation | 5 | 26 | 5 | 26 | 3 | 11 | PM | Remus | 2007 | success | explicit |
| 864 | Clear goals and objectives | 5 | 25 | 5 | 25 | 5 | 25 | PM | Remus | 2007 | success | explicit |
| 865 | Management of expectations | 5 | 25 | 5 | 25 | 5 | 25 | PM | Remus | 2007 | success | explicit |
| 866 | Process and application integration | 6 | 27 | 6 | 27 | 6 | 27 | PM | Remus | 2007 | success | explicit |
| 867 | Organizational culture | 6 | 28 | 6 | 28 | 6 | 28 | PM | Remus | 2007 | success | explicit |
| 868 | Data analysis and conversion | 6 | 27 | 6 | 27 | 6 | 27 | PM | Remus | 2007 | success | explicit |
| 869 | Selection of the appropriate portal package | 7 | 33 | 4 | 23 | 6 | 27 | PM | Remus | 2007 | success | explicit |
| 870 | Portal design | 7 | 29 | 7 | 29 | 7 | 29 | PM | Remus | 2007 | success | explicit |
| 871 | Use of a champion in a significant role | 4 | 24 | 4 | 24 | 4 | 24 | PM | Bradley | 2005 | success | implicit |
| 872 | High training quality and spending a lot of time in training | 3 | 11 | 3 | 11 | 3 | 11 | PM | Bradley | 2005 | success | implicit |
| 873 | Use of Consultants | 3 | 10 | 3 | 10 | 3 | 10 | PM | Bradley | 2005 | success | implicit |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 874 | Use of a steering committee headed by the CEO to review the project | 3 | 15 | 3 | 15 | 6 | 28 | PM | Bradley | 2005 | success | implicit |
| 875 | Project Manager ERP Experience | 7 | 30 | 7 | 30 | 7 | 30 | PM | Bradley | 2005 | success | implicit |
| 876 | Organizational change | 1 | 2 | 1 | 2 | 1 | 2 | PM | Ram et al. | 2013 | success | implicit |
| 877 | full-time project manager | 4 | 17 | 4 | 17 | 4 | 17 | PM | Ram et al. | 2013 | success | implicit |
| 878 | Business process reengineering | 4 | 19 | 4 | 19 | 4 | 19 | PM | Ram et al. | 2013 | success | implicit |
| 879 | Project champion | 4 | 24 | 4 | 24 | 4 | 24 | PM | Ram et al. | 2013 | success | implicit |
| 880 | BPR and minimum customisation | 4 | 19 | 4 | 19 | 3 | 8 | PM | Ram et al. | 2013 | success | explicit |
| 881 | Teamwork / Project team composition, competence and compensation | 4 | 24 | 4 | 24 | 4 | 24 | PM | Ram et al. | 2013 | success | explicit |
| 882 | Careful package selection | 4 | 23 | 4 | 23 | 4 | 23 | PM | Ram et al. | 2013 | success | explicit |
| 883 | Charismatic leadership | 4 | 17 | 4 | 17 | 4 | 17 | PM | Ram et al. | 2013 | success | explicit |
| 884 | Strict monitoring of implementation schedule and costs | 4 | 21 | 4 | 22 | 4 | 22 | PM | Ram et al. | 2013 | success | implicit |
| 885 | Regular project status meetings | 4 | 22 | 4 | 22 | 4 | 23 | PM | Ram et al. | 2013 | success | implicit |
| 886 | establish implementation strategies and systematic guidelines | 4 | 23 | 4 | 23 | 4 | 23 | PM | Ram et al. | 2013 | success | implicit |
| 887 | Leadership | 3 | 15 | 3 | 15 | 4 | 17 | PM | Ram et al. | 2013 | success | implicit |
| 888 | Vendor support | 3 | 12 | 3 | 12 | 3 | 12 | PM | Ram et al. | 2013 | success | implicit |
| 889 | Providing training to staff | 3 | 11 | 3 | 11 | 3 | 11 | PM | Ram et al. | 2013 | success | implicit |
| 890 | external expertise | 3 | 10 | 3 | 10 | 3 | 10 | PM | Ram et al. | 2013 | success | implicit |
| 891 | Strong Communication outwards | 3 | 10 | 3 | 10 | 3 | 10 | PM | Ram et al. | 2013 | success | explicit |
| 892 | Training employee / user training and education / job redesign | 3 | 11 | 3 | 11 | 3 | 11 | PM | Ram et al. | 2013 | success | explicit |
| 893 | ERP vendor support | 3 | 12 | 3 | 12 | 3 | 12 | PM | Ram et al. | 2013 | success | explicit |
| 894 | Consultant quality / use of consultants | 3 | 10 | 3 | 10 | 3 | 10 | PM | Ram et al. | 2013 | success | explicit |
| 895 | Sustained (top) management support / commitment | 3 | 15 | 3 | 15 | 3 | 15 | PM | Ram et al. | 2013 | success | explicit |
| 896 | User involvement, participation and support | 3 | 8 | 3 | 8 | 3 | 8 | PM | Ram et al. | 2013 | success | explicit |
| 897 | training programs that are tailored to build users' confidence when using the ERP system | 3 | 11 | 3 | 11 | 3 | 11 | PM | Ram et al. | 2013 | success | implicit |
| 898 | training programs that are substantially improve the level of understanding of users | 3 | 11 | 3 | 11 | 3 | 11 | PM | Ram et al. | 2013 | success | implicit |
| 899 | training programs that are of adequate length and detail | 3 | 11 | 3 | 11 | 3 | 11 | PM | Ram et al. | 2013 | success | implicit |
| 900 | integration of ERP with partner organisations' information systems | 3 | 12 | 7 | 33 | 3 | 12 | PM | Ram et al. | 2013 | success | implicit |
| 901 | Having a business vision | 5 | 26 | 5 | 26 | 6 | 28 | PM | Ram et al. | 2013 | success | implicit |
| 902 | Formal project plan/schedule | 5 | 25 | 4 | 23 | 4 | 23 | PM | Ram et al. | 2013 | success | explicit |
| 903 | Carefully defined scope of the ERP project | 5 | 25 | 4 | 23 | 4 | 23 | PM | Ram et al. | 2013 | success | implicit |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 904 | Organisational Readiness | 6 | 28 | 6 | 28 | 6 | 28 | PM | Ram et al. | 2013 | success | implicit |
| 905 | Data analysis,conversion and integrity | 6 | 27 | 6 | 27 | 6 | 27 | PM | Ram et al. | 2013 | success | explicit |
| 906 | Implementation quality | 7 | 29 | 7 | 29 | 4 | 22 | PM | Ram et al. | 2013 | success | implicit |
| 907 | Implementation Approach | 4 | 23 | 4 | 23 | 4 | 23 | BPI | McLean and Antony | 2014 | failure | explicit |
| 908 | Project Management | 4 | 17 | 4 | 17 | 4 | 17 | BPI | McLean and Antony | 2014 | failure | explicit |
| 909 | The Management Leadership | 3 | 15 | 4 | 17 | 4 | 17 | BPI | McLean and Antony | 2014 | failure | explicit |
| 910 | Training | 3 | 11 | 3 | 11 | 3 | 11 | BPI | McLean and Antony | 2014 | failure | explicit |
| 911 | Employee Involvement Levels | 3 | 9 | 3 | 11 | 6 | 28 | BPI | McLean and Antony | 2014 | failure | explicit |
| 912 | Feedback and Results | 3 | 11 | 3 | 11 | 3 | 11 | BPI | McLean and Antony | 2014 | failure | explicit |
| 913 | Motives and Expectations | 5 | 25 | 5 | 25 | 5 | 25 | BPI | McLean and Antony | 2014 | failure | explicit |
| 914 | Organizational Culture and Evironment | 6 | 28 | 6 | 28 | 6 | 28 | BPI | McLean and Antony | 2014 | failure | explicit |
| 915 | risk disposition | 1 | 5 | 1 | 5 | 1 | 2 | BPR | Paper and Chang | 2005 | success | explicit |
| 916 | creativity | 1 | 1 | 1 | 1 | 1 | 2 | BPR | Paper and Chang | 2005 | success | implicit |
| 917 | openness to change | 1 | 2 | 1 | 2 | 1 | 2 | BPR | Paper and Chang | 2005 | success | implicit |
| 918 | empowerment | 1 | 5 | 3 | 11 | 3 | 9 | BPR | Paper and Chang | 2005 | success | explicit |
| 919 | help people understand the reasons for change | 1 | 2 | 1 | 2 | 1 | 2 | BPR | Paper and Chang | 2005 | success | implicit |
| 920 | vision flexibility | 1 | 3 | 5 | 26 | 5 | 26 | BPR | Paper and Chang | 2005 | success | explicit |
| 921 | teaming | 4 | 24 | 4 | 24 | 3 | 14 | BPR | Paper and Chang | 2005 | success | explicit |
| 922 | knowledge | 4 | 16 | 3 | 11 | 4 | 16 | BPR | Paper and Chang | 2005 | success | implicit |
| 923 | ownership | 4 | 17 | 4 | 17 | 6 | 28 | BPR | Paper and Chang | 2005 | success | explicit |
| 924 | team work | 4 | 24 | 4 | 24 | 3 | 14 | BPR | Paper and Chang | 2005 | success | implicit |
| 925 | Methodology is critical to effectively dealing with the scope and complexities involved in change | 4 | 23 | 4 | 23 | 4 | 23 | BPR | Paper and Chang | 2005 | success | implicit |
| 926 | developing process workers | 4 | 16 | 3 | 11 | 3 | 11 | BPR | Paper and Chang | 2005 | success | implicit |
| 927 | continuous monitoring | 4 | 21 | 4 | 21 | 4 | 21 | BPR | Paper and Chang | 2005 | success | explicit |
| 928 | appropriate guiding principles | 2 | 7 | 4 | 23 | 5 | 25 | BPR | Paper and Chang | 2005 | success | explicit |
| 929 | graphical process map | 2 | 7 | 4 | 20 | 4 | 23 | BPR | Paper and Chang | 2005 | success | explicit |
| 930 | top-management support | 3 | 15 | 3 | 15 | 3 | 15 | BPR | Paper and Chang | 2005 | success | explicit |
| 931 | organizational learning | 3 | 11 | 3 | 11 | 3 | 11 | BPR | Paper and Chang | 2005 | success | explicit |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 932 | compensation and reward systems | 3 | 14 | 3 | 14 | 3 | 14 | BPR | Paper and Chang | 2005 | success | explicit |
| 933 | information sharing | 3 | 11 | 3 | 11 | 3 | 11 | BPR | Paper and Chang | 2005 | success | explicit |
| 934 | resources | 3 | 13 | 3 | 13 | 3 | 13 | BPR | Paper and Chang | 2005 | success | explicit |
| 935 | politics resolution | 3 | 15 | 3 | 15 | 3 | 15 | BPR | Paper and Chang | 2005 | success | explicit |
| 936 | training | 3 | 11 | 3 | 11 | 3 | 11 | BPR | Paper and Chang | 2005 | success | explicit |
| 937 | education | 3 | 11 | 3 | 11 | 3 | 11 | BPR | Paper and Chang | 2005 | success | explicit |
| 938 | challenging work | 3 | 14 | 3 | 14 | 3 | 9 | BPR | Paper and Chang | 2005 | success | implicit |
| 939 | people's view of the IT development process | 3 | 9 | 3 | 9 | 7 | 29 | BPR | Paper and Chang | 2005 | success | implicit |
| 940 | extracting the knowledge gained by the process workers | 3 | 11 | 3 | 11 | 2 | 7 | BPR | Paper and Chang | 2005 | success | implicit |
| 941 | top-down vision tempered with involvement from process workers | 3 | 9 | 3 | 11 | 3 | 11 | BPR | Paper and Chang | 2005 | success | implicit |
| 942 | proactively sell the vision to key stakeholders before implementing change | 3 | 8 | 3 | 8 | 3 | 8 | BPR | Paper and Chang | 2005 | success | implicit |
| 943 | customer support | 3 | 8 | 3 | 8 | 2 | 6 | BPR | Paper and Chang | 2005 | success | explicit |
| 944 | IT belief system | 3 | 15 | 6 | 27 | 6 | 27 | BPR | Paper and Chang | 2005 | success | explicit |
| 945 | vision communication | 3 | 11 | 5 | 26 | 3 | 11 | BPR | Paper and Chang | 2005 | success | explicit |
| 946 | vision development | 5 | 26 | 5 | 26 | 5 | 26 | BPR | Paper and Chang | 2005 | success | explicit |
| 947 | vision deployment | 5 | 26 | 5 | 26 | 5 | 26 | BPR | Paper and Chang | 2005 | success | explicit |
| 948 | direction | 6 | 28 | 6 | 28 | 6 | 28 | BPR | Paper and Chang | 2005 | success | explicit |
| 949 | IT architecture | 6 | 27 | 6 | 27 | 6 | 27 | BPR | Paper and Chang | 2005 | success | explicit |
| 950 | people's role in the IT development process | 7 | 29 | 7 | 30 | 7 | 29 | BPR | Paper and Chang | 2005 | success | implicit |
| 951 | IT knowledge | 7 | 29 | 7 | 29 | 7 | 29 | BPR | Paper and Chang | 2005 | success | explicit |
| 952 | Origin of idea | 4 | 23 | 4 | 23 | 4 | 23 | PM | Shenhar et al. | 2002 | success | explicit |
| 953 | Project milestones | 4 | 22 | 4 | 23 | 4 | 23 | PM | Shenhar et al. | 2002 | success | explicit |
| 954 | Planning and control methods | 4 | 21 | 4 | 23 | 4 | 23 | PM | Shenhar et al. | 2002 | success | explicit |
| 955 | Design cycles | 4 | 23 | 4 | 23 | 4 | 23 | PM | Shenhar et al. | 2002 | success | explicit |
| 956 | Design techniques | 4 | 20 | 4 | 23 | 4 | 23 | PM | Shenhar et al. | 2002 | success | explicit |
| 957 | Quality management | 4 | 17 | 4 | 17 | 4 | 22 | PM | Shenhar et al. | 2002 | success | explicit |
| 958 | Project team | 4 | 24 | 4 | 24 | 4 | 24 | PM | Shenhar et al. | 2002 | success | explicit |
| 959 | Design reviews | 4 | 22 | 4 | 22 | 4 | 23 | PM | Shenhar et al. | 2002 | success | explicit |
| 960 | Management policy | 4 | 17 | 4 | 17 | 4 | 17 | PM | Shenhar et al. | 2002 | success | explicit |
| 961 | Work Breakdown Structure (WBS) | 2 | 7 | 4 | 23 | 4 | 23 | PM | Shenhar et al. | 2002 | success | explicit |
| 962 | Documentation | 2 | 7 | 2 | 7 | 3 | 11 | PM | Shenhar et al. | 2002 | success | explicit |
| 963 | Resource sharing | 3 | 13 | 3 | 13 | 3 | 13 | PM | Shenhar et al. | 2002 | success | explicit |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 964 | Customer participation | 3 | 8 | 3 | 8 | 3 | 8 | PM | Shenhar et al. | 2002 | success | explicit |
| 965 | Design considerations | 5 | 25 | 4 | 23 | 4 | 23 | PM | Shenhar et al. | 2002 | success | explicit |
| 966 | Formal procedures | 6 | 28 | 6 | 28 | 6 | 28 | PM | Shenhar et al. | 2002 | success | explicit |
| 967 | Organizational structure | 6 | 28 | 6 | 28 | 6 | 28 | PM | Shenhar et al. | 2002 | success | explicit |
| 968 | PM autonomy | 6 | 28 | 4 | 23 | 6 | 28 | PM | Shenhar et al. | 2002 | success | explicit |
| 969 | Formal contracts | 6 | 28 | 6 | 28 | 6 | 28 | PM | Shenhar et al. | 2002 | success | explicit |
| 970 | Integrated Master Schedule (IMS) | 4 | 23 | 4 | 23 | 4 | 23 | PM | Allen at el. | 2014 | success | explicit |
| 971 | Control Account Planning | 4 | 23 | 3 | 13 | 4 | 22 | PM | Allen at el. | 2014 | success | explicit |
| 972 | Controlling and Monitoring | 4 | 21 | 4 | 21 | 4 | 22 | PM | Allen at el. | 2014 | success | explicit |
| 973 | Work Breakdown Structure (WBS) | 2 | 7 | 4 | 23 | 4 | 23 | PM | Allen at el. | 2014 | success | explicit |
| 974 | Stakeholder Partnership | 3 | 8 | 3 | 12 | 3 | 8 | PM | Allen at el. | 2014 | success | explicit |
| 975 | Lessons Learned | 3 | 11 | 3 | 11 | 3 | 11 | PM | Allen at el. | 2014 | success | explicit |
| 976 | Team Building | 3 | 14 | 3 | 14 | 3 | 14 | PM | Allen at el. | 2014 | success | explicit |
| 977 | Integrated Master Plan (IMP) | 5 | 25 | 4 | 23 | 4 | 23 | PM | Allen at el. | 2014 | success | explicit |
| 978 | Organizational Influence | 6 | 28 | 6 | 28 | 6 | 28 | PM | Allen at el. | 2014 | success | explicit |
| 979 | Organizational Structure | 6 | 28 | 6 | 28 | 6 | 28 | PM | Allen at el. | 2014 | success | explicit |
| 980 | Organizational Breakdown Structure (OBS) | 6 | 28 | 4 | 23 | 4 | 23 | PM | Allen at el. | 2014 | success | explicit |
| 981 | Responsibility Assignment Matrix (RAM) | 6 | 28 | 6 | 28 | 4 | 23 | PM | Allen at el. | 2014 | success | explicit |
| 982 | Meeting the scope | 1 | 5 | 4 | 22 | 4 | 22 | PM | Besteiro et al. | 2015 | success | explicit |
| 983 | Defining the schedule | 4 | 23 | 4 | 23 | 4 | 23 | PM | Besteiro et al. | 2015 | success | explicit |
| 984 | Team qualification | 4 | 24 | 4 | 24 | 4 | 24 | PM | Besteiro et al. | 2015 | success | explicit |
| 985 | Determining the control points | 4 | 23 | 4 | 23 | 4 | 22 | PM | Besteiro et al. | 2015 | success | explicit |
| 986 | ability to communicate | 4 | 17 | 4 | 17 | 4 | 17 | PM | Besteiro et al. | 2015 | success | explicit |
| 987 | defining the schedule | 4 | 23 | 4 | 23 | 4 | 23 | PM | Besteiro et al. | 2015 | success | explicit |
| 988 | accepting the proposal of the project | 4 | 17 | 3 | 9 | 4 | 17 | PM | Besteiro et al. | 2015 | success | explicit |
| 989 | Defining the scope of the project | 4 | 23 | 4 | 23 | 4 | 23 | PM | Besteiro et al. | 2015 | success | explicit |
| 990 | Planning the project | 4 | 23 | 4 | 23 | 4 | 23 | PM | Besteiro et al. | 2015 | success | explicit |
| 991 | Communicating the project | 3 | 11 | 3 | 11 | 3 | 11 | PM | Besteiro et al. | 2015 | success | explicit |
| 992 | Accepting the mission of the project | 3 | 9 | 3 | 9 | 5 | 25 | PM | Besteiro et al. | 2015 | success | explicit |
| 993 | Project monitoring meetings | 3 | 11 | 3 | 11 | 4 | 22 | PM | Besteiro et al. | 2015 | success | explicit |
| 994 | Feedback meetings | 3 | 11 | 3 | 11 | 3 | 11 | PM | Besteiro et al. | 2015 | success | explicit |
| 995 | Planned vs. actual budget variation | 3 | 13 | 4 | 22 | 4 | 22 | PM | Besteiro et al. | 2015 | success | explicit |
| 996 | Commitment from the team | 3 | 9 | 3 | 9 | 3 | 14 | PM | Besteiro et al. | 2015 | success | explicit |
| 997 | Meeting the budget | 3 | 13 | 3 | 13 | 3 | 13 | PM | Besteiro et al. | 2015 | success | explicit |
| 998 | Ability to communicate | 3 | 10 | 3 | 10 | 3 | 10 | PM | Besteiro et al. | 2015 | success | explicit |
| 999 | Goals with a realistic objective | 5 | 25 | 5 | 25 | 5 | 25 | PM | Besteiro et al. | 2015 | success | explicit |
| 1000 | Planned vs. actual benefit variation | 5 | 25 | 4 | 22 | 4 | 22 | PM | Besteiro et al. | 2015 | success | explicit |
| 1001 | Planned vs. actual deadline variation | 5 | 25 | 4 | 22 | 4 | 22 | PM | Besteiro et al. | 2015 | success | explicit |
| 1002 | defining realistic goals and objectives and team qualification | 5 | 25 | 5 | 25 | 3 | 9 | PM | Besteiro et al. | 2015 | success | explicit |
| 1003 | Indicating roles and responsibilities | 6 | 28 | 6 | 28 | 6 | 28 | PM | Besteiro et al. | 2015 | success | explicit |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1004 | indicating roles and responsibilities | 6 | 28 | 6 | 28 | 6 | 28 | PM | Besteiro et al. | 2015 | success | explicit |
| 1005 | Project Management | 4 | 17 | 4 | 17 | 4 | 17 | BPR | Dezdar | 2012 | success | explicit |
| 1006 | Top Management Support | 3 | 15 | 3 | 15 | 3 | 15 | BPR | Dezdar | 2012 | success | explicit |
| 1007 | Entreprise-Wide Communication | 3 | 11 | 3 | 11 | 3 | 11 | BPR | Dezdar | 2012 | success | explicit |
| 1008 | User Training and Education | 3 | 11 | 3 | 11 | 3 | 8 | BPR | Dezdar | 2012 | success | explicit |
| 1009 | ERP Vendor Support | 3 | 12 | 3 | 12 | 3 | 12 | BPR | Dezdar | 2012 | success | explicit |
| 1010 | Risk Management | 1 | 5 | 1 | 5 | 1 | 5 | PM | Gomes and Romão | 2016 | success | explicit |
| 1011 | Scope Control | 4 | 22 | 4 | 22 | 4 | 23 | PM | Gomes and Romão | 2016 | success | explicit |
| 1012 | Business Opportunity | 2 | 6 | 2 | 6 | 5 | 25 | PM | Gomes and Romão | 2016 | success | explicit |
| 1013 | Market Impact | 2 | 6 | 2 | 6 | 2 | 6 | PM | Gomes and Romão | 2016 | success | explicit |
| 1014 | Top Management Support | 3 | 15 | 3 | 15 | 3 | 15 | PM | Gomes and Romão | 2016 | success | explicit |
| 1015 | Team Engagement | 3 | 14 | 3 | 14 | 3 | 14 | PM | Gomes and Romão | 2016 | success | explicit |
| 1016 | Resource Availability | 3 | 13 | 3 | 13 | 3 | 13 | PM | Gomes and Romão | 2016 | success | explicit |
| 1017 | Financial Resources | 3 | 13 | 3 | 13 | 3 | 13 | PM | Gomes and Romão | 2016 | success | explicit |
| 1018 | Effective project management | 4 | 17 | 4 | 17 | 4 | 17 | PM | Fowler and Horan | 2007 | success | explicit |
| 1019 | Project personnel knowledge/skills | 4 | 16 | 4 | 24 | 4 | 16 | PM | Fowler and Horan | 2007 | success | explicit |
| 1020 | Lack of effective project management | 4 | 17 | 4 | 17 | 4 | 17 | PM | Fowler and Horan | 2007 | failure | explicit |
| 1021 | Lack required knowledge/skills in the project personnel | 4 | 16 | 4 | 24 | 4 | 16 | PM | Fowler and Horan | 2007 | failure | explicit |
| 1022 | User acceptance | 2 | 6 | 2 | 6 | 2 | 6 | PM | Fowler and Horan | 2007 | success | explicit |
| 1023 | Top management commitment | 3 | 15 | 3 | 15 | 3 | 15 | PM | Fowler and Horan | 2007 | success | explicit |
| 1024 | project team commitment | 3 | 9 | 3 | 9 | 3 | 14 | PM | Fowler and Horan | 2007 | success | explicit |
| 1025 | Enlisting of external contractors | 3 | 8 | 3 | 12 | 3 | 12 | PM | Fowler and Horan | 2007 | success | explicit |
| 1026 | Lack of adequate user involvement | 3 | 8 | 3 | 8 | 3 | 8 | PM | Fowler and Horan | 2007 | failure | explicit |
| 1027 | Lack of top-management commitment to the project | 3 | 15 | 3 | 15 | 3 | 15 | PM | Fowler and Horan | 2007 | failure | explicit |
| 1028 | Poor/inadequate user training | 3 | 11 | 3 | 11 | 3 | 8 | PM | Fowler and Horan | 2007 | failure | explicit |
| 1029 | Lack of cooperation from users (user resistance) | 3 | 9 | 3 | 9 | 3 | 8 | PM | Fowler and Horan | 2007 | failure | explicit |
| 1030 | Perceived usefulness of technology | 4 | 27 | 4 | 27 | 4 | 27 | BPI | Rodriguez et al. | 2020b | success | explicit |
| 1031 | Kind of business model | 5 | 24 | 5 | 24 | 5 | 24 | BPI | Rodriguez et al. | 2020b | success | explicit |
| 1032 | Technology adoption | 7 | 29 | 7 | 29 | 7 | 29 | BPR | Rodriguez et al. | 2020a | success | explicit |
| 1033 | Organizational adaptation | 6 | 26 | 6 | 26 | 6 | 26 | BPR | Rodriguez et al. | 2020a | success | explicit |
| 1034 | Organizational resistance | 6 | 25 | 6 | 25 | 6 | 25 | BPR | Rodriguez et al. | 2020a | success | explicit |

# Appendix C: Expert Interviews Overview

| Company | PDP | Expert | Operating region | Position | Functional/ technical | Experience |
|---|---|---|---|---|---|---|
| Company P<br>Turnover:<br>3,5 Billion<br>Employees:<br>>20.000<br>Production sites: >100 | P1:<br>Digital flow production | E1 | Germany | Project Sponsor | both | 31 years |
| | | E2 | Portugal | Employee | technical | 10 years |
| | | E3 | Germany | Project Manager | technical | 6 years |
| | | E4 | Germany | Employee | technical | 8 years |
| | P2:<br>IoT platform | E5 | South Africa | Project Manager | functional | 17 years |
| | | E6 | South Africa | Employee | functional | 12 years |
| | | E7 | Germany | Project Manager | technical | 11 years |
| Company A<br>Turnover:<br>6.5 Billion €<br>Employees:<br>>20.000<br>Production sites: >100 | A1:<br>Industrial IoT application | E8 | England | Employee | functional | 7 years |
| | | E9 | England | Project Manager | functional | 13 years |
| | | E10 | Germany | Project Manager | technical | 14 years |
| | | E11 | Germany | Project Sponsor | both | 30 years |
| Company H<br>Turnover:<br>170 Million €<br>Employees:<br>>1.000<br>Production sites: 5-10 | H1:<br>IoT platform | E12 | Germany | Project Manager | functional | 32 years |
| | | E13 | Germany | Project Sponsor (CIO) | both | 33 years |
| | H2:<br>Predictive maintenance | E14 | Germany | Project Manager | technical | 17 years |
| | | E15 | Germany | Project Manager | functional | 6 years |
| | | E16 | Germany | Employee | technical | 12 years |
| | H3:<br>Big data analyt-ics | E17 | Germany | Employee | functional | 14 years |
| | | E18 | Germany | Project Manager | technical | 4 years |
| Company T<br>Turnover:<br>290 Million €<br>Employees:<br>>700<br>Production sites: 5-10 | T1:<br>Robotic process automation | E19 | Germany | Employee | technical | 8 years |
| | | E20 | Germany | Project Manager | technical | 21 years |
| | | E21 | Germany | Project Sponsor (CFO) | both | 23 years |

# Appendix D: Detailed Context-Description of the investigated PDPs

PDP P1 related to the implementation of digital flow production. In P1, company P was attempting to replace the manual material logistics, which implied that, until that point, employees had manually planned and operated transportation processes. This PDP aimed at enabling autonomous material logistics and at adapting these to current production requirements. By doing so, company P aimed to improve logistics processes and further increase their effectiveness via a digital end-to-end analysis of the entire production process. In PDP P2, company P introduced an IoT platform for its production processes and products. In this PDP, the company aimed to replace the production management process. Aside from the MES and ERP, the systems of the production plants were not integrated with other systems or devices. To identify products, employees labeled the product components and manually traced them with barcode scanners. P2 established a connecting layer between machines, which enabled product tracing. The production plant reached an unprecedented level of connectivity which enabled the rapid exchange of information and allowed each network participant to control machines remotely. Based on P2, company P introduced big data analytics.

PDP A1 refers to the introduction of the Industrial IoT. A1 involves manual quality control processes being replaced with automated quality control measures based on sensor data. The manual process asked employees to measure the quality of goods produced as well as the key figures of machines used. The objective of the PDP was to reduce the number of manual processes needed to manage the quality of products and machines. Furthermore, company A equipped product components with sensors with which employees could track and trace products throughout the production process.

PDP H1 describes the introduction of an IoT platform connecting smart devices, the manufacturing enterprise system (MES), and enterprise resource planning (ERP). Formerly, each equipment manufacturer provided proprietary software and interfaces. During H1, company H re-engineered the process of production control. Previously, the MES did not meet its requirements, and an interface between the MES and the ERP did not exist. Company H thus aimed to unify the interfaces of the plant and machine suppliers, homogenize data sources, and decentralize control entities. The IoT platform supports the coordination and homogenization of the data collection. Overall, the machines of three plants were connected during the project. PDP H2 describes the introduction of a predictive maintenance solution. In H2, the project team aimed to redesign the process of plant maintenance. Before H2, employees and sensors collected data in an unsystematic manner. Real-time production data analysis did not exist. Employees had to maintain machines at various, imprecise time intervals, which often led to unnecessary

maintenance being carried out. The new data analytics introduced during H2 enabled the use of multiple, formerly unused production data. Company H was, thus, able to design a framework to homogenize process data, synchronized data collectors, and installed new data collection points. PDP H3 refers to the introduction of big data analytics of energy generation and consumption data. Company H employed H3 to establish a process for energy management. In practical terms, H3 was conducted to enable standardized data collection, homogenize data collected, and set-up data analytics. Thereby, company H expected to identify opportunities to save energy by improving the energy efficiency of production. Prior to H3, data collection and analysis were in their infancy and the analysis of energy data had not been possible. Employees could not make qualitative statements about energy generation or use. The PDP is designed to facilitate the exploration of knowledge about energy consumption and, thus, enable improved energy management. Company H now expects additional sales opportunities to arise via the monetarization of knowledge about their energy demand, as energy providers need access to such information for their demand management.

Finally, PDP T1 describes the introduction of robotic process automation in the sales department. Company T aimed to replace the order release process with T1. Formerly, the options, once orders were received, were manual acceptance, acceptance despite discrepancies, or rejection. Employees, thereby, manually caught up authorized signatures, which is why the schedule of the sales representative was a bottleneck that regularly led to stand-time. With this PDP, company T sets out to first record the acceptance of orders and examine the cash audit of the outstanding accounts of the ordering organization. Second, the administrative department routed corresponding information to the sales representative in charge. Three, the resumption of the order and its release or rejection by the sales representative, fourth, the terminal of the production plant had to be prepared to release or reject the order consequently.

# Appendix E: Interview Process

During the interviews, the interviewees were encouraged to speak freely and at length, allowing us to offset researcher bias, to gain practical knowledge (Heidt *et al.*, 2019), and to allow for the identification of novel factors (Myers and Newman, 2007). As we sought to gain a deep understanding of the selected PDPs, the interviews were led actively sharing relevant knowledge and discussing candidate SFs (Myers and Newman, 2007). Throughout the interaction with the interviewees, we used gained insights to validate and refine the *ex-ante* list of candidate SFs. Based on the interview protocols (Sarker *et al.*, 2013), each interview followed the same structure (Greener, 2008). All interviews lasted 60 to 90 minutes and were recorded. We transcribed the recordings and coded the data via qualitative content analysis (Krippendorff, 2013) supported by MAXQDA. To offset potential bias, interviewees and companies were anonymized (Benbasat *et al.*, 1987).

# Appendix F: Mapping of the Success Codes and SF

| SF | No. of the success code: shortened code [reference]; |
|---|---|
| Goal Clarity | • No. 211: Clear objective (Pankratz and Loebbecke, 2011);<br>• No. 338: Clear objective and scope (Jugdev and Müller, 2005);<br>• No. 726: Develop and communicate clear written mission and vision statements (Guimaraes, 1997) |
| Strategy Integration | • No. 77: Organizational alignment towards digital (Holotuik and Beimborn, 2017);<br>• No. 127: No linkage with to overall business goals and objectives (Siha and Saad, 2008);<br>• No. 729: Adopt an integrated approach to IT and business planning (Guimaraes, 1997) |
| Infrastructural Agility | • No. 88: Modular IT platform (Holotuik and Beimborn, 2017);<br>• No. 352: Standard software architecture (Jugdev and Müller, 2005);<br>• No. 547: Infrastructure in place to support the developers (Avital, 2003) |
| Organizational Agility | • No. 81: Multi-level and multi-speed organization for faster reaction (Holotuik and Beimborn, 2017);<br>• No. 351: Organizational adaptability (Jugdev and Müller, 2005);<br>• No. 967: Organizational structure (Shenhar *et al.*, 2002) |
| Employee Agility | • No. 483: Organizational resistance (Al-Mashari and Zairi, 1999);<br>• No. 584: User resistance (Umble *et al.*, 2003);<br>• No. 602: Skepticism about project result (Abdolvand *et al.*, 2008) |
| Innovation Attitude | • No. 356: Encouraging new ideas (Dvir *et al.*, 1998);<br>• No. 555: Introduce new products (Malinova *et al.*, 2014);<br>• No. 917: Openness to change (Paper and Chang, 2005) |
| Management Agility | • No. 298: Agile requirements (Jugdev and Müller, 2005);<br>• No. 357: Willingness to consider changes and new approaches (Dvir *et al.*, 1998);<br>• No. 554: Adapt to external changes (Malinova *et al.*, 2014) |
| Resource Agility | • No. 48: Agility to reallocate resources (Holotuik and Beimborn, 2017)<br>• No. 997: Meeting the budget (Besteiro *et al.*, 2015);<br>• No. 1016: Resource availability (Gomes and Romão, 2016) |
| Risk Attitude | • No. 52: Accept failure (Holotuik and Beimborn, 2017);<br>• No. 143: Organization's processes for assigning ownership of risks (Costantino *et al.*, 2015);<br>• No. 284: Company-wide education on the concepts of risk management (Cooke-Davies, 2002) |
| Customer Knowledge | • No. 70: Outstanding customer experience and satisfaction (Holotuik and Beimborn, 2017);<br>• No. 524: Being recognized as valuable by users (Avital, 2003);<br>• No. 1013: Market Impact (Gomes and Romão, 2016) |
| Employee Domain Knowledge | • No. 163: Team member's skills (Pankratz and Loebbecke, 2011);<br>• No. 620: Business skills of the project team (Dezdar and Ainin, 2011);<br>• No. 1019: Project personnel knowledge/ skills (Fowler and Horan, 2007) |
| Employee Technology Knowledge | • No. 450: High technical level (Dvir *et al.*, 1998);<br>• No. 624: Technical skills of the project team (Dezdar and Ainin, 2011);<br>• No. 951: IT knowledge (Paper and Chang, 2005) |
| Management Domain Knowledge | • No. 22: Project manager's leadership style (Irvine and Hall, 2015);<br>• No. 63: Capability to develop new business models (Holotuik and Beimborn, 2017);<br>• No. 252: Characteristics of the project team leader (Ika, 2009) |
| Management Technology Knowledge | • No. 448: Technical issues managed (Dvir *et al.*, 1998);<br>• No. 451: A technical leader (Dvir *et al.*, 1998);<br>• No. 828: Technical leadership skills (Hughes *et al.*, 2017) |
| Process Improvement Skills | • No. 105: Process improvement (Siha and Saad, 2008);<br>• No. 235: Improve the underlying process, where necessary, prior to digitizing the process (Abollado *et al.*, 2017);<br>• No. 461: Effective process redesign (Al-Mashari and Zairi, 1999) |
| Process Knowledge | • No. 109: Questioning the fundamental assumptions of a process (Siha and Saad, 2008);<br>• No. 237: Focus first on processes that are fully understood (Abollado *et al.*, 2017);<br>• No. 563: Identify & understand weaknesses of your processes (Malinova *et al.*, 2014) |

| | |
|---|---|
| Process Design | • No. 68: Data-driven and digitally automated process (Holotuik and Beimborn, 2017);<br>• No. 103: Failure to define a beginning and end to the process (Siha and Saad, 2008);<br>• No. 956: Design techniques (Shenhar *et al.*, 2002) |
| Process Monitoring | • No. 98: Focus on the measures of process success (Siha and Saad, 2008);<br>• No. 174: Control of the development process (Pankratz and Loebbecke, 2011);<br>• No. 231: Workflow progress tracking tool (Abollado *et al.*, 2017); |
| Customer Integration | • No. 72: Direct contact for customer-centricity (Holotuik and Beimborn, 2017);<br>• No. 411: Team includes end-user representatives (Dvir *et al.*, 1998);<br>• No. 1026: Lack of adequate user involvement (Fowler and Horan, 2007) |
| Employee Support | • No. 483: Organizational resistance (Al-Mashari and Zairi, 1999);<br>• No. 584: User resistance (Umble *et al.*, 2003);<br>• No. 602: Skepticism about project result (Abdolvand *et al.*, 2008) |
| External Communication | • No. 420: Communication with all subcontractors (Dvir *et al.*, 1998);<br>• No. 479: Effective use of consultants (Al-Mashari and Zairi, 1999);<br>• No. 891: Strong communication outwards (Ram *et al.*, 2013) |
| Internal Communication | • No. 262: Ineffective communication behaviors (Kirsch and Slaughter, 2013);<br>• No. 631: Development of a communication plan (Antony *et al.*, 2012);<br>• No. 744: Communication throughout the project (Clarke, 1999) |
| Partner Integration | • No. 116: Sharing forums among comparative firms (Siha and Saad, 2008);<br>• No. 859: Partnership with vendor (Remus, 2007);<br>• No. 900: integration with partner organizations' information systems (Ram *et al.*, 2013) |
| Project Monitoring | • No. 166: Performance measurement systems (Pankratz and Loebbecke, 2011);<br>• No. 290: Provide direct feedback on current project performance (Cooke-Davies, 2002);<br>• No. 506: Measurement of costs and benefits (Frey and Buxmann, 2012) |
| Project Preparation | • No. 25: Quality of planning (Irvine and Hall, 2015);<br>• No. 255: Poorly understood or ill-structured project requirements (Kirsch and Slaughter, 2013);<br>• No. 990: Planning the project (Besteiro *et al.*, 2015) |
| Team Portfolio | • No. 181: Right mix of team members (Pankratz and Loebbecke, 2011);<br>• No. 577: A great implementation team (Umble *et al.*, 2003);<br>• No. 881: Teamwork and project team composition, competence, and compensation (Ram *et al.*, 2013) |
| Team Support | • No. 202: Team members' motivation (Pankratz and Loebbecke, 2011);<br>• No. 472: Empowerment of both individuals and teams (Al-Mashari and Zairi, 1999);<br>• No. 1015: Team Engagement (Gomes and Romão, 2016) |
| Top Management Support | • No. 152: Top management support (Costantino *et al.*, 2015);<br>• No. 555: Commitment by top management (Umble *et al.*, 2003);<br>• No. 725: Motivated by chief executive willing to be held accountable for project success (Guimaraes, 1997) |
| Technology Complexity | • No. 218: Technology characteristics (Pankratz and Loebbecke, 2011);<br>• No. 444: Technical feasibility checked (Dvir *et al.*, 1998);<br>• No. 826: feasibility undertaken (Hughes *et al.*, 2017) |
| Technology Maturity | • No. 47: Project deliverable/ technology - maturity (Irvine and Hall, 2015);<br>• No. 267: Maturity of software (Kirsch and Slaughter, 2013);<br>• No. 552: Knowledge of the technology in use (Avital, 2003) |

# Appendix G: Identification of New Candidate Success Factors

Overall, we identified seven candidate SFs not included in the literature. Three underline the importance of partners as carriers of expertise within PDPs. Our interviewees consistently provided two examples referring to the importance of partners for PDP success. Either partners' domain knowledge links to the process to be digitalized (Yayavaram *et al.*, 2018) or partners hold essential technological expertise regarding DTs (Flor *et al.*, 2018) to be used in the PDP. A project manager of PDP P2 stated: *"Partners become ever more important. Digitalization is none of our core competencies, which is why we must trust and rely on strong partners" (project manager P2).* Beyond *partner domain knowledge* and *partner technology knowledge*, the interviewees stressed the importance of *partner agility*. They emphasized the importance of partner agility in the event of changes during PDPs, as partners then must deliver new input, show clemency in renegotiations, or react quickly (Ren *et al.*, 2005). The CIO of company H, for example, claimed that "*it becomes ever more important that partners can quickly react to new circumstances, for example, when we receive new requirements from our own customers"* (CIO H).

Another four new candidate SFs fall into the categories of strategy, culture, people, and technology. In the *strategy* category, we found *digital ambition* as a candidate SF, which we define as the continuous focus on the digitalization of the organization and its business processes (Gartner, 2017). This factor involves an active interest and support in taking advantage of DTs, especially their exposure through the management. In PDP T1, there never was a lack of passive support from the top management, as the project sponsor had much confidence in the PDP team. However, this very sponsor was not interested in the implementation of the chosen DT, as the following statement highlights: *"The guys from IT actually know what they do. I don't have to care about them, and I won't do as I'm not interested in those technologies […]"* (project sponsor T1). This lack of active support reduced the team members' motivation. The negative effect of missing *digital ambition* became particularly evident when the management opportunistically assigned team members to other projects. In the original project, the lack of sponsor interest also affected the motivation of employees not being part of the PDP core team, who regularly canceled meetings without justification. However, this sort of behavior was not apparent in projects championed by the project sponsor. By contrast, in company H, *digital ambition* strengthened the motivation of PDP H1's team members. The CIO, who even had received awards for fully embracing digitalization, continuously communicated a cheerful outlook toward the company's PDPs. Accordingly, the employees felt highly motivated by the recognition they received from the project sponsor and manager. Their awareness of this positive feedback resulted in increased output and commitment, which in turn helped ensure PDP H1's effectiveness and efficiency.

In the *culture* category, we found that organizations must foster a *digitalization attitude*, which we define as the PDP members' willingness-to-change and open-mindedness toward DTs (Koleva, 2019). PDP P2, for example, demonstrated the need for *digitalization attitude* as a part of the corporate *culture*. As the PDP team missed to involve prospective process participants during the implementation, the management introduced new plant strategies including the cultivation of a positive *digitalization attitude*. Over time, employees showed increased open-mindedness toward the introduced Internet of Things platform, as becomes evident in a project manager's statement: *"The employees did not even realize what happens with such technologies. […] the publishing of the plant vision for digitalization brought awareness to the ordinary employees, who normally do their job without further reflection."* (project manager P2).

In the *people* category, we found *data analysis* as a candidate SF, which previous studies commonly defined as the central, decentral, or hybrid usage of analytical and decision-making capabilities for diagnostic, descriptive, prescriptive, and predictive purposes (Porter and Heppelmann, 2015). Today, digitalization increases the application possibilities of analytics (Clarke, 2016). In each investigated PDP, the team members used data analysis methods. Even in those PDPs that did not rely on data analysis, the team members said that data analysis was becoming increasingly important. The positive influence on PDP success could be observed in, for example, projects H2 and H3, both of which involve analytical approaches and, as the sponsors and managers underlined, consequently rely on *data analysis*. Team members of H2 and H3 classified *data analysis* as the factor with the greatest impact on PDP success. The technical project manager of H3 stated that they *"[…] just can proceed with knowledge in analytics: the more knowledge, the faster and safer the success"* (technical project manager H3). However, a lack of *data analysis* knowledge may even cause problems in PDPs that do not use DTs for data analysis. In PDPs implementing such DTs, disregard for *data analysis* jeopardizes the whole project. Consequently, we highlight the positive effect that *data analysis* has on PDP success.

In the *technology* category, we found a positive effect of *technology comprehensibility* on PDP success i.e., the level of abstractness of the DT used in a PDP (Flor *et al.*, 2018). In fact, this candidate SF focuses on the maturity and complexity of a DT, which, if mis-assessed, can negatively impact PDP success. When implementing DTs, it is the team members' understanding of functionality and impact that poses a challenge. For example, the CIO of company H stated that *"with the speed of DTs emerging, how can we ensure the knowledge and skillset needed? […] We cannot update the knowledge about technology as quickly as those digital technologies emerge. The only control we have is to select DTs which are understandable for our employees and the management"* (CIO H).

# Appendix H: Refinement of Existing Candidate Success Factors

In addition to the identification of new candidate SFs, we could also refine two existing factors based on our findings from the interviews. First, we had to split *goal clarity* into the candidate SFs *process goal clarity* and *project goal clarity*. We define *process goal clarity* as the transparency and consistency of the goals of the business process affected by the PDP (Peralta *et al.*, 2015). By contrast, *project goal clarity* refers to the transparency and consistency of the goals of the PDP itself (Raziq *et al.*, 2018). The clarity of PDP goals and their communication are supposed to positively affect PDP success, a relationship which we observed in PDP H3. The impact of *project goal clarity* became evident as company H concretized the process affected by the PDP. Previously, company H had planned the PDP as a big data analytics project without specifying the underlying process. The project sponsor, manager, and employees consistently observed that the project sped up after the participants had identified the process affected. Accordingly, we included *process* and *project goal clarity*. The CIO of company H, for example, emphasizes that H1 "*runs like clockwork because the project's scope is clearly defined"*.

Moreover, we changed the SF candidate *infrastructural agility* to *infrastructural readiness*, defined as the extendibility, compatibility, and robustness of the organization's technological infrastructure (Haddad *et al.*, 2018). During the interviews, PDP team members frequently stated how important it is that infrastructure does not hinder the implementation of DTs. In the PDPs P1 and A1, the project teams had to overcome several infrastructural challenges. In P1, the PDP team had to renew the technological infrastructure that provided the foundation for the PDP. The fact that the planning employees were not involved in the PDP core team led them to underestimate the effort of this step. In A1, some members of the project team first had to implement the infrastructure, including the purchase of technical components. The actual PDP then began with reduced resources as the time and effort the employees had already invested did not serve the needs of the PDP. The importance of infrastructural readiness becomes evident in a project sponsor's (A1) statement: *"When infrastructure is not ready to implement the PDP's technology, the PDP is doomed"*.