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RELEVANCE OF IS PROJECT SUCCESS DIMENSIONS – A CONTINGENCY APPROACH

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ABSTRACT

Measurement of information system project success (ISPS) remains an unsolved challenge. Instead of seeking a commonly accepted measurement approach, some scholars suggest to assess ISPS by applying a contingency approach. Its central idea is that no set of success dimensions fits best in all situations; instead, the dimensions' relevance differs depending on variables like stakeholder perspective or project characteristics. We continue existing research by investigating how the relevance of success dimensions varies depending on project characteristics like complexity or size. We conduct a quantitative survey among experienced project managers in Germany. Results from 102 projects indicate that whereas certain dimensions (e.g., meeting customer requirements, customer satisfaction) are important in most projects, the relevance of many dimensions significantly varies depending on project characteristics. For researchers, we expect the more adequate assessment of ISPS to increase the validity of ISPS studies. We help practitioners to identify relevant ISPS dimensions for their projects.

Keywords

Information systems, project success, success dimensions, contingency theory, project characteristics.

INTRODUCTION

Despite decades of research, measurement of information system project success (ISPS) remains an unsolved challenge. An exhaustively agreed-upon understanding of the constituent dimensions of this concept is missing; instead, various diverging approaches exist (cf. *Theoretical Background*). A plausible reason for this lack of agreement may be that ISPS is a concept which cannot be assessed in the same manner from different perspectives, at different points in time or for different project characteristics. For example, ISPS is suggested to be a subjective matter (Myers, 1995). This leads to perceived differences depending on stakeholder perspective (Dvir, Lipovetsky, Shenhar and Tishler, 1998; Ika, 2009). Furthermore, scholars stress that success assessments can vary across time (Pinto and Slevin, 1988; Ika, 2009). Researchers also emphasize that projects are never the same and should be treated accordingly (Dvir et al.,1998; Shenhar and Dvir, 2004). In compliance with these views, ISPS should be assessed using a contingency approach rather than a uniform approach. The central idea of such contingency approach is that no set of success dimensions (measures used to assess project success, e.g., meeting schedule) fits best in all situations. Instead, dimensions' relevance differs depending on variables like stakeholder perspective, point in time or project characteristics. The latter are various project attributes like complexity or size. We go into more detail regarding development and concept of contingency theory in *Theoretical Background*.

Previous works examine the effects of stakeholder perspective (Basten, Joosten and Mellis, 2011) and point in time (Nunnenmacher, Jung, Chehrazi, Klaus, Lampasona, Webel and Ciolkowski, 2011). We focus on different assessments of ISPS depending on project characteristics like complexity or size. Without constricting our research with preliminary hypotheses, we conduct a quantitative survey. Using an online questionnaire, we link the experiences of information system (IS) project managers regarding the relevance of success dimensions in their projects to given characteristics of these projects. Thereby, we derive statements about relevance of ISPS dimensions depending on project characteristics to answer the following research question:

How do project characteristics influence the relevance of IS project success dimensions?

With our study, we contribute to the development of a contingency approach for assessing ISPS. Such an approach should allow for a more adequate measurement of ISPS, which is of high importance for scholars and practitioners. In research, ISPS is often used as dependent variable in causal models (e.g., investigating the impact of specific success factors on project success; cf. Petter, 2008; Sharma and Yetton, 2007). One premise for the validity of such studies is the adequate measurement of the dependent variable. For practitioners, adequate ISPS assessments are for example crucial for making appropriate decisions about future projects.

The remainder of this paper is organized as follows. In the next section, we motivate our study by describing the theoretical background on ISPS measurement and contingency theory in this context. We then present our study design, followed by our results. Subsequently, we discuss the results and conclude with our contributions and an outlook.

THEORETICAL BACKGROUND

State of Research on Measurement of ISPS

Traditionally, ISPS is measured by using a project's adherence to schedule, adherence to budget and conformance with specified requirements as success dimensions (also called criteria) (Agarwal and Rathod, 2006; Ika, 2009; Karlsen, Andersen, Birkely and Odegard, 2005). Scholars in IS as well as general project management research stress that assessing (IS) project success by using only these dimensions is insufficient (Agarwal and Rathod, 2006; Dvir et al., 1998). Many (IS) projects provide evidence for this view: some projects are considered successful despite not meeting plans, other projects are perceived as failures despite satisfying the traditional dimensions (Furulund and Moløkken-Østvold, 2007; Ika, 2009). Nelson (2005) speaks of successful failures and failed successes, respectively. One of several mentioned reasons for this mismatch is the defectiveness of estimates underlying project plans (Basten and Mellis, 2011). Planning is often affected in negotiations and/or by political constellations (Glass, Rost and Matook, 2008; Lederer, Mirani, Neo, Pollard, Prasad and Ramamurthy, 1990). Therefore, projects conducted as efficiently as possible might be considered successful despite not meeting schedule (which was unrealistic in the first place). As Gray (2001, p. 104) stated: "if a project fails to meet an impossibly tight budget, but is efficiently delivered without wastage, to what extent should it be said to have 'failed'?". It is arguable that, in projects that are considered successful despite not meeting plans, improving planning skills would solve the mismatch. However, in cases where projects are considered unsuccessful despite meeting plans, this argument does not apply – if everything went as planned and still leads to resentment, other criteria have to be in play. Ika (2009) mentions several reasons for the continuing popularity of adherence to planning: it is unequivocal, easy to apply and parties can agree to it. In general, researchers agree that adherence to planning is important for assessing ISPS but consider the latter a multidimensional construct (Aladwani, 2002; Ika, 2009; Thomas and Fernandez, 2008; Yetton, Martin, Sharma and Johnston, 2000) and suggest further dimensions for its measurement. Commonly proposed dimensions include efficiency of the development process (Baccarini, 1999; Thomas and Fernandez, 2008) and satisfaction of different stakeholders (Baccarini, 1999; Karlsen et al., 2005).

However, there is still no agreed-on understanding of the dimensions of (IS) project success (e.g., Ika, 2009) as diverging approaches show (e.g., Agarwal and Rathod, 2006; Aladwani, 2002; Baccarini, 1999; Barclay and Osei-Bryson, 2009; Nelson, 2005; Yetton et al., 2000). One of various approaches to organize the multiple dimensions is to divide (IS) project success in two major dimensions – process success and product success (Baccarini, 1999; Collins and Baccarini, 2004). In Nelson's (2005) view, the satisfaction of all stakeholders is the overall dimension for project success. This differs from Baccarini's (1999) approach, which considers satisfaction of different stakeholders to be sub-dimensions of process and product success. Yet other researchers highlight the importance of one particular stakeholder group – the customer (DeCotiis and Dyer, 1979; Pankratz and Loebbecke, 2011).

Considering the subject from another angle, many researchers doubt the suitability of defining one concept of (IS) project success without differentiating between stakeholder views (Freeman and Beale, 1992; Ika, 2009), points in time (Pinto and Slevin, 1988; Ika, 2009) or project characteristics (Dvir et al., 1998; Karlsen et al., 2005). The attempt to define one concept of ISPS is in our view a major reason for the lack of agreement in research outlined above. Scholars emphasize that projects differ from each other and need to be treated accordingly (e.g., Shenhar and Dvir, 2004). There are works on project classification in order to adequately investigate project success factors, identify appropriate management styles and develop project-specific tools (e.g., Dvir et al., 1998; Shenhar and Dvir, 2004). At this point, an important distinction needs to be made: success factors are aspects contributing to project success, whereas success dimensions are measures by which project success is judged (e.g., Cooke-Davies, 2002). In this work, we focus on success dimensions, contributing to a contingency approach for measuring ISPS that accounts for project-specific differences.

Contingency Approach for Measuring ISPS

Since the 1950s, organization and management theory is influenced by contingency theory (Hanisch and Wald, 2012). Contrarily to former universalistic works (e.g., Taylor, 1911), contingency theory states that no single way of managing and organizing fits best in all situations; instead, the most effective approach needs to account for given contingencies such as size or technology (Donaldson 1996; Tidd, 2001). This approach was developed by, among others, Woodward (1958, 1965), Burns and Stalker (1961) and Lawrence and Lorsch (1967), and supported by a substantial body of research in the following decades. Examples of contingency research streams include strategic decision processes (Fredrickson, 1984), human resource management (Delery and Doty, 1996) and organizational structure (Donaldson, 2001).

Contingency theory did not remain free of criticism. For example, scholars criticize its foundation on empirical data rather than sound theory (Livari, 1992) and that its deterministic nature barely accounts for other influences like managerial choice or institutional pressures (Livari, 1992; Powell and DiMaggio, 1991). Nonetheless, while acknowledging the criticism and taking the according issues into consideration, other scholars support and apply contingency theory (e.g., Dennis, Wixom and Vandenberg, 2001; Tidd, 2001).

Along the lines of organizations in organization theory, the dominant thinking in project management in its early years was based on the “one size fits all” approach (Dvir et al., 1998). Projects were considered detached from their environments and treated as fundamentally similar to each other. Accordingly, project management was developed as a universal concept. Today, existing project management standards like PMBOK Guide (Project Management Institute, 2004) or PRINCE2 (Office of Government Commerce, 2005) provide generally acknowledged practices across a wide range of projects (vom Brocke and Lippe, 2010).

However, conceptualizing projects as temporary organizations (Lundin and Söderholm, 1995; Packendorff, 1995) launched a new perspective on this topic in the 1990s. Since then, more and more researchers argue for a differentiating approach (e.g., Balachandra and Friar, 1997; Brown and Eisenhardt, 1997; Dvir et al., 1998; Ika, 2009; Shenhar, 2001; Shenhar and Dvir, 2004). Advocates of this contingency perspective claim that the project’s context needs to be considered since the project’s fit with external contingencies impacts the effectiveness of the temporary organization (cf. Hanisch and Wald, 2012). Dvir and Shenhar are counted among the most notable advocates of this view. Corresponding research reveals that “project management has a wide range of variations and projects have less characteristics in common than previously considered” (Dvir et al., 1998, p. 931). Hence, although originating from organization and management theory, contingency theory is widely seen as applicable and actually is widely applied in project management context.

According to the contingency perspective, existing project management standards need to be adapted to fit the context of particular projects. This is especially crucial for IS projects as current standards mostly stem from defense and engineering projects, hence reflecting their specific peculiarities (Andersen, 2006; vom Brocke and Lippe, 2010). However, IS projects considerably differ from such projects. IS projects’ progress is less transparent, they differ from previous IS projects (leading to lack of appropriate experience data) and are more prone to technological changes (Fuller, Valacich and George, 2008; Sommerville, 2011). Furthermore, it is more complicated to specify user requirements in IS projects and thus to exactly establish the project objectives (Turner and Cochrane, 1993; vom Brocke and Lippe, 2010).

Approaches for customized project management are incorporated in existing standards as well (vom Brocke and Lippe, 2010). According to the PMBOK Guide, “good practice does not mean the knowledge described should always be applied uniformly to all projects” (Project Management Institute, 2004, p. 4). Accordingly, several domain-specific extensions are provided, but not for IS projects. Without guidance for adaptation of common standards, project managers have to decide themselves which approaches fit their specific projects best. However, as project managers tend to neglect serious considerations of alternatives (Brown, McCormick and Thomas, 2000; Howell, Windahl and Seidel, 2010; Shenhar, 2001), standards are often applied without necessary modifications.

Overall, there are arguments for both a differential management of projects and a uniform “best practice” approach. For example, Cooke-Davies, Crawford and Lechler (2009, p. 111) state that established maturity models and standards “take a generic approach, effectively recommending that an ultimate goal is set for the implementation of project management within organizations and for a level of perfection to which all should aspire”. The authors conclude that “while there is a growing interest in the differential management of projects […], there are pressures that drive organizations aspiring to "best practice" to adopt similar project management systems regardless of the differences between the types of projects they manage" (Cooke-Davies et al., 2009, p. 111). The choice between applying a standardized or tailored project management approach may ironically depend on the context. For instance, Payne and Turner (1999) stress the importance of project size in this matter: while showing that project-specific adoptions are generally rated more successful than standardized approaches, they highlight the usefulness of company-wide standards for medium-size projects. Other scholars contribute to the contingency debate on generalizability of critical success factors for different project contexts by showing that project success factors are not universal (e.g., Dvir et al., 1998; Scott-Young and Samson, 2008). Overall, following the contingency-based project management stream, numerous studies applied contingency theory in various contexts like RFID supply chain projects (Wamba and Chatfield, 2009), project failure (Sauser, Reilly and Shenhar, 2009) and distributed IS development teams (Sarker and Sarker, 2009).

Our study supports this growing research stream. More precisely, we follow the call for a contingency approach regarding ISPS measurement (e.g., Dvir et al., 1998; Ika, 2009). We agree that ISPS cannot be assessed in the same manner in different situations and that success dimensions' relevance differs depending on values of project characteristics.

STUDY DESIGN

In this section, we first describe our research approach, followed by our way of data collection and analysis. We then provide an overview of our sample's characteristics and address limitations of our study.

Research Approach

We conducted a quantitative survey to link (1) ISPS dimensions to (2) IS project characteristics, aiming to analyze the dimensions' importance depending on different characteristics. We explain our selection of dimensions and characteristics below.

(1) ISPS Dimensions

As outlined in *Theoretical Background*, there is no exhaustive agreement on ISPS dimensions in literature. Consequently, we focused on a specific set of dimensions (listed in Table 1), including those that are widely acknowledged in works on this topic (cf. *Theoretical Background)*. First, we included the traditional adherence-to-planning criteria (dimensions 1 to 4). Moreover, we consider process efficiency (Baccarini, 1999; Freeman and Beale, 1992; Gray, 2001; Thomas and Fernandez, 2008) as fundamental indicator of success. Finally, we included the satisfaction of various project stakeholder groups (Baccarini, 1999; Baker, Murphy and Fischer, 1988; Freeman and Beale, 1992; Karlsen et al., 2005) to account for different subjective perceptions of ISPS.

	Dimension	**Definition**
1	Adherence to budget	Conformance between the planned and the actual development cost.
2	Adherence to schedule	Conformance between the planned and the actual development time.
3	Meeting functional requirements	Conformance between the specified functional requirements and their actual realization.
4	Meeting non-functional requirements (product quality)	Conformance between the specified non-functional requirements and their actual realization.
5	Process efficiency	Ratio of objective achievement to the effort expended (budget, particularly human resources).
6	Customer satisfaction (organizational level)	The customer organization is satisfied with the project's overall course of action and its outcome (the developed system).
7	End-user satisfaction (individual level)	The end-users are satisfied with the developed system, for example in terms of functionality and usability.
8	Contractor satisfaction (organizational level)	The contractor organization is satisfied with the project's overall course of action and its outcome (the developed system).
9	Project team members' satisfaction (individual level)	The team members are satisfied with their achievements on and the overall course of the project.

Table 1. ISPS Dimensions Used in our Study

(2) IS Project Characteristics

Since there is no standard set of characteristics for project classification (Shenhar, 2001) as well, we adapted previous works concerning aspects that differentiate between projects (cf. Table 2). Most characteristics were found in works of Dvir and Shenhar, who are counted among the most notable advocates of contingency research in project management context (cf. *Theoretical Background*). Furthermore, we added characteristics that further works mentioned to differentiate between projects and that we believe to have impact on ISPS dimensions' relevance (characteristics 6, 7 and 9).

The characteristic *Complexity* indicates whether a project possesses high or low complexity regarding its hierarchy of systems and subsystems (scope). *Technological uncertainty* specifies whether the technology used is innovative and unknown (high uncertainty) or mature and well-known (low uncertainty). *Fixed deadline* differs between projects with a usual competitive deadline and projects that must meet a fixed deadline at all costs (e.g., due to legal regulations). *Contractor type* indicates whether the project contractor is an internal IT department or an external organization. *Contract type* differentiates between fixed-price (where client and contractor agree upon a price beforehand) and time-and-material (where contractor gets paid according to effort) projects. *Form of contracting organization* specifies whether the customer is a private company or a public organization (henceforth: private and public projects, respectively). *Relatedness* describes the project's relation to the overall portfolio, differentiating between holistic, stand-alone projects and projects that are part of superordinate endeavors. *Size* and *duration* differentiate between small vs. large and short vs. long projects, respectively.

	Project characteristic	**Values**	**Sources**
1	Complexity	High vs. low	Dvir et al., 1998; Shenhar; 2001; Shenhar and Dvir, 2004
2	Technological uncertainty	High vs. low	Dvir et al., 1998; Shenhar; 2001; Shenhar and Dvir, 2004
3	Fixed deadline	Yes vs. no	Shenhar and Dvir, 2004
4	Contractor type	External vs. internal	Shenhar and Dvir, 2004; Susilo, Heales and Rohde, 2007
5	Contract type	Time-and-material vs. fixed-price	Müller and Turner, 2005; Sadeh, Dvir and Shenhar, 2000
6	Form of contracting organization	Public vs. private	Moløkken-Østvold and Jørgensen, 2005; Rainey, Backoff and Levine, 1976
7	Relatedness	Holistic vs. partial	Connolly and Dean, 1997
8	Size (in number of team members)	Small vs. large*	Dvir et al., 1998; Payne and Turner, 1999
9	Duration (in months)	Short vs. long*	Drew, 1994

Table 2. IS Project Characteristics Used in our Study (* differentiation according to the sample median)

Data Collection and Analysis

We designed an online questionnaire that was filled out by IS project managers of the contractor organization. We randomly contacted companies in Germany and received 102 usable responses. The respondents characterized their completed IS projects and rated the relevance of provided ISPS dimensions for the characterized projects. Based on this data, we derived statements about ISPS dimensions' relevance depending on project characteristics.

Respondents rated the relevance of each ISPS dimension in each characterized project. Figure 1 illustrates this rating. For each dimension (exemplary in Figure 1: process efficiency), a short definition was given, followed by the respondents' characterized projects. Each dimension was rated on a 7-point Likert scale regarding its relevance in the particular projects from the participants' subjective perspective. Thus, we established the link between the relevance of all dimensions and the project characteristics via the characterized projects as perceived by project managers.

In data analysis, we clustered the projects according to project characteristics (e.g., small projects) and analyzed the effect of characteristics on specified relevance of success dimensions. In conformance with contingency theory (cf. *Theoretical Background*), we did not predefine hypotheses but derived the classification from our sample. We clustered our sample according to the values of project characteristics (e.g., small vs. large projects) and applied significance tests to differentiate between project clusters. Significance tests are to be chosen according to sample characteristics. To analyze whether one of two samples of independent observations tends to have larger values than the other, we chose the Mann-Whitney-U test (Mann and Whitney, 1947) since our data exhibits independent samples and different sample sizes, and normal distribution cannot be guaranteed.

Dimension: Process efficiency

Definition: Ratio of objective achievement to the effort expended (budget, particularly human resources)

Please specify the relevance of the dimension “Process efficiency“ for your subjective perception of project success in the respective projects:

	not relevant at all						very relevant
Project: ABC development	○	○	○	○	○	○	○
Project: …	○	○	○	○	○	○	○

Figure 1. Example of Dimensions Rating: Process Efficiency

Whereas according insights are interesting for researchers, practitioners cannot effectively use them as the data does not provide the relevance of success dimensions relative to each other. Ideally, practitioners would need all possible combinations (= project clusters) of the 18 values (nine characteristics, each with two values) with the respective order of dimensions’ relevance for each cluster. Thus, practitioners could for example see the relevance of each dimension in a holistic, large, fixed-price, complex, long project with a fixed deadline, high technological uncertainty, contracted by an external private customer. However, all possible scenarios add up to 2^9=512 combinations, requiring at least a four-digit sample of projects to yield valuable results for each combination. Considering our sample size (n=102), we developed the following heuristic approach to generate three exemplary clusters.

1. We considered all possible project clusters combining the values of project characteristics.
2. We chose the cluster with most projects included.
3. We compared this cluster to all other clusters with a different value in exactly one characteristic. We calculated the sum of deviations between the means of all dimensions and chose the cluster with the smallest total difference, thus ensuring that the two clusters are rated as similar as possible.
4. We merged these two (similar) clusters.
5. If fewer than 20 projects were included in the merged cluster, we used it as new starting point and started over with step 3. Otherwise we continued with step 6.
6. We continued with step 1 using all possible project clusters while inverting the value of one characteristic that was included in the previous cluster and provided the largest number of projects.

We iterated until three clusters with at least 20 projects were identified.

Participant Demographics and Distribution over Project Characteristics

We collected data over a total of 102 projects from experienced IS project managers in Germany. Table 3 provides an overview of participant demographics and project durations and sizes. Figure 2 illustrates the value distributions over all investigated projects as characterized by the participants in our study (cf. *Research Approach*).

Participant demographics	**Min**	**Max**	**Mean**	**Median**
Number of managed projects	3	100	33	20
Years of IS development experience	5,5	30	16	15
Project duration and size				
Duration in months	3	66	15	11
Size (Number of team members)	1	500	37	10

Table 3. Participant Demographics and Project Duration and Size

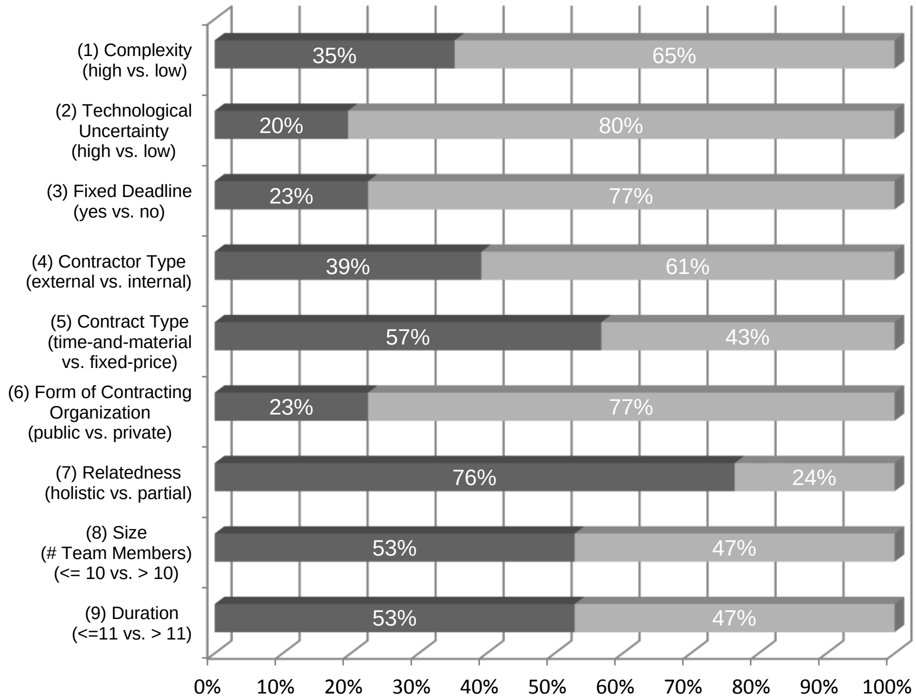

Figure 2. Distribution over Project Characteristics (n=102 projects)

Limitations

Since researchers do not completely agree on the ISPS dimensions (cf. *Theoretical Background*), it is possible that our list of dimensions does not include all potentially important aspects. Nevertheless, we chose a broad range of dimensions that have been widely used or commonly proposed. Along those lines, we selected project characteristics that were commonly proposed and are supposed to apply to most IS projects. Moreover, as our sample size restricted distinguishing between industry types, we focused on differentiating between public and private organizations instead.

RESULTS

Table 4 shows participants' general assessments concerning the relevance of ISPS dimensions. All dimensions are rated rather important (lowest mean: 4.71, lowest median: 5.00), with meeting functional requirements being the most relevant and adherence to budget the least relevant dimension.

Success dimension	**Mean**	**Median**
Meeting functional requirements	6.02	7.00
Adherence to schedule	5.53	6.00
Customer satisfaction (organizational level)	5.51	6.00
Meeting non-functional requirements (product quality)	5.43	6.00
Contractor satisfaction (organizational level)	5.04	5.00
End-user satisfaction (individual level)	5.02	5.00
Process efficiency	4.80	5.00
Project team members' satisfaction (individual level)	4.72	5.00
Adherence to budget	4.71	5.00

Table 4. ISPS Dimensions' Relevance (n=102 projects)

Table 5 provides an overview of project characteristics and related success dimensions that have shown significant differences for different values of these characteristics. The results are provided along with the level of significance (with a given confidence interval of 0.95). Moreover, we provide results of power analyses. Several cases are close to or exceed the commonly used threshold of 0.8 (Cohen, 1988). In cases with large differences between sample sizes, power is accordingly lower. Nevertheless, our results prove to be meaningful (cf. *Discussion*).

For each investigated characteristic, we found at least one ISPS dimension with significant differences depending on the characteristic. Contractor type, contract type and relatedness show significant differences regarding the satisfaction of various stakeholders. Adherence to budget is especially neglected in projects with high technological uncertainty (3.90). Whereas meeting functional requirements is seen as the overall most important dimension (cf. Table 4), it is significantly less important in highly complex or public projects. Both meeting functional and non-functional requirements are rated significantly less important in public compared to private projects.

Project characteristics / Success dimensions	**Means**		**p-values**	**Power (1-β)**
(1) Complexity	High	Low		
Meeting functional requirements	5.64	6.23	0.071*	0.68
(2) Technological uncertainty	High	Low		
Adherence to budget	3.90	4.90	0.012**	0.76
(3) Fixed deadline	Yes	No		
Adherence to schedule	6.57	5.23	0.000***	0.64
Process efficiency	5.17	4.70	0.085*	0.36
(4) Contractor type	Internal	External		
Customer satisfaction (organizational level)	5.10	5.77	0.004***	0.69
Contractor satisfaction (organizational level)	4.05	5.68	0.000***	0.99
Project team members' satisfaction (individual level)	4.38	4.94	0.089*	0.47
(5) Contract type	Fixed-price	Time-and-material		
End-user satisfaction (individual level)	5.45	4.69	0.013**	0.67
Contractor satisfaction (organizational level)	5.55	4.66	0.022**	0.75
(6) Form of contracting organization	Private	Public		
Meeting functional requirements	6.25	5.22	0.001***	0.94
Meeting non-functional requirements (product quality)	5.62	4.78	0.012**	0.72
Project team members' satisfaction (individual level)	4.94	4.09	0.043**	0.62
(7) Relatedness	Partial	Holistic		
Customer satisfaction (organizational level)	5.00	5.67	0.063*	0.58
End-user satisfaction (individual level)	4.29	5.24	0.016**	0.72
(8) Size (# Team members)	Small	Large		
Process Efficiency	4.33	5.33	0.001***	0.95
(9) Duration	Short	Long		
Adherence to budget	4.96	4.42	0.074*	0.88
Meeting non-functional requirements (product quality)	5.93	4.87	0.001***	0.99
Project team members' satisfaction (individual level)	5.22	4.15	0.001***	0.97

Table 5. Significant Differences Concerning the Relevance of ISPS Dimensions (* 0.01; ** 0.05; * 0.10)**

Table 6 presents three exemplary clusters that we developed by applying our heuristic approach (cf. *Data Collection and Analysis*). Cluster 1 contains only external projects and thus essentially differs from cluster 2 in this characteristic. Furthermore, cluster 2 contains only short, private projects. Cluster 3 differs from the first two clusters by including only time-and-material projects with low technological uncertainty.

For each cluster, the relevance ratings of the nine success dimensions are provided in descending order. Meeting functional requirements is consistently considered the most important dimension in all clusters, followed by meeting non-functional requirements and customer satisfaction. While being considered important in all clusters, customer satisfaction is especially emphasized in cluster 1. The same applies to contractor satisfaction. Both adherence to schedule and to budget are assessed higher in cluster 2. Although ranked fourth, the actual mean of adherence to schedule is the lowest in cluster 3. Project team members' satisfaction is ranked least important in clusters 1 and 3, but more important in cluster 2.

Project cluster	ISPS dimensions' relevance								
	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Holistic, external, no fixed deadline, low complexity (n=23)	MFR (6.35)	CUS (6.13)	MNR (5.74)	EUS (5.48)	COS (5.35)	ATS (5.22)	ATB (4.43)	PRE (4.26)	PTS (4.26)
2. Holistic, internal, private, short (n=20)	MFR (6.50)	MNR (6.20)	ATS (5.60)	CUS (5.50)	ATB (5.40)	PTS (5.40)	PRE (5.20)	EUS (5.00)	COS (3.95)
3. Holistic, time-and-material, private, low technological uncertainty (n=29)	MFR (6.10)	MNR (5.62)	CUS (5.48)	ATS (5.17)	EUS (4.86)	ATB (4.86)	PRE (4.76)	COS (4.62)	PTS (4.62)

Table 6. Project Clusters and the Relevance of ISPS Dimensions
Adherence to budget (ATB); Adherence to schedule (ATS); Meeting functional requirements (MFR); Meeting non-functional requirements (MNR); Process efficiency (PRE); Customer satisfaction (CUS); End-user satisfaction (EUS); Contractor satisfaction (COS); Project team members' satisfaction (PTS)

DISCUSSION

We observed that the respondents tend to avoid rating dimensions at the bottom of the Likert scale (cf. the rather important assessments of all dimensions in Table 4). Overall, less than 8 % of all ratings were on one of the two lowest points. We believe the social desirability bias (Edwards, 1957) to be a plausible reason for this finding. According to this bias, individuals tend to answer in the way they think others expect from them. IS project managers might not want to exclude any dimension as they otherwise risk to be suspected of (inappropriately) neglecting this dimension in their projects.

Taking a look at the dimensions themselves, the ratings of single adherence-to-planning dimensions are remarkable. Whereas meeting functional and non-functional requirements as well as adherence to schedule are rated most important (next to customer satisfaction), adherence to budget is found at the very bottom of the list. We believe a plausible explanation is that meeting requirements is mostly the actual reason for the project in the first place and is therefore considered important in most projects. Adherence to schedule and adherence to budget are interrelated dimensions – changing the one will mostly influence the other. Thereby, keeping the schedule seems to be mostly considered more important than keeping the budget – it is not unusual that managers make use of additional resources hoping to keep the planned schedule (which according to Brooks' Law rarely works; cf. Brooks, 1995).

Additionally, Table 5 reveals that the relevance of adherence-to-planning dimensions significantly varies depending on specific project characteristics. Adherence to budget, for example, is considered even less important in projects with high technological uncertainty. This is not surprising as such projects inherently entail more risks; therefore, budget overruns might be accepted more willingly. The relevance of meeting both functional and non-functional requirements is rated significantly lower in public projects. In our view, a relationship is being formed between customer and contractor over the course of a contracted project. This relationship is crucial for image building and future collaboration and is among others positively influenced by meeting customer requirements. We believe that project managers lessen the importance of meeting requirements in public projects as it does not have the same impact on the relationship to customer as in private projects. We invite researchers to further investigate this matter.

These different ratings of adherence-to-planning dimensions are interesting considering the debate on adherence to planning (cf. *Theoretical Background*). For instance, according to the often cited Chaos Report (The Standish Group International, 2009), considerably few projects succeed (32 %). However, Chaos classifies projects as unsuccessful in case of even slight budget overruns, neglecting the possibility that adherence to budget is not that relevant in these projects in the first place. Neither does this report differentiate projects with regard to specific characteristics, thereby missing to adjust the relevance of success dimensions accordingly. However, taking such variations into account is necessary to measure ISPS adequately and might show that project success rates are higher than claimed.

Process efficiency is on average rated less important than most other dimensions (cf. Table 4), but still more important than adherence to budget. We suggest that the latter largely reflects the quality of planning, whereas process efficiency provides a more adequate assessment of efficient use of resources. Interestingly enough, process efficiency significantly gains importance in projects with many team members (cf. Table 5). In such projects, effective communication and leadership are particularly crucial for project success, which we believe is reflected in higher relevance of process efficiency. It is not surprising that adherence to schedule is rated significantly more relevant in projects with a fixed deadline (cf. Table 5).

Regarding the satisfaction of various stakeholders, our results presented in Table 4 confirm prior research (cf. *Theoretical Background*) that customer satisfaction is overall an important dimension of ISPS (DeCotiis and Dyer, 1979; Pankratz and Loebbecke, 2011). Furthermore, both customer and contractor satisfaction are ranked significantly higher in external projects compared to internal ones (cf. Table 5). Revisiting our thoughts on building a customer-contractor relationship, both dimensions seem to play a greater role in external projects since this relationship is being more extensively formed in external than in internal projects (in the latter, customer and contractor belong to the same organization). As regards the higher relevance of end-user satisfaction in fixed-price projects, we believe that product quality (which is important to end-users) may suffer due to shortcuts which arise from time pressure (Austin, 2001; Costello, 1984). Therefore, project managers might emphasize the satisfaction of end-users in such projects. The higher importance of contractor satisfaction in fixed-price projects may be explained with the fact that the contractor bears the risks in this contract type (Gopal and Koka, 2012). Following Gopal and Koka (2012), customers face higher risks in time-and-material contracts, which appears in two ways. First, contractors tend to place their best resources on fixed-price rather than time-and-material projects (Arora and Asundi, 1999). Second, the time-and-material contract form provides an incentive to the contractor to extend the duration of the project (Bajari and Tadelis, 2001; Banerjee and Duflo, 2000).

The comparison of the three exemplary clusters in Table 6 reveals interesting insights as well. The consistently high rankings of meeting functional and non-functional requirements emphasize the importance of these dimensions in most project types. However, no cluster contains only public projects. As described, the importance of meeting requirements decreases in such projects. The higher importance of customer and contractor satisfaction in cluster 1 can be attributed to the fact that cluster 1 contains external projects only (see the discussion regarding the customer-contractor relationship above). The higher importance of adherence to schedule and to budget in cluster 2 can be explained by the characteristic project duration – cluster 2 contains only short projects in which a more precise and realistic planning regarding project duration and costs can be expected. The lower mean of adherence to schedule in cluster 3 (which contains time-and-material projects only) is in line with our discussion of effects of contract form in the previous paragraph. We assume that project team members' satisfaction is rated higher in cluster 2 as it contains internal projects only – in such projects, satisfaction of the own team seems to gain importance. However, our power analysis revealed a probable insignificance of this result (cf. Table 6) so that it should be further investigated. Overall, this exemplary juxtaposition re-emphasizes our findings that whereas certain dimensions are important in most projects, there are considerable differences of dimensions' importance depending on project characteristics.

CONCLUSION

In this paper, we investigate the relevance of ISPS dimensions depending on project characteristics from the perspective of project managers. Results collected from 102 projects indicate that, on the one hand, certain dimensions are important in most projects (e.g., meeting functional and non-functional requirements, customer satisfaction). On the other hand, there are considerable variances of dimensions' relevance depending on project characteristics. Even meeting functional requirements – the most important dimension on average – is significantly less important in public projects. Adherence to budget, one of the traditional adherence-to-planning dimensions, is considered the overall least important dimension and even less relevant in for example long projects and projects with high technological uncertainty. The comparison of different project clusters also reveals considerable variations in the importance of various success dimensions. Such variations need to be taken into account – when success of individual projects is being measured – by adjusting the set of assessed success dimensions accordingly.

We contribute to the large body of research on the measurement of ISPS by providing statements about the relevance of ISPS dimensions depending on project characteristics. Thereby, we enable scholars and practitioners to gain insights into relevant dimensions of their IS projects. For the research community, we expect the more adequate assessment of ISPS to increase the validity of studies reporting on ISPS rates or using ISPS as dependent variable. We help practitioners to identify important dimensions in their specific projects, leading to more adequate assessments of project success and therefore more accurate decisions about future investments.

Whereas our study focuses on the perspective of project managers, we endorse previous research that suggests considering ISPS assessment from the view of various project stakeholders (Dvir et al., 1998; Karlsen et al., 2005). We therefore encourage researchers to investigate other stakeholders' perspectives on this topic.

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