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*Publication date:*
2018

*Document Version*
Publisher's PDF, also known as Version of record

*Citation for published version (APA):*
Iivari, J., Hansen, M. R. P., & Haj-Bolouri, A. (2018). *A Framework for Light Reusability Evaluation of Design Principles in Design Science Research*. Paper presented at 13th International Conference on Design Science Research and Information Systems and Technology, Chennari, India.

# A Framework for Light Reusability Evaluation of Design Principles in Design Science Research

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**Abstract.** Many design science research (DSR) papers in IS suggest sets of "design principles" (DPs) as their major contributions. However, the reusability of these DPs in the real practice has been largely neglected. This paper proposes a framework of five criteria reusability evaluation: (1) accessibility, (2) importance, (3) novelty and insightfulness, (4) actability and guidance, and (5) effectiveness. We believe that the framework instantiated as a lightweight tool can be used to improve proposals of DPs by design science researchers and thereby increase the reusability of the proposed DPs. This is important for DSR to maintain its practical relevance.

**Keywords:** Design Science Research, Design Principles, Evaluation, Framework, Reusability, Practitioners.

## 1 Introduction

The great ethos of design science research (DSR) in Information Systems (IS) has been to design innovative IT artifacts that are relevant for practice and not only of interest in research. Artifacts such as the relational data model [1], entity-relationship model [2], group decision/meeting support systems such as GroupSystems [3], CASE tools such as ISDOS [4, 5] and MetaEdit [6] are prime examples of such artifacts.

More recently, many DSR papers in IS have suggested sets of DPs as their major contributions [7–16]. Following Sein et al. [17], Chandra Kruse et al. [18] characterize DPs as "knowledge about the creation of other instances of artifacts belonging to the same class" (p. 39). Our presumption is that DPs are primarily intended for practitioners, who create (design) instances in question. Therefore, DPs should be reusable by practitioners working in similar as well as other settings as the one where they were invented. If not, much of DSR loses its practical ethos.

Already Markus et al. [7] recognized the reusability of DPs as an issue in DSR when questioning whether other development teams could follow the suggested design and development principles to produce successful systems (p. 207). Reuse of DPs is thus not unproblematic. It comprises of interpreting scope and content of the

DPs, matching them with the problem space, guesstimating missing information, projecting DPs into the solution space, and implanting them into design process [18].

One reason for the reuse challenges may be that DPs published in the DSR literature have been authored for the research community rather than for practitioners possibly reusing them. As far as the proposed disciplines have been justified, it is done in terms of theoretical/explanatory and conceptual grounding rather than in terms of empirical grounding [19, 20], and in quite a limited sense in the latter case without any attention to their reusability (see Section 2). In this situation, there is a high risk that DPs remain unnoticed by the practitioners and DSR loses its practical relevance.

The purpose of this paper is to suggest a framework for light reusability evaluation of DPs. "Light" here is used as an alternative to "heavy" which would imply naturalistic, rigorous evaluation that run the risk of being impractical or even impossible to perform in a DSR setting. In the next section our literature review demonstrates that the issue of reusability evaluation of DPs has largely been neglected in the DSR literature. The likely reason for this neglect is that a "full" evaluation of the reusability is challenging. As a response, we suggest a framework for light reusability evaluation of DPs in DSR to be conducted by practitioners as would-be-reusers. The framework is inspired by the proposal of applicability check from Rosemann and Vessey [21]. It is so lightweight that we claim that it can be regarded as a standard for a minimum reusability evaluation of DPs in DSR papers.

## 2 Review of Empirical Evaluation of Design Principles in the IS Literature

In order to illuminate a state-of-the-art of the empirical evaluation of DPs, we reviewed DSR papers suggesting DPs published in AIS Senior Scholars' Basket of 6 journals (EJIS, ISJ, ISR, JAIS, JMIS, MISQ). Additionally, we reviewed similar contributions published in the DESRIST proceedings between 2010-2017. The literature review was performed the following way: the keywords "design principles" and "design guidelines" were searched for in each article. Articles were included if they contained actual proposals of DPs. Thereafter, each article was analyzed for possible empirical evaluation of the proposed DPs. It could be any kind of formative or summative evaluation of either the usefulness, use or reuse of the DPs themselves (direct evaluation), or evaluation of one or more artifacts instantiating the DPs (indirect evaluation). Furthermore, the articles were analyzed for who performed the evaluation and how it took place.

The analysis of the resulting papers was focused on the empirical evaluation of the DPs and divided into three sub-categories: proof-of-concept, internal practitioner evaluation and external practitioner evaluation. We decided to focus on empirical evaluation, since our interest lies in the evaluation of reusability of DPs. Without involving would-be-reusers such evaluation is difficult, if not impossible. Proof-of-concept of a set of DPs can be shown by simply demonstrating a concrete system that instantiates them [22]. The distinction between internal and external practitioner evaluation is based on the position of practitioners relative to the project - whether or not

they belong to the DSR project or not. In both cases the evaluation of DPs may be direct (focusing on the DPs themselves) or indirect (evaluating an instantiation of the DPs).

The distinction between internal and external practitioners corresponds to that between internal validity (credibility) and external validity (transferability) [23]. In DSR it is, however, essential to evaluate not only the truth or trustworthiness of the findings, but also the utility of the focal artifact (DPs in our case).

**Table 1.** Empirical evaluation of DPs in the IS literature (including only journal papers)

| | **Design principles (DPs)** | **Empirical evaluation of DPs** | | |
|---|---|---|---|---|
| | | **Proof of the concept** | **By internal practitioners** | **By external practitioners** |
| Markus et al. [7] | 6 DPs for designing IT support for emergent knowledge processes | The DPs were implemented in various prototypes of TOP modeler and the final system and/or followed in the development process | Indirectly when formatively evaluating different prototype versions | The commercial success of the system (Top Modeler) may be used as an indirect external demonstration of the value of their DPs |
| Lindgren et al. [8] | 4 DPs for designing competence management systems | The DPs implemented in prototypes | Indirectly when formatively evaluating the prototypes, but not the final versions of the principles | No |
| Yang et al. [9] | 5 DPs for designing integrated information platforms for emergency responses | The DPs were implicitly implemented in the integrated information platform for emergency responses in Beijing Olympics | Indirectly when formatively evaluating different prototype versions and the final system | No |
| Gregor et al. [10] | 4 DPs for designing change strategies for (governmental) intervention in least developed countries | The DPs were implicitly applied in the project carried out in Bangladesh, even though the DPs were explicitly identified after the project | Indirectly when formatively evaluating the intervention in several stages in and the completed project | No |
| Meth et al. [11] | 2 DPs for designing requirements mining systems | Principles implemented in two prototype versions | N/A, since the DSR project did not take place in cooperation with any client organizations | Indirectly when formatively evaluating prototypes and directly when evaluating the final prototype |
| Giessmann | 6 DPs (of form and | The DPs were applied in designing a busi- | Explicit, summative evalua- | No |

| | | | | |
|---|---|---|---|---|
| and Legner [12] | function) for designing business models for platforms as service | ness model | tion by seven practitioners | |
| Babaian et al. [13] | 4 DPs for designing collaborative ERP systems | Two of the DPs were implemented in a prototype | N/A, since the DSR project did not take place in cooperation with any client organizations | The two DPs were indirectly evaluated in two experiments, which summatively assessed the functional features of the prototype (each involving 12 graduate students) as well as by one expert practitioner |
| Germonprez et al. [14] | 4 DPs for "responsive design" of open source software | Evidence from 40 organizations participating the Linux open source community, all of them not all instantiating all aspect of DPs | N/A, since the DSR project did not take place in cooperation with any client organizations | No |
| Lukyanenko et al. [15] | 6 DPs for conceptual modeling in the context of user-generated content | The DPs were applied in designing a citizen science information systems (NLNature) | Not reported | The utility (impact) of the DPs evaluated by interviewing NLNature's users, but not by external practitioners likely reusing the principles |
| Seidel et al. [16] | 4 DPs for designing IS support for organizational sensemaking in environmental sustainability transformations | The DPs were implemented in prototypes | Indirectly when formatively evaluating the prototypes | No |

Table 1 summarizes the results, including only the ten journal papers for space reasons. As for the empirical evaluation of the DPs, the analysis of the DESRIST 2010-2017 proceedings identified 17 papers suggesting DPs as their major contributions. They gave results consistent with those obtained from the journal papers.

The results of Table 1 indicate that all – [14] as an exception - of the reviewed papers demonstrated the "proof of concept" of the suggested principles concerning the IS/IT system by showing how the principles were implemented in prototypes, in the real system analyzed, or executed in action. Papers that included evaluation of DPs involving practitioners internal to the DSR project did it indirectly, with Giessmann and Legner [12] as an exception, but they did not report the details of the evaluation (e.g. what exactly was evaluated in the case of their DPs).

As for the external evaluation, Meth et al. [11] - and Gass et al. [24] among DESRIST papers (not included in the table) - extended their empirical evaluation to the target community of practitioners possibly reusing the principles outside the DSR project context. Gass et al. [24] indirectly and directly evaluated both their artifact and six of their identified principles for enterprise social question and answer sites through five focus groups of practitioners. Yet, they did not clearly identify the community of practitioners who might reuse the principles and consequently it is unclear to what extent the participants in focus groups represented these would-be-reusers.

Meth et al. [11] report a DSR project following DSR Strategy 1 [25], i.e. it was not conducted in close cooperation with any client organization. Contrary to many Strategy 1 DSR projects they pay exceptional attention to the empirical evaluation of their DSR contributions. They suggest two DPs, which were instantiated in their prototype system. They evaluated the usefulness of the first prototype by demonstrating it to practitioners (experts in requirements engineering) and the user-friendliness (usability) of second prototype in a similar way. They also introduced the first prototype in a conference on requirements engineering. They conducted a separate experimental ex post evaluation of the second prototype using students (n = 40) and a small number (n = 5) of experts in requirements mining. Quite interestingly, the prototype made it possible to compare the effectiveness of two versions of design principles (DP1, and DP1 + DP2) and to contrast them with manual requirements mining.

Babain et al. [13] and Lukyanenko et al. [15] conducted external evaluation of their DPs, but not involving real practitioners as would-be-reusers. Babaian et al. [13] used graduate students as subjects in the evaluation and Lukyanenko et al. [15] evaluated the utility (impact) of the six DPs proposed by interviewing NLNature's (a system for citizen science) users, but not external practitioners likely reusing the principles.

To sum up, only Meth et al. [11] and Gass et al. [24] among the 27 DSR papers reviewed had a direct evaluation of DPs involving members of the target community of the principles.

Meth et al. [11] is also an example of fairly heavy evaluation of DPs. One should note, however, that researchers are always obliged to compromise between a "full" evaluation of DPs and what is practically possible. To have a "full" evaluation a researcher should be able to assure the internal validity and the external validity of the findings on which the evaluation is based. Assuming DSR strategy 2, in which the DPs are developed in a specific practical setting of the client [25], the researcher should have 1) a credible account that a system (or action) instantiating the DPs resulted in specified outcomes – positive and negative – in that specific practical setting and that the DPs significantly contributed to those outcomes, and 2) that the specified

DPs can be transferred to other settings so that the DPs help practitioners to instantiate them and the resulting system (or action) leads to the similar outcomes as in the original setting of the DSR project and that the DPs significantly contribute to those outcomes. It is, however, up to researchers rather than practitioners to assure the internal validity and the external validity of the findings. Therefore, Table 1 does not attempt to evaluate how internally valid or externally valid the evaluations were.

Recognizing the above difficulty of "full" evaluation of DPs, the following section proposes a framework for a light evaluation of DPs, which can be applied when:

- The authors wish to publish their major DSR ideas (expressed set of design principles) as soon as possible before their careful evaluation (one reason is to get the "ownership" of the ideas),
- And/or careful testing and empirical evaluation of the DPs are not possible at the time of invention, because there is not necessary technology available (as in the case of Codd's [1] relational model at that time),
- And publication outlets are ready to publish innovative DSR ideas (DPs), even though they are tentative and not carefully tested and empirically evaluated (this is analogous to publishing pure theory building papers).

# 3 A Framework for Light Reusability Evaluation

## 3.1 Introduction

As implied by our earlier discussion, we consider it vital that each DSR paper that proposes a set of DPs as its major contribution will specify **the target community of practitioners** who are supposed to reuse those principles. This section introduces a framework for reusability evaluation of DPs by practitioners of the target community.

The framework comprises five criteria (shown in Fig. 1): (1) accessibility, (2) importance, (3) novelty and insightfulness, (4) actability and guidance, and (5) effectiveness. The framework is inspired by the dimensions of research relevance (accessibility, importance, suitability) in the method of applicability checks proposed by Rosemann and Vessey [21]. They target their method to traditional behavioral research – whether positivistic or interpretive in its origin – and, while artifacts can be included, their applicability is not specifically addressed.

Rosemann and Vessey [21] suggest seven steps for the applicability check. One step is preparing materials that describe the context, objectives, and expected utility of the research (no more than five pages). Keeping in mind the concept of DPs, we contend that they can be evaluated more independently of the research context in which they were originated. This allows lighter evaluation of their reusability than the process of applicability check in Rosemann and Vessey [21].

The first two criteria in Figure 1 correspond to the first two aspects of research relevance in Rosemann and Vessey [21]. They do not include the third dimension – novelty and insightfulness to practitioners - likely presuming that novelty and insightfulness to the scientific community imply novelty and insightfulness to the practitioner community, too. We do not see this assumption as self-evident. Referring to suitabil-

ity in Rosemann and Vessey [21], we distinguish between two aspects of it: actability and guidance on the one hand and effectiveness on the other hand. Actability means that the DPs can be acted and carried out in practice.

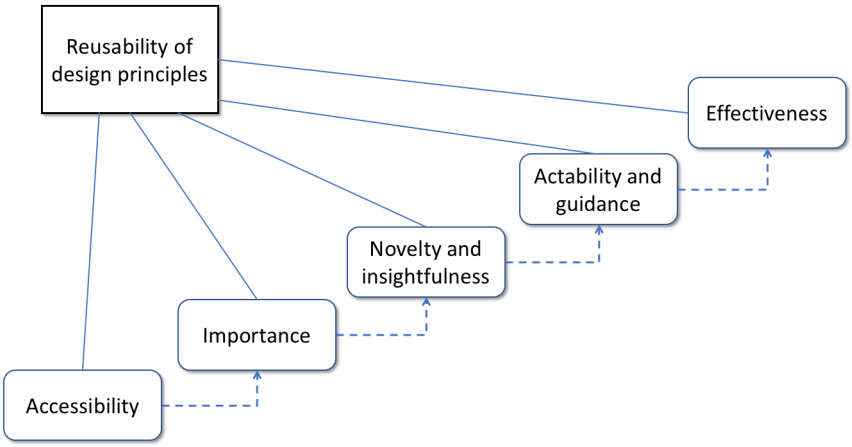


**Fig 1.** Criteria of reusability of design principles

The dotted arrows in Figure 1 suggest that the set of five criteria is not "flat", but their order is relevant: if interpreted dichotomously (Yes/No), the five criteria form an order so that if the answer to nth criterion is "no", all the remaining criteria are irrelevant. For example, in the case of novelty and insightfulness, if the set of DPs just confirms what is already known by the respondent, it cannot be expected to change the respondent's action and therefore to affect its effectiveness. Therefore, the actability and sufficient guidance is not an issue in this situation.

### 3.2 Accessibility

When considering accessibility of DPs, an essential question is if the members of the target community can understand and comprehend the principles and whether they are intelligible to them. To illustrate, DP2 in Seidel et al. [16], referring to "noticing" and "bracketing", is an example of a design principle that may not be clear to members of the target audience. If these concepts are not clear to ordinary practitioners, are they assumed to read and understand the whole article possibly continuing to Weick et al. [26] or can one reasonably expect that there will be intermediaries (e.g. consultants) who translate the DPs into a language more comprehensible to practitioners? If not, there is a clear danger that DPs remain unnoticed by the practitioners. As a consequence, we see it important that DPs – if not written in plain English in scientific articles – would have a practitioner-oriented version, in which the principles are briefly explained using a language accessible to the target community of practitioners.

### 3.3 Importance

The instances of the class of artifacts, which the proposed set of DPs helps to create [18], should be important in practice. Generally speaking, DSR can be assumed to increase the practical relevance of IS research, especially in Strategy 2 when taking in a close cooperation with client organizations [25]. However, contrary to Rosemann and Vessey [21], we contend that even close cooperation between researchers and practitioners cannot guarantee the practical relevance of research for two reasons. Firstly, numerous IS failures [27] demonstrate that even practitioners may fail to identify the real problem, construct appropriate requirements, implement the system technically, or to get the system accepted and used. If a DSR project attempts to build a system to address a heretofore unsolved problem [28], this risk of failure is still higher compared with (seemingly) routine IS development. Although a failed DSR project may lead to significant learning from the failure [29], lessons from it would mainly lead to negative mistakes to be avoided. Negative mistakes indicate specific, contextual experience that may not apply to practitioners, and this may in turn decrease their reusability due to lack of practitioners' interest. Secondly, practitioners within the same application domain may perceive the practical importance of the problem, the systems to address it, and the related DPs differently due to differences in their context (e.g. country and resources available) and situational factors (e.g. priority). These differences lead us to expect variation in practitioners' perceptions of importance of any set of DPs.

### 3.4 Novelty and insightfulness

In order to make a difference in practice, the proposed set of DPs as a whole should provide practitioners with new knowledge and insight, not only confirmation of what they already know. To exemplify, Lempinen et al. [30] provide an example of a set of two DPs where the novelty and insightfulness to practitioners may be questionable. Engaging stakeholders early and identifying their interests have been identified as an essential activity for conducting proper project management in most certifications (IPMA, PMI, etc.), for example.

According to our understanding, the novelty to practitioners has been forgotten in the DSR literature, most likely because the presumption that DSR contributes new and innovative artifacts [28] implies that they are new also to practitioners. Yet, it is important to keep in mind that what is new and innovative may differ in the case of researchers and practitioners. When reviewing DSR papers, their newness is usually evaluated by fellow researchers only. We therefore claim that evaluation of DPs should be extended to cover practitioners' perception of novelty too, i.e. whether they see the set of DPs novel and insightful.

### 3.5 Actability and appropriate guidance

Actability means that a design principle can be acted and carried out in practice, i.e. it is under the control of the practitioners in question and is realistic to be carried out.

As implied by Table 1, most DSR papers have tested the realism of those DPs that concern the system (i.e. principles of function and form [31]). Yet, one can conceive seemingly reasonable DPs, which are not necessarily realistic. As an example, many software engineering and information systems texts refer to "complete (user) requirements", implicitly suggesting a design principle to capture complete requirements. "Complete requirements" is not really realistic in many contexts, since requirements are socially negotiated [32].

Referring to the low number of DPs identified in most of DSR papers in Table 1, it is clear that the principles provide only partial knowledge for designing instances of the class or type of systems that the DPs claim to support. Chandra Kruse et al. [18] point out that all design principles comprise also tacit knowledge, implying that no set of codified DPs is sufficient for designing instances in question. Despite this inherent tacit knowledge component, target practitioners may still find the set of DPs to provide more or less sufficient guidance for the design problem when one takes into account the existing pre-knowledge and expertise among the members of the target community. A set of DPs interpreted literally on the other hand, may at least in principle be too restrictive, even though Chandra Kruse et al. [18] emphasize creative application of them. So, we see that they should be delicately balanced so that they provide sufficient guidance without being too restrictive. They should focus on the essential and distinctive aspects of the type of systems, the design of which they attempt to support, complementing the expected, general IS development knowledge of practitioners of the target community.

### 3.6 Effectiveness: Relative advantage and usefulness

Evaluation of effectiveness of DPs – i.e how they might affect the adopting unit's (e.g. an organization's or individual's) performance is a complicated issue. First, there is a question of how DPs affect the development process of the system in the adopter's context and then there is a question of how the instantiated system might affect the adopter's performance. Complete evaluation would require a naturalistic approach [33] so that a real instantiated system is used by real users in a real organizational context over a longer period so that possible effects of the system could be identified. One should note that even in this case it is extremely difficult to determine the influence of the system because numerous compounding factors affect the influence of the DPs on the adopter's performance.

Despite these difficulties, practitioners of the target community may be able to reasonably estimate – better than nothing - the potential relative advantage of a proposed system, especially if the instantiated system or its prototype can be demonstrated to them. It is also easier to evaluate the impact of DPs on the IS development (instantiation) process than their effect on the performance of the adopting unit. Depending on the task supported, the evaluation may take place in terms of criteria specific to the task. Meth et al. [11], for instance, used recall and precision of requirements mining from users to get their feedback about the usefulness of the system.

## 4 Discussion and Concluding Remarks

When analyzing DSR papers for their evaluation of reusability of DPs we found that the issue of DP reusability has been seriously neglected. To remedy the situation, we suggested a framework for light reusability evaluation of DPs. Next we will first contrast our framework with the frameworks for evaluation of design science research of Prat et al [34] and Venable et al. [33]. After that we will proceed to the question of how our light evaluation could be used in DSR.

Venable et al. [33] propose their FEDS framework for evaluation in design science. They distinguish naturalistic evaluation and artificial evaluation on the one hand and formative evaluation and summative evaluation on the other hand. The former distinction makes it possible to characterize the continuum of light and heavy evaluation. Naturalistic evaluation as outlined in [33] is a clear example of heavy evaluation. Artificial evaluations [33] may vary in their heaviness depending what aspects to be considered - people, system, situation – are real and what artificial or just surrogates (e.g. students representing real users or real practitioners). In our light version, the evaluation of DPs takes place in an artificial setting, by real practitioners, but not necessarily with a real instantiation of the principles in any system.

Venable et al. [33] do not specifically discuss the evaluation of DPs and thus do not suggest clear guidelines for the said evaluation. Actually, it is a little bit difficult to position our framework in their FEDS model. Since the light evaluation is predominantly artificial on the artificial-naturalistic dimension, and can be used both formatively and summatively, it would be a horizontal line on the artificial side, resembling the purely technical strategy in Venable et al. [33]. But – although predominantly artificial - the light evaluation of DPs does not focus on the technical issues as Venable et al. [33] assume artificial evaluations be oriented.

Prat et al. [34] develop a taxonomy of evaluation methods in DSR based on six dimensions of evaluation - criterion of evaluation, evaluation technique, form of evaluation, secondary participants, level of evaluation, and relativeness of evaluation – and based on their systematic analysis of 121 DSR papers published in the Senior Scholar Basket 8 journals. They do not specifically address evaluation of DPs but consider them to be IT artifacts. Referring to their dimensions, our light evaluation framework suggests an evaluation method that applies a question-based technique, is based on (subjective) perceptions in the case of form of evaluation, has practitioners (of the target community) as secondary participants, evaluates an abstract artifact in the case of level of evaluation, and is focused on either relative absence of comparable artifacts or relative to comparable artifacts. In the case of goals, Prat et al. [34] end up with a complex hierarchy of 34 criteria at the lowest level. As explained above, our light framework for the reusability evaluation of DPs by practitioners is based on five criteria, only actability and effectiveness having clear equivalents in Prat et al. [34].

Gregor and Hevner [35] emphasize flexibility in judging the needed evaluation in DSR papers, pointing out that mere “proof-of-concept” may be sufficient in the case of a very innovative artifact. Despite that, we contend that generally each DSR paper proposing DPs as its major contribution should have a minimum reusability evalua-

tion of the proposed principles. We believe that our framework is so light that it could serve as a standard of such minimum DP evaluation.

Fig. 2 exhibits the way of utilizing the proposed framework in the DSR process, supporting both research design, practical usability evaluation, paper authoring, and paper reviewing. As for research design, researchers aiming at a DSR paper with a set of DPs as its major contribution should be prepared to have at least a minimum reusability evaluation. We advise to recruit at least a small "sample" of members of the target community for participating in the evaluation. One possibility is to use members of local, regional, national or international professional associations or conference participants, for example.

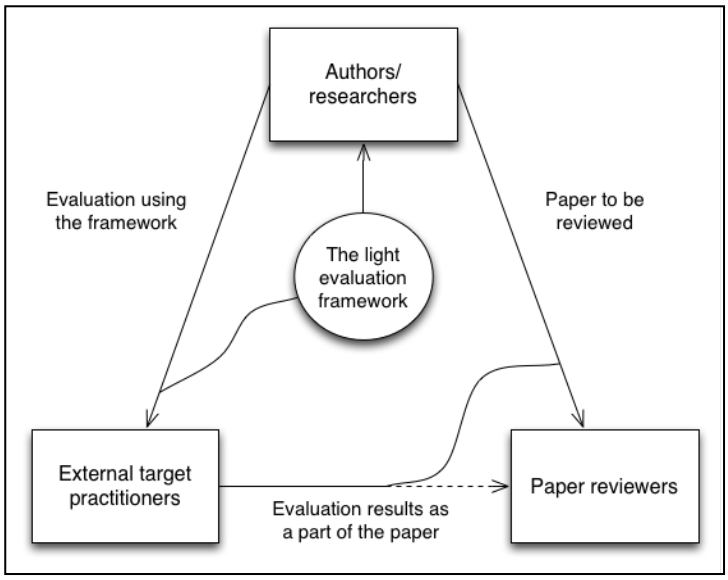


**Fig. 2.** Utilizing the light evaluation framework

The framework also aids reusability evaluation to be performed by authors involving real practitioners. It also eases the authoring DP papers by providing a standard for presenting evaluation results. If authors decide not to conduct even a minimum evaluation of their DPs, they should justify their decision in their manuscript.

Finally, the framework would aid reviewing. If accepted as a standard of minimum reusability evaluation, reviewers will have a clear idea that each paper suggesting DPs should have such an evaluation or similar. The inclusion of a concise and short summative, quantitative evaluation would also ease the reviewing process, especially for conferences where severe page limits inhibits extensive reporting of evaluations.

A clear weakness of our paper is that we have not evaluated the framework in any way. There are two issues in this evaluation. First, the framework is targeted to the research community of authors and reviewers and should be applicable to this target group. Second, our framework implies participation of practitioners in the evaluation.

As for the first issue, our framework is a design artifact in itself, and with slight imagination it can be expressed as a set of DPs (e.g. "When performing light reusability evaluation, evaluate first accessibility of the DPs to be evaluated" and so on). It means that the framework may recursively be applied to its own evaluation. So, we expect that reviewers as members of the research community conduct the first evaluation, i.e. whether they see the framework accessible, important, novel and insightful, actable and effective in promoting the practical relevance of DSR.

As for the second issue, we have included a questionnaire template for evaluating reusability of DPs in Appendix A. The template is based on general psychometric principles of measuring latent constructs (such as accessibility) primarily using reflective indicators [36]. The questionnaire template in its current form is not ready to be answered directly by practitioners but must be instantiated to take into account the type of the system, the set of DPs and possibly the context (e.g. nature of the organization) in which the DPs are to be reused. These may affect the effectiveness criteria to be used. To illustrate possible effectiveness criteria at a general level, Appendix A includes items of perceived usefulness [37] at the individual level and items of organizational effectiveness [38] at the organizational level. The items of effectiveness can be refined, concretized and extended, when deemed reasonable.

Once instantiated, the questionnaire can be used both formatively (to evaluate how to improve the DPs) and summatively (to evaluate the quality of the DPs). When used formatively the instantiation can serve as a semi-structured interview guide. When used as a summative quantitative evaluation, the psychometric properties (such as reliability and validity) of the questionnaire may be tested using standard procedures [36].

One purpose of the questionnaire template is to concretize our idea of light reusability evaluation. As a simple, quantitative evaluation, we expect completion time of practitioners to be at most 5-10 minutes. That can most certainly be considered *light*.

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# Appendix A

### A questionnaire template for light evaluation of reusability of design principles

The questionnaire should include a practitioner-oriented introduction of the design principles in terms of type (class) of system, the development (instantiation) of which they attempt to support (including proper introduction of the type of the system) (1-2 pages).

To what extent do you agree with the following statements (totally disagree, …, totally agree)?

**Accessibility**
- The design principles are easy for me to understand
- The design principles are easy for me to comprehend
- The design principles are intelligible to me

**Importance**
- In my view [Type X systems] address a real problem in my professional practice
- In my view [Type X systems] address an important - acute or foreseeable - problem in my professional practice

**Novelty and insightfulness**
- I find that the design principles convey new ideas to me
- I find the design principles insightful to my own practice

**Actability and appropriate guidance**
- I think that the design principles can be carried out in practice
- I find that the design principles provide sufficient guidance for designing [Type X systems]
- I find that the design principles provide sufficient direction for designing [Type X systems]
- I find that the design principles are not restrictive when designing [Type X systems]
- I find that that the design principles provide me with sufficient design freedom when designing [Type X systems]

**Effectiveness**
- I believe that the design principles can help design [Type X system] in practice
- I find the design principles useful for designing [Type X system] in practice
- Compared to my current situation, I believe that [Type X system] would improve my performance
- Compared to my current situation, I believe that [Type X system] would increase my productivity
- Compared to my current situation, I believe that [Type X system] would enhance my effectiveness in my job
- Compared to the current situation, I believe that [Type X systems] would increase the quantity of products/services of my organization/company
- Compared to the current situation, I believe that [Type X systems] would improve the quality of products/services of my organization/company
- Compared to the current situation, I believe that [Type X systems] would improve the innovativeness of my organization/company
- Compared to my current situation, I believe that [Type X systems] would improve the reputation of excellence of my organization/company

  Compared to my current situation, I believe that [Type X systems] would improve the job morale of my organization/company