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Intra-organizational Nudging: Designing a Label for Governing Local Decision-Making

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Abstract. Even though organizations may plan for long-term enterprise-wide objectives, they are shaped by local decision-maker's actions. The latter tend to have conflicting goals, such as short-term and immediate satisfaction of local business needs over organization-wide objectives. While local and diverse decision-making enables specialized products and services, ungoverned behavior may lead organizations that are hard to control and manage. Hence, the challenge is to harness, rather than eliminate decentral autonomy by reaping its benefits while limiting its downsides. Pursuing this purpose, this Design Science Research (DSR) study presents the creation and evaluation of a governance mechanism: a nudge-based label. It also contains a set of design features, which are evaluated quantitatively and qualitatively with expert surveys and discussions. The contributions include design knowledge about labels and the investigation of nudging as an intra-organizational governance mechanism.

Keywords: Complexity management · Local-global conflict · Behavioral alignment · Choice architecture · Nudging

1 Introduction

While increasing complexity of an organization's information systems (IS) inhibits its ability to adopt technological innovations, to innovate business models, or to satisfy new regulatory requirements [1], it can also enable products and services that are tailored to the needs of individual actors in such socio-technical systems [2]. Especially in large organizations, the mutually adaptive nature of business requirements and information technology (IT) enablement leads to an emergence of hardly controllable growth in complexity [3, 4]. Thereby, the arising challenge in IT governance (ITG, the processes that ensure effective and efficient use of IT to reach organizational goals [5]) does not consist of the elimination or suppression of local decision authority, but rather of finding effective ways to address the problems caused by the latter such as the inhibiting effect on controllability and manageability of enterprises [6]. Possible solutions should therefore reap the benefits of local decision authority, while moderating the evolution of the IT

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landscape [2], to achieve efficiency and effectiveness. Therewith, the research problem can be summarized as the need for means to guide individual and local decision-makers within organizations to act and decide in line with system-wide objectives in the context of hard-to-manage organizational systems.

This class of problems can be observed in non-organizational environments as well. Such domains include public health management, promoting political engagement, and societal welfare [7], where locally effective behavior is misaligned with system-wide interests. In these domains the application of insights from psychology to decision-making has gained significant interest, under the term of behavioral economics [8]. Therein, a general solution approach for guiding dispersed and unaligned behavior is to address the automatic system of the brain. The literature stream that specifically addresses the alignment of individual decision-making and behavior with system-wide objectives is choice architecture, as popularized by Thaler and Sunstein [7] and their nudge theory. Choice architecture reflects that individuals' specific choices depend upon the decision environment and thus the presentation of a choice [9]. Nudge theory advocates for small choice architecture interventions (nudges) to achieve desirable behavioral outcomes, based on reliably observed psychological effects [7].

Even though nudging has been found to be easy to implement, inexpensive, and applicable to a wide variety of domains [10], there is barely any research on how this solution could be applied in the intra-organizational environment. (One exception we found is [11].) Using the DSR approach, we design a nudge-based general solution to the issue of intra-organizational behavioral governance, by designing and evaluating a theory-informed label, for which we specified a suite of design features (DF). The contribution to practice includes ideas of implementation through both the visualized DFs and insights gathered from experts during the evaluation cycle. At the same time, there is a knowledge contribution to research in designing and evaluating a set of DFs and therefrom deducing design propositions, as well as in exploring the idea of using nudging in the intra-organizational context.

2 Theoretical Foundations

2.1 IT Governance

IT governance has become a vital part of businesses as they increasingly invest in technology [12]. These investments in IT and IS as well as the gain in size of organizations, increases complexity [13, 14]. The latter materializes in resistance, increased effort, and likelihood of failure to changing business models, operational processes, or IS [1, 6], thereby inhibiting adaptability of organizations and increasing the cost for changes. The latter is detrimental, since organizations need to be both efficient and flexible to survive in their environments [15]. However, complexity may also be a lever to adopt environmental changes [2] and to enable continuous innovation, which is why it may be harnessed, rather than eliminated [16, 17].

In corporate governance the focus of ITG is on the definition and implementation of "processes, structures, and relational mechanisms in the organization that enable both business and IT people to execute their responsibilities in support of business/IT alignment and the creation of business value from IT-enabled business investments"

[18]. Thus, ITG not only provides structure, but more importantly, effective ITG should include considerations as to how human behavior brings the whole together [19]. Operationally, ITG mechanisms are used to produce IT-related decision and behavioral patterns that align with organizational goals [20]. These mechanisms include decision process designs, policies that guide these processes, definition of accountabilities, etc. [20]. It is believed that ensuring compliance with sanctioned policies, procedures and guidelines yield effective ITG outcomes [20]. Thus, reflective thought processes have been thought to be effective levers to induce behavioral change [8]. However, this leaves substantial parts of the behavioral variance in individuals unexplained [21]. Behavioral economics can bridge the gap by applying evidence from psychology to models of decision-making [8]. In that regard, nudging may be an effective solution to align dispersed behavior in the sense of ITG goals.

2.2 Nudge Theory

The issue of dispersed behavior that may negatively affect a system if it is not properly aligned with system-wide interests, is known in various domains such as politics, public health, and social security systems. In those environments, the concept of decision architecture, as a means of shaping decision making, has been readily used over the past decade as an alternative local view. The nudge theory [7] posits that habits and cognitive limitations may be strategically used to change decision environments ever so slightly to achieve desirable outcomes. The theory thereby relies on insights from reflexive cognitive processes [22], also known as heuristics and cognitive biases [23], or psychological effects [24]. Unlike traditional control-based interventions, nudges only marginally change the decision environment to alter “people’s behavior in a predictable way without forbidding any options or significantly changing their economic incentives” [7]. While nudging seems to be an effective and efficient way of guiding individual behavior in various domains [10], current research on nudging does not cover intra-organizational environments yet. However, based on its underlying premise that nudges take advantage of human heuristics and biases, it seems reasonable to expect nudging to work on employees in intra-organizational environments as well.

2.3 Psychological Effects in Nudging Literature

Mirsch et al.’s [24] comprehensive literature review on relevant psychological effects for nudging in the physical and digital sphere revealed the twenty most frequently used psychological effects in extant literature. For the design of our nudge-based intervention we have selected all effects that were used at least in five publications. Upon further investigation, we found that the effects of ‘hyperbolic discounting’ and ‘discounting’ are of low relevance to our use case, and we therefore excluded these two effects. This has left us with these seven psychological effects:

Framing, governs decision-makers by means of a purposefully designed decision frame that takes advantages of psychological principles to induce a predictable shift in decision preferences [25]. As an example, [25] framed a decision problem by describing it in two semantically different ways. One was positively framed (save X of Y lives), whereas the other was negatively framed (Z of Y people die). While the outcomes where the same (Y – X = Z), people responded differently depending on how the question was framed. Since then, many studies confirmed this effect [e.g., 26, 27–29].

The *status quo bias*, makes use of individuals' tendency to maintain the current status. The strong desire to remain with the current status quo is rooted in the tendency to overestimate the discomfort of accepting change as well as to underestimate the potential benefits that change may bring [30]. Providing default options is a typical [24] and effective [31] application of how this effect is used to nudge decision-makers.

Social norms is a term to describe "rules and standards that are understood by members of a group and that guide and/or constrain social behavior without the force of laws" [32]. As a result, people "orient towards the behavior of others" [24] in order to avoid sanctions form their social networks [32]. A well-known example of a social norm nudge is the "Most of us wear seatbelts" campaign by the Montana Department of Transportation, which led to higher use of safety belts in cars.

Loss aversion refers to a psychological effect that individuals' decisions tend to be influenced more strongly by the prospect of negative outcomes than positive ones [30]. Nudging implementations include a statement on the popularity of certain limited offers or adding that a certain offer is only available on a specified day. This may trigger a feeling of loss, unless the opportunity is grasped and the purchase is made [24].

Anchoring and adjustment refers to the fact that individuals lacking reference points tend to estimate values based on cues in their decision environments [23]. Providing individuals with reference points allows them to compare different situations and choices [24]. Whereas a person may not know whether a specific dishwasher is efficient or not, when provided with an efficiency label as a starting point (see Sect. 2.4), they 'anchor' their judgments on relative distances to that reference point [e.g., 33].

Priming is an effect that "can be described as the preparation of individuals for the decision moment by gently leading them to the decision" [24]. One operationalization of this effect is to elicit intentions beforehand [e.g., "Do you intend to vote?", cf. 34].

Lastly, *availability heuristics* describe changes in individual perceptions based on the ease at which one can recall a certain event [24]. People perceive the probability of a certain event to occur as higher if the latter is mentioned frequently or recently [35].

2.4 Energy Efficiency Labels

In this paper, the term label is used to refer to decision information nudges [36] that intend to alter individual decision outcomes by providing succinct disclosure on certain decision-relevant aspects [37]. One of the most successful label types are standardized energy efficiency labels for e.g., dishwashers, washing machines, or fridges [38]. They have been found to be particularly effective in aligning individual decisions with desirable societal goals [39]. Therefore, and because labels (as a low intrusive intervention) were found to have high acceptance, we used generalized design knowledge on energy efficiency labels as a starting point for our design.

The developments and findings on energy labelling research were synthesized from [39] and the design knowledge can be summarized as follows:

1. New energy labels should be designed through end-user-based market research.
2. Comparative energy labelling is perceived as being helpful in decision making.

3. Comparative scales are more easily understood than technical information only.
4. Discrete categories illustrate comparisons more effectively than continuous scales.
5. Adding primary consumption figures (e.g., kWh) comparative scales is helpful.
6. Using colors to exploit their strong connotations is helpful to foster understanding.
7. Information should be carefully organized to avoid overload and poor structure.
8. The adoption of a well-known label design cannot be assumed to be effective in a new environment. It should be confirmed through research beforehand.

Since labelling was found to solve the generic problem class, and energy efficiency labels seem to be highly effective, the subsequent artifact construction will take these findings as a foundation for designing principles that guide the design of the artifact. The next section addresses the past efforts that exist in bringing the label from its public application environment into organizations as a tool to align employee behavior.

2.5 An Example of a Label Used in the Intra-organizational Environment

Little qualified research on the design and use of labels within organizations exist. The same is true for nudging (see above). Study [11] addresses this gap between very successful use cases in the public domain (i.e., guiding individual behavior for the public good) and the lack of exaptation of such solutions to the intra-organizational domain (i.e., guiding employee behavior toward organizational goals). They designed an Enterprise Architecture (EA) label that nudges local decision makers to opt for choices that favor an enterprise-wide perspective. Similar to the case of a label for ITG, the EA label was designed to solve the local-global conflict where local decision makers should opt for IS design alternatives that are aligned with EA goals.

Paper [11] emerged with design knowledge that is also relevant to this paper's objectives. First, in order for the label to be perceived as a nudge rather than a measurement system for quantified performance, designers should favor simplicity over absolute accuracy. Second, they employed several measures, which were aggregated with equal weights to an overall score. The equal weighting created transparency for local decision-makers, which was perceived as beneficial.

3 Method

To design an ITG mechanism for aligning individual decision making with organizational objectives, we opted for a research approach that follows DSR principles. DSR is well established in the field of IS [40–42], and its purpose is to extend organizational and human capabilities through the creation of new artifacts [43].

3.1 The DSR-Approach

The DSR process builds on existing theory, where established knowledge serves as an input informing the design [41, 43]. Thereby both descriptive and prescriptive knowledge is used to inform the researchers about the object of investigation and the design process respectively. While there are various reference processes and guidelines on how to conduct DSR [40, 42], the framework from Hevner, March [43] is the most cited one [44]. Hevner's three cycle view [45] is an improved and more detailed version of that framework [46], which is why rely on the latter. The process consists of three research cycles: the relevance, rigor and design cycle [45].

The *relevance cycle* initiates DSR by providing research requirements and an application context. In this paper, the application context is motivated in the introduction and conceptually discussed in Sect. 2. Some researchers explicitly translate the knowledge of the problem into (meta) requirements [47], whereas in other papers the inclusion is implicit [48]. In a later step this cycle defines acceptance criteria to evaluate the research results [45, 46]. According to Dresch, Pacheco Lacerda [42] the implementation of an artifact in DSR is not a mandatory step. Due to the great effort in terms of time and costs to field test the artifact, this study does not yet include the evaluation in an application context but features a conceptual evaluation with practitioners.

The *rigor cycle* is a feedback loop to "provide past knowledge to the research project to ensure its innovation" [45]. Grounding DSR can be achieved by including additional knowledge on the problems, existing artifacts, analogies/metaphors, and theories [45]. For this paper, the knowledge base is provided in Sect. 2 and its inclusion in design and development activities is reported on in Sect. 4. The knowledge base will be enhanced by extensions to existing theories (nudging) and design knowledge (labels).

The *design cycle* represents the core of the DSR model [45] and requires the most effort. In this step, artifacts are designed and rigorously evaluated before releasing them to field testing as part of the relevance cycle. The design is explicated in more detail in Sects. 3.2 and 4, while the evaluation is presented in Sects. 3.3 and 5.

3.2 Design and Development Procedures

The procedures that led to the designed artefacts (i.e., design features and design principles) followed four phases: First, (1) we harnessed the existing knowledge bases by searching the literature on the problem (intra-organizational behavioral alignment, see Sect. 1, and ITG, see Sect. 2.1), a possible solution approach (nudging, see Sect. 2.2), known design options within nudging (see psychological effects in Sect. 2.3), and known prescriptive knowledge about a suitable carrier for such nudges (energy efficiency labels, see Sect. 2.4). In the second phase (2) we derived an initial set of design principles for creating a label. Thereafter, (3) we compiled the existing knowledge and an existing label design [11] (see Fig. 1) as a starting point for the design and development of our own label. The actual design phase (4) was based on several workshops during which we iterated between brainstorming and evaluation phases. Thus, design ideas were freely shared, before comparing the knowledge bases from step 3 with these ideas, which ultimately led to the emergence of the designed artefact.

3.3 Evaluation Procedures

To evaluate our artefact (i.e., the design features) and to solidify our design principles, we have opted for two types of evaluation: A quantitative survey and a qualitative expert discussion. Both took place at practitioner workshops, where the artefact and a scenario of its application was presented, before inviting the experts to partake in an electronic survey with evaluation questions on each of the design features (measurements on 7-point Likert scales). To enhance the insights from the quantitative evaluation, a qualitative discussion ensued directly after the collection of the data. We simultaneously visualized the results and used the visualizations to spur discussions to make sense of the data together. We implemented this explanatory mixed-method design at three workshops with experts from practice in the domains of enterprise architecture management, information systems management, and production management—all of which are regularly confronted with managing the local-global conflict within their organizations. The same procedure was used in all workshops (more detail in Sect. 5).

4 Artefact Development

4.1 Transfer of Existing Knowledge

Based on the knowledge outlined in Sect. 2, we initially transferred the learnings from existing research to the specific case an ITG label by deriving design principles. The following design principles (DP) emerged (in parentheses, the number of the respective statement from Sect. 2.4 is provided).

- DP1: Comparative elements should be included. (2)
- DP2: Comparison should not be solely based on technical information. (3)
- DP3: Discrete categories for comparative elements should exist. (4)
- DP4: Quantitative measures outlined in addition to comparative scales should be included. (5)
- DP5: Colors with strong connotations should be used to foster understanding. (6)
- DP6: Information should be carefully organized. (7)
- DP7: Excessive information should be avoided. (7)

4.2 Starting Point

The starting point for developing the set of DFs was the knowledge base as described above, including the most commonly used psychological effects, knowledge on nudging and the creation of a label, the derived DPs, and a label for a related context [11] (see Fig. 1). Based on the psychological effects presented above, we analyzed that existing label and identified three different underlying psychological effects: The overall rating represented as a classification (A to F) and the belt (red to green), are graphical representations of anchoring and adjustment, since they provide reference points. The second effect is loss aversion, which can be seen in the display of the trend. Displaying a (negative) trend can nudge people to exert additional effort to prevent losing their current rating. Lastly, the whole label can be considered to contribute to a framing effect as the choice of the contents of the label frames the interpretation of its message. With this information stack as a starting point, we have iteratively designed the following set of ten design features.

4.3 Design Features

As described in Sect. 3.2, we have had several workshops among the co-authors of this paper, during which we iteratively developed the design features of our proposed label. The final result can be seen in Fig. 2. Its constituents are the following:

DF1 is adapted from [11] and the Energy Label of the European Union [39]. It relies on the anchoring and adjustment mechanism. It displays the overall rating of the local entity and summarizes the individual measurement items in discrete categories (DP3). Its meaning is underlined by a color scale where red is associated with a bad, and green with a good score (DP5).

DF2 provides an overview of the rating distribution among the different local entities, allowing individuals to more accurately compare their rating with peers (DP2–3).

DF3 is a quantitative measure that indicates the likelihood to lose the current rating for the worse (DP4), which represents the psychological effect of loss aversion.

DF4 is a multitude of measurement items (in this case two are displayed for illustration, DP4). This informs users about the underlying mechanisms that lead to the overall rating, which establishes understanding and clarity, while also framing the label such that certain sub-aspects are made explicitly salient. Thereby, each measurement item is delimited by a box, which should help structure and organize the contents (DP 6).

The boxes with measurement items contain DF5, DF6, and DF7. In DF5, a belt ranging from red to green color (DP5) indicates a low or high performance and makes it possible to evaluate the achieved value XY. Therefore, DF5 is a graphical display for the anchoring and adjustment effect (DP1). DF6 (grey triangle) is an operationalization of the social norms effect and shows the average performance of the peer group for the specific performance indicator. This allows for additional comparison (DP1–2) and, in case of comparably poor scores, motivates individuals to increase their effort to reduce social pressure. The last feature in the boxes of measurement items are the trends (DF7), which implement the effect of loss aversion. The arrows aim at displaying the trend for an individual performance indicator over the last periods (DP2). Thereby, colors are used to indicate their desirability (DP5).

DF8–DF10 are mainly text-based. DF8 is a default selection for corrective actions and will be set by the global entity (e.g., enterprise architects) (DP2). The local entity (i.e., the decision-maker) then has to actively opt for another action, if it is not willing to implement the suggestion. Hence, DF8 represents the status quo bias. However, DF8 can also be seen as a form of priming, since it prepares the local entity for a decision.

DF9 displays best practices and is an example for social norms and the priming effect. It aims to nudge local entities towards an action that has been performed successfully by peers, by raising social pressure and preparing for a specific decision (DP2).

DF10 is an operationalization of the psychological effect of availability heuristic, as it shows past incidents and raises awareness among local entities. Thus, individuals may judge the probability of such incidents occurring as higher than others (DP2) and are more likely to work against them.

To keep the label understandable, trustworthy, and simple (DP6, DP7), the different DFs are arranged by following a top-to-bottom approach: First displaying the DFs that show an overall rating. Next, single measurement DFs elaborating on the overall rating, followed by additional informational DFs that are not necessarily relevant for the overall rating. This arrangement itself has the psychological effect of framing.

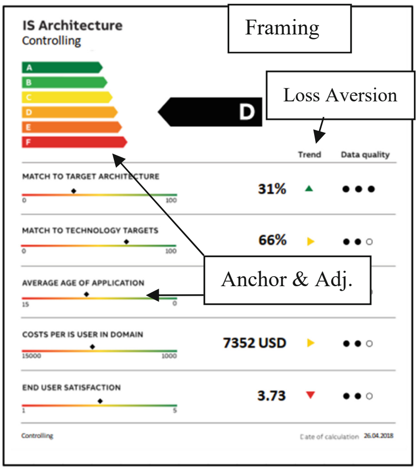

Fig. 1. Identification of psychological effects, see Schilling, Aier [11]

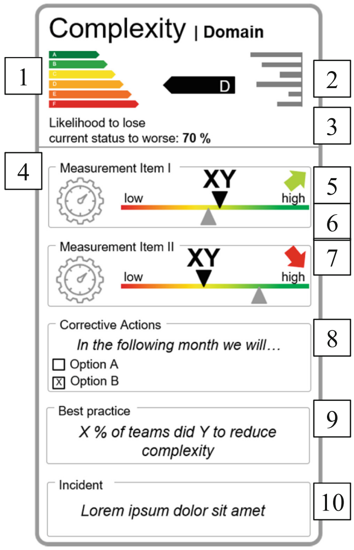

Fig. 2. Label with the ten DFs

5 Evaluation

Our evaluation of the DFs comprises quantitative and qualitative analyses. We quantitatively surveyed experts on the perceived effectiveness of the DFs, before confronting them with the results of the survey in a qualitative group discussion to interpret the data.

5.1 Quantitative Expert Survey

To evaluate the effectiveness DFs in aligning local actors' decisions with global objectives of an organization, we created an electronic survey and proceeded as follows:

Phase 1: General Introduction. In the first phase the participants were shortly introduced to the problem of behavioral alignment in ITG by means of nudges in general and a designed label in particular. In case of unclarities, the experts could ask questions.

Phase 2: Provision of a Scenario. In order to increase the shared understanding for the specific application of the label and thus the potential usefulness and effectiveness of the DFs, the participants were provided with a scenario that operationalizes the problem. In that scenario, two decision options (A vs. B) were presented, where B aligned with organization-wide goals and A primarily serves local decision-makers.

Phase 3: Data Collection. Each individual DF was presented and explained by one co-author such that its operationalization for the specific scenario became apparent. For each DF, the participants were asked to respond anonymously through an online survey to the following question: "Is this design element effective and thus suitable to nudge local decision makers to opt for the enterprise-wide desirable outcome (option B)?" Responses were gathered on a 7-point Likert scale ranging from 1 (very ineffective) to 7 (highly effective).

The workshops took place in October and November 2019 in Switzerland and Germany. Since participation was voluntary, not all participants responded to the survey (workshop 1: 44/52 attendants (84.6%); workshop 2: 10/12 (83.3%); workshop 3: 11/15 (73.3%)). The experts were highly experienced, with many of them having more than ten years (45%) and most of them (72%) having more than five years of experience in their current field of work. The overall average of the ratings for the DFs was 4.87 out of 7 and each question was answered by 63 to 66 experts. The descriptive statistics of the individual effectiveness assessments of the DFs are ordered according to the mean effectiveness votes in Table 1.

Apart from DF3, all DFs were assessed to be above average (>4.0). However, it is apparent that DF1, DF4, and DF5 are judged to be highly effective and DF6 and DF7 are also highly rated. Together, these DFs engender the design principles DP1-DP6. DP7 (not featuring excessive information) is necessarily dependent on the combination of DFs. In that regard, the question of how much information is 'excessive' needs to be determined. This, among others, was part of the qualitative discussions.

Table 1. Description of quantitative survey data including results from the factor analysis.

Effectiveness rating	N	Mean	STD	F1	F2	F3	F4
DF4: Split into individual items	66	5.47	1.459			0.61	
DF1: Rating	64	5.33	1.624				0.93
DF5: Colored belt	65	5.26	1.482			0.93	
DF6: Average of all entities	66	5.02	1.583		0.60		
DF7: Trend	66	5.00	1.608		0.59		
DF8: Measures for improvement	66	4.86	1.654	0.76			
DF2: Comparison of rating distribution	63	4.86	1.848		0.81		
DF10: Issues in the past	66	4.52	1.825	0.67			
DF9: Best practice suggestion	65	4.40	1.748	0.82			
DF3: Probability of losing current rating	63	3.97	1.732		0.73		

A factor analysis to identify types of DFs has yielded four factors (F): F1 contains DF8–DF10, which are the text-based DFs. F2 contains DF2–3 and DF6–7, which are the comparative DFs (between periods and/or entities). F3 contains DF4–5, which split the overall rating (DF1) into more detailed measures. F4 only contains DF1, the overall rating, underlining its relevance and unique nature.

5.2 Qualitative Expert Discussion

The responses from the quantitative survey were visualized as histograms (distribution of votes on the 7-point Likert scale per DF) and bar diagrams (relative effectiveness rating between the DFs) as the foundation for the discussions to interpret the data. At each of the three workshops, two of the co-authors took notes on the insights provided by the participants. In case of unclarity, the participants were asked to elaborate. The qualitative data gathered in this way was thereafter summarized and aggregated into four additional design principles. Hence, the main findings from the qualitative expert discussions can be summarized as follows:

- DP8: It should be clear to users how the components of the rating are built. (Explanation: If employees do not understand how the rating is built, the credibility and thus the effectiveness of the label is low).
- DP9: A label should be very simple. (Explanation: Understandability is more important than completeness. A focus on some objectives, e.g., 3–4 design elements, may be beneficial in gaining approval of the measures and to avoid selection and discussions about relevance (DP7). As a minimum, DF1 and DF5 may suffice).
- DP10: Text-based DFs must be relevant for the specific local entity. (Explanation: While the ideas of measures for improvement (DF8), best practice examples (DF9), and information about incidents (DF10) are perceived to be conceptually interesting, their implementation was judged to be difficult, since their success depends on their suitability for each individual. It is crucial that users can directly relate to them).
- DP11: Each label has to be designed with and for the intended userbase. (Explanation: Finding the right measurement items was deemed a core difficulty in operationalizing the DFs shown at the workshops. This seems challenging, not only for text-based DFs, but DFs in general. Our findings back the earlier finding that labels are more effective when designed in collaboration with its target audience [39]).

The idea of introducing a label into the intra-organizational context has been well perceived. However, participants voiced concerns regarding the operationalization of the DFs. This is in line with previous findings requiring new labels to be designed along with end-user-based market research [39].

6 Discussion

This study has set out to create design knowledge toward solving the problem of misalignment between individual (local) behavior and organizational (global) goals, which—in the context of mutually adaptive business requirements and IT enablement—leads to a hardly controllable growth of complexity in IT governance. Therefore, extant knowledge on how to influence individual decisions toward system-wide objectives was combined with design knowledge on how this problem class is addressed in other domains to develop DFs for a governance label that carries nudges.

The design process has yielded a label with ten distinct DFs, based on well-established psychological effects in the choice architecture literature and knowledge on how to create an effective label. The evaluation of the DFs was conducted at three workshops with experts in managing such local-global conflicts within organizations. At each workshop, the effectiveness of the artifacts (DFs) was quantitatively assessed first, and qualitatively discussed afterwards.

The main findings of this DSR study includes the design of ten semi-abstract design features (see Fig. 2) that may serve as a baseline set of features for label designers. However, the latter must adapt and specify these DFs together with prospective users to the specific application context.

Furthermore, this study has brought forward a set of eleven design principles (DP) for the design of labels in the intra-organizational environment. Seven DPs were transferred from the existing bases of knowledge (Sect. 4.1). The remaining four DPs stem from the qualitative discussions with experts (Sect. 5.2).

The main findings furthermore include that visually implemented DFs are more effective than text-based ones, and the expected effectiveness for the ten DFs created in this study is heterogeneous. Furthermore, a label should be simple and therefore limited in scope. Otherwise, local decision-makers may distrust the label's accuracy, argue about the various DFs' relative importance, misunderstand it, and potentially disregard it. Combining the findings on the relative expected effectiveness of the DFs (quantitative surveys) and the strong request to focus on a lower number of DFs (qualitative discussions), as well as the design principles that informed the label design in the first place, we conclude that an effective label should focus on a small selection of simple-to-understand DFs.

Having positioned the abstraction level of the artifact such that the DFs are not directly applicable but must first be 'translated' to a specific setting is certainly a limitation of this study. The evaluation revealed that the effective operationalization of the DFs (and in particular the text-based ones) is highly challenging. Furthermore, the findings are limited to solve the problem of guiding individual behavior towards organizational objectives. The creation of a full-blown design theory (level 3 contribution) is out of scope for this paper and the design knowledge created from a very situated solution (level 1) would not sufficiently contribute to solving the research problem. Therefore, the level 2 contribution type was deemed suitable for this paper [41].

Another major limitation, due to time and effort constraints, is the fact that the artifacts were not translated and tested in the real application domain.

In future studies, these limitations may be addressed by translating the design knowledge created throughout this DSR project (i.e., the design principles and the suggested design features) together with organizations to test its effectiveness. Since this would entail interventions with real employees, ethical concerns should be addressed as well. Based on the insights that may be drawn from such studies, a more complete design theory for the design of a nudge-based ITG mechanisms may arise.

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References

1. Buckl, S., Ernst, A.M., Matthes, F., Schweda, C.M.: How to make your enterprise architecture management endeavor fail! In: 16th Conference on Pattern Languages of Programs (PLoP 2010), Chicago, USA (2010)
2. Axelrod, R., Cohen, M.D.: Harnessing Complexity: Organizational Implications of a Scientific Frontier. Free Press, New York (1999)
3. Allen, P.M., Varga, L.: A co-evolutionary complex systems perspective on information systems. J. Inf. Technol. **21**(4), 229–238 (2006)
4. Allen, P.M., McGlade, J.M.: Evolutionary drive: the effect of microscopic diversity, error making, and noise. Found. Phys. **17**(7), 723–738 (1987)
5. Gartner: IT Governance (ITG). Information Technology Glossary. https://www.gartner.com/en/information-technology/glossary/it-governance. Accessed 01 June 2021
6. Bernus, P., et al.: Enterprise engineering and management at the crossroads. Comput. Ind. **79**, 87–102 (2016)
7. Thaler, R.H., Sunstein, C.R.: Nudge. Improving Decisions About Health, Wealth and Happiness. Penguin, London (2008)
8. Dolan, P., Hallsworth, M., Halpern, D., King, D., Metcalfe, R., Vlaev, I.: Influencing behaviour: the mindspace way. J. Econ. Psychol. **33**(1), 264–277 (2012)
9. Johnson, E.J., et al.: Beyond nudges: tools of a choice architecture. Mark. Lett. **23**(2), 487–504 (2012)
10. Szaszi, B., Palinkas, A., Palfi, B., Szollosi, A., Aczel, B.: A systematic scoping review of the choice architecture movement: toward understanding when and why nudges work. J. Behav. Decis. Mak. **31**(3), 355–366 (2018)
11. Schilling, R.D., Aier, S., Winter, R.: Designing an artifact for informal control in enterprise architecture management. In: Proceedings of the 40th International Conference on Information Systems (ICIS 2019), Munich, Germany (2019)
12. Almeida, R., Pereira, R., Mira da Silva, M.: IT governance mechanisms: a literature review. In: Falcão e Cunha, J., Snene, M., Nóvoa, H. (eds.) IESS 2013. LNBIP, vol. 143, pp. 186–199. Springer, Heidelberg (2013). https://doi.org/10.1007/978-3-642-36356-6_14
13. Ciborra, C.U., et al.: From Control to Drift: The Dynamics of Corporate Information Infastructures. Oxford University Press, Oxford (2000)
14. Henfridsson, O., Bygstad, B.: The generative mechanisms of digital infrastructure evolution. MIS Q. **37**(3), 907–931 (2013)
15. Davis, J.P., Eisenhardt, K.M., Bingham, C.B.: Optimal structure, market dynamism, and the strategy of simple rules. Adm. Sci. Q. **54**, 413–452 (2009)
16. Brown, S.L., Eisenhardt, K.M.: The art of continuous change: linking complexity theory and time-paced evolution in relentlessly shifting organizations. Adm. Sci. Q. **42**(1), 1–34 (1997)
17. Garud, R., Tuertscher, P., Van De Ven, A.H.: Perspectives on innovation processes. Acad. Manag. Ann. **7**(1), 775–819 (2013)
18. Van Grembergen, W., De Haes, S.: Enterprise Governance of Information Technology: Achieving Strategic Alignment and Value. Springer, Heidelberg (2009)
19. Wilkin, C.L., Chenhall, R.H.: A review of IT governance: a taxonomy to inform accounting information systems. J. Inf. Syst. **24**(2), 107–146 (2010)
20. Huang, R., Zmud, R.W., Price, R.L.: Influencing the effectiveness of IT governance practices through steering committees and communication policies. Eur. J. Inf. Syst. **19**, 288–302 (2010)
21. Webb, T.L., Sheeran, P.: Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. Psychol. Bull. **132**(2), 249–268 (2006)
22. Oliver, A.: From nudging to budging: using behavioural economics to inform public sector policy. J. Soc. Policy **42**(4), 685–700 (2013)

23. Tversky, A., Kahneman, D.: Judgment under uncertainty: heuristics and biases. Science **185**(4157), 1124–1131 (1974)
24. Mirsch, T., Lehrer, C., Jung, R.: Digital nudging: altering user behavior in digital environments. In: 13th International Conference on Wirtschaftsinformatik (WI 2017), St. Gallen, Switzerland (2017)
25. Tversky, A., Kahneman, D.: The framing of decisions and the psychology of choice. Science **211**(4481), 453–458 (1981)
26. Gong, J., Zhang, Y., Feng, J., Huang, Y., Wei, Y., Zhang, W.: Influence of framing on medical decision making. EXCLI J. **12**, 20 (2013)
27. Goh, K.H., Bockstedt, J.C.: The framing effects of multipart pricing on consumer purchasing behavior of customized information good bundles. Inf. Syst. Res. **24**(2), 334–351 (2013)
28. Guthrie, J., Mancino, L., Lin, C.-T.J.: Nudging consumers toward better food choices: policy approaches to changing food consumption behaviors. Psychol. Mark. **32**(5), 501–511 (2015)
29. Lehner, M., Mont, O., Heiskanen, E.: Nudging–a promising tool for sustainable consumption behaviour? J. Clean. Prod. **134**, 166–177 (2016)
30. Kahneman, D., Knetsch, J.L., Thaler, R.H.: Anomalies: the endowment effect, loss aversion, and status quo bias. J. Econ. Perspect. **5**(1), 193–206 (1991)
31. Hummel, D., Maedche, A.: How effective is nudging? A quantitative review on the effect sizes and limits of empirical nudging studies. J. Behav. Exp. Econ. **80**, 47–58 (2019)
32. Cialdini, R.B., Goldstein, N.J.: Social influence: compliance and conformity. Annu. Rev. Psychol. **55**(1), 591–621 (2004)
33. Ölander, F., Thøgersen, J.: Informing versus nudging in environmental policy. J. Consum. Policy **37**(3), 341–356 (2014). https://doi.org/10.1007/s10603-014-9256-2
34. Sunstein, C.R.: Nudging: a very short guide. J. Consum. Policy **37**(4), 583–588 (2014). https://doi.org/10.1007/s10603-014-9273-1
35. Stewart, N., Chater, N., Brown, G.D.: Decision by sampling. Cogn. Psychol. **53**(1), 1–26 (2006)
36. Münscher, R., Vetter, M., Scheuerle, T.: A review and taxonomy of choice architecture techniques. J. Behav. Decis. Mak. **29**(5), 511–524 (2016)
37. Codagnone, C., et al.: Labels as nudges? An experimental study of car eco-labels. Econ. Polit. **33**(3), 403–432 (2016)
38. Heinzle, S.L., Wüstenhagen, R.: Dynamic adjustment of eco-labeling schemes and consumer choice-the revision of the EU energy label as a missed opportunity? Bus. Strateg. Environ. **21**(1), 60–70 (2012)
39. Egan, C., Waide, P.: A multi-country comparative evaluation of labelling research. In: European Council for an Energy Efficient Economy (ECEEE) 2005 Summer Study Proceedings, pp. 811–822 (2005)
40. Winter, R.: Design science research in Europe. Eur. J. Inf. Syst. **17**(5), 470–475 (2008)
41. Gregor, S., Hevner, A.R.: Positioning and presenting design science research for maximum impact. MIS Q. **37**(2), 337–355 (2013)
42. Dresch, A., Pacheco Lacerda, D., Valle Antunes Jr., J.A.: Design Science Research. Springer, Cham (2015). https://doi.org/10.1007/978-3-319-07374-3
43. Hevner, A.R., March, S.T., Park, J., Ram, S.: Design science in information systems research. MIS Q. **28**(1), 75–105 (2004)
44. Hjalmarsson, A., Rudmark, D., Lind, M.: When designers are not in control – experiences from using action research to improve researcher-developer collaboration in design science research. In: Winter, R., Zhao, J.L., Aier, S. (eds.) DESRIST 2010. LNCS, vol. 6105, pp. 1–15. Springer, Heidelberg (2010). https://doi.org/10.1007/978-3-642-13335-0_1
45. Hevner, A.R.: A three cycle view of design science research. Scand. J. Inf. Syst. **19**(2), 87–92 (2007)

46. Hevner, A.R., Chatterjee, S.: Design Research in Information Systems: Theory and Practice. Integrated Series in Information Systems, vol. 22. Springer, Dordrecht, Heidelberg, London, New York (2010)
47. Eekels, J., Roozenburg, N.F.M.: A methodological comparison of the structures of scientific research and engineering design: their similarities and differences. Design Stud. **12**(4), 197–203 (1991)
48. Peffers, K., Tuunanen, T., Rothenberger, M., Chatterjee, S.: A design science research methodology for information systems research. J. Manag. Inf. Syst. **24**(3), 45–77 (2007)