Conceptual Model of Stakeholders' Investment-Engagement in Public Services' Design

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Abstract. Public sector organisations increasingly engage people in collaborative designing of public services and highlight the benefits of public involvement. However, users' and other stakeholders' contribution in the design process are seldom accounted for. In this paper, we address the challenges of public service development by presenting a study that conceptualises different stakeholders' investments in design activities. We introduce the key elements of a new conceptual Stakeholder Investment-Engagement (SI-E) Model and provide a tentative application of it to an existing case of a Digital Library. The initial application shows that the model can uncover significant effort that end-users and partners invest in design activities. The new conceptual model enriches our theoretical and practical understanding of collaborative design management by recommending 1) critical examination of existing conceptualisations and practices of cost-justification in the public sector, 2) acknowledgement of various stakeholders' investments, and 3) temporal evaluation of stakeholders' engagement to design activities.

Keywords: Public sector, collaborative design, public services, cost-justification, stakeholders, investment, temporalities, engagement.

1   Introduction

Involvement of citizens, peers and other external resources in the development and production of public services is generally perceived beneficial for both the process and the outcome. The advantages of stakeholder involvement are widely described in policies and academic literature. First, citizen participation is considered essential when new services are developed for meeting emerging and evolving societal needs [1–3]. Service users, who are the experts of their community and its practices, are considered as an invaluable resource in the design of novel services [4]. Further, the involvement of stakeholders in the processes of service delivery is seen to advance social inclusion, to fulfil the ideal of democracy and to advance prosperity in the society [5]. Finally, the involvement of external resources in the process is considered increasing openness and fostering innovation, also in the public sector [6, 7].

Across the body of literature, the justification for involving people in the process is more often based on taken-for-granted assumptions or mere descriptions of co-created benefits than accountable evidence. Case reports, indeed, highlight the positive effects

of timely user involvement [4, 8], users' active role in service development [9–13] or user-driven innovation in the public sector [14, 15]. As such, they serve as good benchmarking examples for theorists and practitioners alike. However, these case descriptions seldom evaluate the spent resources in relation to the perceived benefits. Particularly, users' investment of their time and effort are often met with a simple note instead of a detailed account. Still, from the managerial perspective, identification of required resources should be a basic step in justifying their allocation.

In the western world, the public sector is facing a surge of reforms that emphasise the managerial approach to public services' delivery. The dominant paradigm in the reformist discourse is the New Public Management (NPM), which imports into the public sector central concepts from business practices. Although there is criticism of the NPM approach [16] and predictions of its demise [17], managerial approaches reflecting the NPM ideology prevail in contemporary public sector policies [18, 19]. Consistently, the policies call for better evaluation and measurement frameworks for the public sector [2, 20].

Practitioners in the field are offered differing views about appropriate methods of and measures for evaluating their performance and delivery. Depending on the goals, which can themselves be contradictory [21], the focus of evaluation can be set on the supply (i.e., availability of the service) [5], the quality or impact [22, 23] or internal budget management [24, 25]. At present, there seems to be no consensus of effective methods that would support the achievement of public sector objectives [26–28].

The public sector can learn much from the private sector management, but it has also its characteristics that must be considered. The contemporary public services' production is increasingly inter-organisational and interactive (as opposed to intra-organisational), processual and systemic (as opposed to discrete and transactional) [29]. The polycentric service provision environment offers opportunities, particularly for the digitalisation of public services, but it also brings challenges. Orchestration of different stakeholders' participation is an essential strategic activity for any organisation [30, 31]. The success of a digital service can depend on organisation's ability to motivate users or partners to invest their time and resources in the development of the service [32–34] or to resolve conflicting interests between stakeholders [35]. Acknowledgement of stakeholders, i.e., inclusion and exclusion of viewpoints, is ultimately an ethical choice that has considerable relevance in the public sector [30].

This paper addresses the above mentioned challenges of managing public services' production by presenting a qualitative study on public service cost-justification. The focus is on the design phase, which dictates the potential of the service delivery and the user experience, especially in the digital context [cf. 9, 36, 37]. Although digitalisation of public services increases the importance of the digital, this paper does not differentiate design in the physical and the digital realm. Yet, the focus of interest is on participatory and collaborative activities conducted during the design process.

Collaborative *design* is here treated broadly as a wide spectrum of design activities that involve individuals or groups of people from different backgrounds to contribute to some aspect of the public service design. In the modern public service landscape, it is relevant to consider all of these stakeholders when we evaluate the performance and outcomes of design. After all, these stakeholders invest either their time or money in the work. Thus, the concept incorporates ideologies and meanings from the domains

of human-computer interaction (HCI), service design (SD) and even administration studies, bridging different perspectives such as participatory design and open innovation, as well as concepts such as co-design and user experience design (UXD). The common nominator for these varying approaches is the aim to take a human-centric approach and engage people to the design process for a shorter or longer period of time [38–41].

There is a demand for exemplary field studies, unified measurement instruments, and conceptual models that enable showing and managing the performance of design in the public sector [1, 28, 42]. The core purpose of this study is to find a conceptual model that incorporates the inter-organisational nature of modern public service provision and aids in evaluating and managing the design of public sector services. Although the meaning and value of public services are born from the output of design, value assessment begins from the input to the process. Resource allocation and justification can be examined from different viewpoints that focus on aspects such as consumption check, power distribution or value creation [24]. Here, the concept *investment* refers to a holistic understanding of individuals' or organisations' resources, be they counted in currency, hours or other metrics, that have significance for performance measurement and management. Thus, investment means any contribution to collaborative design independent of the model of engagement [cf. 25].

Grounded on the previous contemplations, the research question that we seek to answer in this paper is:

RQ 0: How to assess stakeholders' investment in the design of public services?

We began this study by conducting a literature review in spring 2017. With the review we aimed at identifying and characterising concepts, finding applicable models, and practices that could guide the assessment of different stakeholders' investment in public services' design activities. We wished to find empirical evidence with detailed data about the application of different evaluation models. Furthermore, we wished to see if there are more recent models and metrics that might be better applicable to the contemporary service provision landscape, and particularly to the public sector.

The second phase of the study was setting and defining the model for assessing stakeholders' investment. In scientific thinking, a model can be seen as structuration of researcher's arguments [43]. Our aim was to collect the key concepts for the model from the literature review, and then consolidate them into a purposeful form. We were prepared to ground the model on conceptualisations of previous research if applicable models could be found. Finally, we applied the new conceptual model to the existing case data. Figure 1 outlines the phases of this study and depicts the sequence of steps.

The rest of the paper presents the study as follows. In the second chapter, we give a detailed description of the literature review, including the used resources, search procedures, and findings. Then, we describe the setting and defining of the new conceptual Stakeholder Investment-Engagement (SI-E) Model. We end the third chapter with a description, how the conceptual SI-E model could be applied to a real-world situation. We present the methods used and discuss the limitations of phases in each equivalent chapter. We conclude the paper with a brief summary and a discussion of directions for future research.
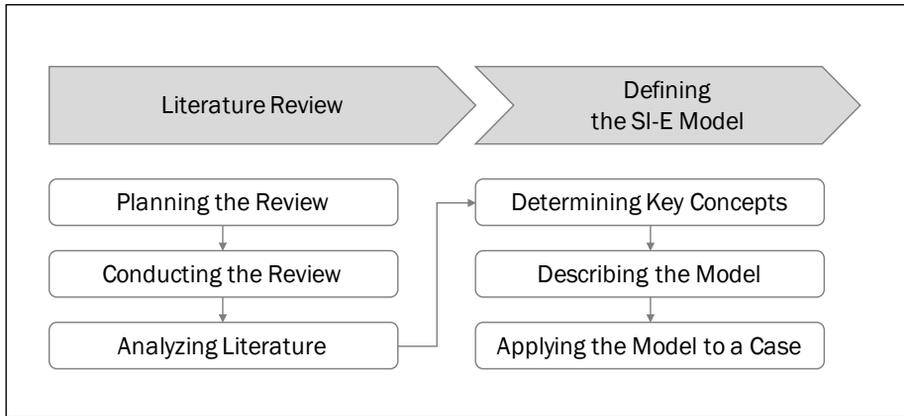
Fig. 1.. Phases of this study, including the steps of both phases.

2 Literature Review: Setting Conceptual Grounds

2.1 Search Strategy

Our aim was to conduct a literature review to get an understanding of the current state of research on the field, as well as to find theories, models and practices that could help us find answers to the research question. We also aimed at identifying potential gaps in knowledge, particularly about the characteristics of design in the public sector. Our approach at this phase was inductive. We followed the process depicted in Fig. 1, starting by planning the literature review, then conducting it as planned, and finally analysing the findings. We used the reference manager application Zotero, as well as general office applications for documentation, elaboration and analysis of the review.

Questions directing the search execution of the literature review should be more concrete than the main research question [44, 45]. Our overall aim was to investigate, what the literature says about the cost-justification of design activities in digital service production. Particularly, we tried to find evidence and models that take into account the characteristics of designing services in the public sector. To conduct a solid review and to extract relevant information from the literature, we posed four subquestions for this phase.

RQ 1: What types of stakeholders are identified investing in the design of services?
RQ 2: What valuation concepts or instruments there are for assessing investments on services' design?
RQ 3: What are the reported metrics for such assessment?
RQ 4: What valuation concepts or instruments, if any, there are particularly for the public sector?

A good literature review follows a systematic review protocol, which reduces potential researcher bias and permits a replication of the review in the future, thus improving reliability and validity [46]. The evolution of digital discovery tools and ecosystems has changed the nature and process of academic resource discovery [47, 48]. Thus, we also had to use several resources and search tactics for the retrieval of existing information. We began the search using two distinct university library digital discovery services. These digital library services provide the same functionalities, but they encompass different collections and a different set of electronic material included in a global index of scholarly e-resources[1]. In the interest of access, we limited the search to full-text materials in English, but in the interest of coverage across disciplines, we avoided using other filters for the reduction of search results. Instead, we combined different search terms and used the same search phrases and result filters in both digital library services.

We used both simple search and advanced search options to exploit the relevance logics of the search engines. We tried several search combinations to find enough potential material that concerns the investments or costs of design activities. We soon became aware, that there is much variance in the used terminology for the concepts investment and design, and that it is challenging to find relevant literature where these concepts have a semantic relation. Digital library discovery tools offer an opportunity to search databases across different disciplines, but they require a more explorative search strategy than traditional database searches [49]. Thus, our final pool of search phrases was rather ample, including the following terms: *investment, ROI, cost, cost-benefit, benefit, TCO, business, design, usability* and *user-centred*, as well as phrases *return on investment, total cost of ownership, service design* and *design management*.

As an example of the search process, we here present one of the first searches that we conducted and documented[2]. The search string *usability ROI* (the operator being AND) captured a total of 1836 references. Browsing through the title, abstracts, and other reference information in the search results view we identified ten relevant publications, which appeared among the first 200 most relevant references. We excluded references in which *ROI* referred to something else than return on investment (e.g., region of interest). Also, we excluded book reviews, conference overviews, conference workshop or panel descriptions, as well as other publications that did not include researchers' or practitioners' direct contribution. Apart from the ten references, which we pinned on our personal digital library interface account for further inspection, the result set contained hundreds of items where the search terms co-occurred without any semantic relation between them.

In order to verify the coverage of the findings, we repeated similar searches in two databases that are included in the global e-resources' index, using their own search interfaces. These two databases are ACM Journals and Transactions[3] and IEEE Xplore Digital Library[4]. However, we did not find any new relevant references and

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[1] Both digital library interfaces are integrated to a mega-aggregation of scholarly e-resources, which is currently the Primo Central Index provided by Ex Libris Group. These library interfaces can be accessed in URLs https://aalto.finna.fi and https://helka.finna.fi.

[2] The digital library interface used in this search: https://aalto.finna.fi.

[3] Available at: http://dl.acm.org/advsearch.cfm.

[4] Available at: http://ieeexplore.ieee.org/search/advsearch.jsp.

the ones that we found matched with the ones we had already pinned in the university library accounts. To complement the retrieval of relevant literature, we checked the references cited in the already retrieved material and searched if they were accessible. This way, we were able to complete the set with a few publications (some industry reports and some academic open-access publications) that have not been indexed in the library catalogues or the index of scholarly e-resources.

2.2 Publication Selection and Data Extraction

Next, we refined the inclusion/exclusion criteria to identify relevant material for closer examination, material that Fink calls "evidence that matters" [46]. From thousands of articles retrieved in searches, we finally had a set of 54 references on the initial list of publications. A closer look at the reference list revealed, that there was some overlapping, some duplicates or previous editions of the same work, or parts of a monograph that was already included. After exclusions, the set of literature comprised of 39 publications.

During a thorough review, we evaluated the contents and extracted the key elements of each document. We constructed a review matrix for organising the elements of publications, including document properties and meaningful concepts. Table 1 shows the most relevant property categories for the current study. Some of publications in the second inspection consisted of industry reports (7) or magazine articles (10). Although their evidence is anecdotal, we included them in the analysis because they were the few ones describing de-facto operations and opinions from the field. Actually, scholarly case studies revealing industry examples and data on the costs associated with services' design appear to be scarce.

Finally, after exclusions, there remained 33 published texts that provided feasible information as a starting point for the next step, data analysis.

Table 1. Extracted properties of publications.

ID	Property	Values	Purpose / Research Question
P1	Publication year	Material-based	Overview of literature, trends
P2	Type of publ.	B / BS / JA / MA / R (*	Overview of literature, reliability
P3	Stakeholders	Material-based	RQ1
P4	Valuation concept / instrument	Material-based	RQ2
P5	Metrics	Material-based	RQ3
P6	Sector	Private / Public	RQ4

*) B = Book, BS = Book section, JA = Journal article, MA = Magazine article, R = Report

2.3 Conceptual Analysis and Findings

Literature reviews take two forms: qualitative and statistical summary of effects [45]. The number of relevant literature in the review was too small for proper statistical

estimations of the phenomenon and its effects, and therefore we summarise the results in a qualitative description.

Our aim was to isolate interesting information from the literature, not only for the sake of answering the research question(s) but also for exploring emergent ideas and divergent views. When extracting the concepts, we tried to avoid interpreting authors' intentions and tagged only explicitly expressed words, terms and sentences. However, we abstracted some of these expressions into general concepts, in order to form a synthesis of the literature.

Overview

As most of the authors remarked, the body of knowledge on this topic is rather thin, and reliable case evidence from the field is scarce. The reason for this was traced to the complexity of design activity; Many of the authors seemed to consider themselves pioneers because they wished to tackle this difficult topic. While generations of researchers and practitioners have struggled in defining what constitutes a design task, a design activity, and the design discipline, some have also strived for proving the accountability of this domain.

The retrieved literature was published between 1993 and 2016. A general trend in the earlier studies was an evaluation of individual design methods or the cost-justification of design activities as part of a product/service engineering project. Later, there also were studies where the focus was shifted beyond individual choices to the role of design as part of the wider business value chain (the "black-box approach" [50]) or nation's prosperity (e.g., [51, 52]).

More than half of analysed publications (22/33) presented practical measures, either in principle or based on real case analyses. As repeated in many articles in this review, the conceptual and theoretical presentations on the topic are still rather underdeveloped. Moreover, the theoretical discussion is only slightly interconnected. The most cited and highest esteemed work still seems to be the twice compiled book Cost-Justifying Usability, edited by Bias and Mayhew [53].

Stakeholders (RQ 1)

The literature confirmed that there are many stakeholders involved in design activities. Thorough reading was required to distinguish the different stakeholder groups from the variety of expressions used in the literature. For example, the context dictated whether customer referred to an end-user or a company purchasing products or services from another. Also, the term developer could refer to user experience designers or technical engineers. Table 2 lists identified stakeholder groups and their frequency in the reviewed literature.

Most authors in the review considered the design investments from the viewpoint of a company or a public organisation. The next important stakeholders were those whose time and effort was measured, i.e., designers or teams responsible for design-related operations. Many authors make notice of managers' or sponsors', or even legal departments' [54] role in the decision, where financial investments are made.

Table 2. Identified stakeholder groups investing in services' design.

Stakeholder (abstracted from P3)	Description	Publications	Freq. (n=33)
Designer	Person or team responsible of design activities and user experience.	[50][52][53][54] [55][56][57][58] [59][60][61][62] [63][64][65][66] [67][68][69][70] [71]	21
Another internal unit	Person or team responsible for other operations than design within the organisation, e.g., technical developers, training, marketing, management.	[53][54][55][56] [57][59][60][62] [63][65][66][67] [68][69][70][71] [72][73][74]	19
Organisation	Organisation or company investing its assets (human and financial resources) on design activities.	[50][51][52][53] [54][56][57][59] [61][62][63][64] [65][66][67][73] [74][75][76][77] [78][79][80][81]	24
User	End-user of the product or service, also individual person as a customer.	[50][53][54][55] [56][58][59][61] [65][66][71][72] [73][78]	14
Customer (org.)	Organisation that is purchasing the product or service (in B2B).	[61][74][77]	3
Peer	A person or a community who can contribute to designer's work by sharing knowledge.	[55][65][71]	3
External partner	Public or private organisation with which the service provider collaborates or cooperates. This group includes agents that promote design.	[52][53][56][73] [74]	5
External financier	External actor who is responsible for funding the activity or who aims at a financial or societal gain.	[58][60][74]	3
Society	Government and citizens.	[52][53][78]	3

Valuation concepts or instruments (RQ 2)

The literature presented many instruments that are familiar from the business world, but also some that are specifically designed for justifying costs and showing the value of design. The majority of articles focused on the financial justification of design activities. The most popular approaches to monetary measuring of performance were return on investment (ROI) and cost-benefit analysis (CBA). Through monetary calculations that use different variations of ROI, CBA, total cost of ownership (TCO), or other methods, decision-makers in private and public sectors can be steered to see the tipping point when given design activities are cost-effective (see,

particularly [53, 56]). Table 3 shows all identified valuation concepts and instruments, and their frequency in the reviewed literature.

The literature shows some strong arguments for expanding evaluation techniques beyond economic measures, and for capturing the social and environmental aspects of design outcome [79]. Some authors recommend using alternative methods, such as triple-bottom-line [57, 73, 74, 78] or balanced scorecard (BSC) [57, 72–74] which take into consideration a wider spectrum of interest and values. The utmost approach is to oppose all evaluation aiming at financial efficiency, and take a value-oriented approach to assessing design activity [58, 62, 77].

Table 3. Identified valuation concepts or instruments for justifying the cost of design.

Concept / Instrument (abstracted from P4)	Description	Publications	Frequency (n=33)
ROI	Return on investment (incl. Return on design investment)	[50][51][53][54][55][57] [60][63][68][69][70][72] [73][74][76][78][79][81]	18
CBA	Cost-benefit analysis	[53][56][59][61][63][65] [66][70]	8
3-B-L	Triple-bottom-line	[57][73][74][78]	4
BSC	Balanced Scorecard	[57][72][73][74]	4
GVA	Gross value added	[51][74][78][80]	4
SU	Service usability index	[74][78]	2
TCO	Total cost of ownership	[54][77]	2
CPV	Customer Perceived Value	[77]	1
SDMI	Service design maturity index	[52]	1
SROI	Social return on investment	[57]	1
TV	Total Value of usability	[64]	1
W/AM	Worth-Aversion Map	[72]	1
Other	(Not named)	[82]	1

Metrics (RQ 3)

Similar to valuation concepts and instruments, the reviewed literature showed a wide variety of metrics that are familiar from other contexts but can be utilised in assessing design activity. The authors highlight that examining the rate of design investment is multidimensional and poses many challenges. The set of recommended metrics depends on the scope and purpose of the evaluation, as well as the used valuation approach and instrument.

To manage this complexity, cost variables can be separated to tangible and intangible [53]. Tangibles are easier to measure because their data and metrics are usually easily available. The literature proposes a long list of tangible components to be considered in cost calculations: employees' wages, external contractors' fees, expenses of purchasing software or supplies (for, e.g., user studies), test users' travel expenses, administration overheads, etc. If estimates are needed, in some companies they are set by the company's financial department [60]. Many quantification methods have been adopted from other disciplines. One example is the statistical conjoint

analysis method (CAM), which is quite popular in marketing studies and has also been utilised for estimating customers' value propositions in design preferences [76].

Among the intangible metrics is human effort, which can often be quantified in wages or fees. However, the reviewed literature included some implications to uncompensated efforts that are involved in design activities. Users may be involved in the design process itself as co-designers, and particularly in the case of public services, this effort may be given free. Other stakeholders, such as peers and professional communities [55, 65, 71], may also provide valuable, yet uncompensated input in the design process.

Also, it requires some intrinsic effort and commitment from the entire development organisation, including decision makers, to collaborate with design professionals for the target benefits [50, 65]. A professional motivated by different work goals, such as a technical developer, must be well motivated in order to invest her/his efforts in learning design practices [67].

Public sector (RQ 4)

From the total 33, only 20 publications focused solely on the private sector, only three on the public sector, and nine considered the viewpoints of both sectors. The first articles from 1990's presented challenges for adopting a design approach in corporate settings, whereas closer today the emphasis has moved to the public services and societal interests. Still, the review implies to a lack of coherent concepts, instruments and metrics for the evaluation of design in the public sector [cf. 52, 79].

There are many concerns that are common for design managers regardless of the sector. In business and public sector alike, there is the demand for accountability of invested funds, and the challenge of finding credible measures for design activities [e.g., 53, 79]. Moreover, there can be a tendency to consider user-centred design costs additional and easily excluded in the pressure of efficiency [e.g., 52, 59].

There has been a demand for new, value-based paradigms for the HCI discipline that can be projected to the concepts of evaluation [52, 62, 72]. The public service value chains from a single design task to a perceived value, such as citizens trust in government [cf. 58], differ inevitably from the value chains in the business world. Nevertheless, the literature review implies that these value chains, on different levels of public policy, should be made visible and accountable [52, 53, 79].

Temporality

Although the aspect of time was not included in the research questions, time-relatedness of cost-justifications emerged strongly and repeatedly from the literature. The literature showed that the temporality of contributions varied from a very short effort to permanent strategic commitment in design. Table 4 shows the categories of identified temporalities of design activities and their frequency in the reviewed texts.

One of the tendencies in private and public sectors alike seems to be the perception of design as an ad-hoc cost factor during the development phase, and an activity that quickly delivers solutions to urgent issues [62, 71]. Time is an essential element of efficiency, which was particularly highlighted in reports from the industry. If design activities are perceived to undermine the strict deadlines of product/service planning and development, they tend to be abandoned [66, 69]. It is essential for a private business to be in control of their processes and expenditure, and therefore this kind of

actors emphasise the straightforward assessment of project-time investments [60]. However, nearly all authors pointed out a discrepancy between the perceived correlation of project-time investments and long-term benefits.

The evaluation aims at providing evidence for decision-makers, both on private and public sectors, about whether or not to invest in something. Executives often expect evidence about project-time expenses presented with common instruments such as ROI or CBA. Still, the majority of authors noticed the importance of assessing costs from the entire product/service lifecycle. Some preferred using the TCO as a framework for assessment [54, 77], some introduced an own design-specific method [64].

In private and public sectors alike, design can also be seen as a strategic choice that requires long-term commitment and engagement from the organisation. For financing agents, be they business sponsors or governments, the aspect of time is strongly related to business targets. According to some authors, committed financers consider design as an integral part of organisations strategies [64] and, ideally, measure design performance and benefits at regular intervals [79]. Long-term engagement into design investment can also be seen as a form of risk management and risk prevention, particularly in the public sector [71]. In the public context, evaluation can be used to measure organisation's learning and performance improvement [79]. An indisputable challenge is the fact that costs of design activities come evident sooner than their benefits [64].

To sum these notions, the aspect of time seems to be related to all key interests of this study: stakeholders, valuation concepts, instruments, metrics, and the public sector. As noted before, temporalness is well acknowledged in the instruments and metrics. However, the aspect of time in relation to various stakeholders in the public sector seems to be an uncharted territory.

First, the valuation of design activities takes into account only some stakeholders' investments in relation to time, ignoring others'. For example, the TCO assessments perfectly include the lifecycle costs for the organisation developing or purchasing the product/service, but often ignore resources allocated by external partners. Particularly, the uncompensated effort of end-users during the design process is not considered as a relevant design investment. Second, the literature presents more models, instruments, and examples for short-term and project-time assessment of design activities than for long-term evaluation that spans over years or decades. The life cycle of public sector services and the realisation of their impacts are unavoidably longer than of their counterparts in the private sector.

Table 4. Identified temporalities of design activities.

Temporality of design activity	Description	Publications	Frequency (n=33)
Ad-hoc cost factor	Design is a short-term investment during the planning or development phase that is usually expected to bring quick or clear results.	[50][53][59][65][68][69][71]	7
Project-time expenditure	Design requires resources during the span of the project.	[50][53][54][55][56][57][59][60][61][62][63][64][65][66][68]	19

| Life-cycle costs | Design causes costs during the entire life-cycle of the product/service. | [69][70][75][82] [50][53][54][56][57] [59][62][63][64][65] [66][67][72][73][74] [76][77][78][81] | 19 |
| Permanent resource | Design is a strategic asset. It should be a permanent resource that can be allocated to different functions in the organisation. | [50][51][52][57][58] [60][62][64][65][67] [71][72][73][74][78] [79][80] | 17 |

2.5 Limitations and Way Forward

We drew together a pool of 33 publications across disciplines related to design to get an overview of trends and state of research on the topic of design investments. If there had been more peer-reviewed scholarly material accessible, providing relevant information on the topic, we would have excluded the magazine articles and grey literature from this review. Future repetitions of a literature review should explore the scholarly articles' index using search terms more characteristic in disciplines of business administration and organisation studies to find if there are applicable conceptualisations and more empirical studies providing versatile evidence.

Following a systematic review strategy, we could identify leading concepts, as well as matters that other researchers and practitioners have considered important. The interpretative analysis of some concepts, especially of stakeholders and temporalities, may be biased because there has been no external validation of the outcome. However, the analysis provided interesting information and built the grounds for the next part of the study.

The results of the literature review suggest that a multitude of methods and metrics are available for design activity evaluations, but there is no coherent conceptualisation that would encompass the elements that are characteristic for modern public service production. These elements include, at least, the different stakeholders, who are essential for the open innovation ideology. A finance-oriented evaluation, which excludes partners who invest their resources to the common goal, remains inadequate and one-eyed. Moreover, the reviewed literature suggested that time plays an important role in value assessment. The existing conceptualisations can adequately manage either one of these elements, but not both.

Given the motivation of this study, we next draw on the existing concepts and define a model that broadens the focus of design activities' evaluation.

3 Defining the Conceptual SI-E Model

The second phase of the study was the setting and defining a conceptual model that builds on the evidence and previous knowledge on the topic. The guiding question for this phase was the primary research question (RQ 0): How to assess stakeholders' investment in the design of public services?

The general understanding is that a model serves as an abstract representation of the real world phenomenon, aiming at faithful isolation of concepts and their relations. We follow another discourse and draw a model that aids to overcome real-life challenges and constraints with abstract elements [cf. 83, 84]. The purpose of the following conceptualisation is to capture potentially emerging aspects and events that do have their counterparts in the real world, but most likely never in the same form, aggregation nor force as expressed in the model. Thus, this model should be perceived and treated as an independent instrumental artefact, an epistemic tool [cf. 83].

## 3.1 Acknowledgement of Stakeholders

The first conceptual element of the model is *Stakeholder*, which adheres the following reasoning.

Managing an organisational system and its components, such as stakeholders and their contribution to some activity, seems like a straightforward systematisation of factual elements (*hard data*) and estimation of subjective elements (*soft data*, see [85]). With only a few exceptions, the reviewed literature took this straightforward position and, though acknowledging the complexity of design, presented its organisation as a neutral system that does not entail significant power relations. Alvesson et al. [86] argue, that even seemingly neutral organisational settings, structures and practices can hide politically weighted power relations. Looking at organisational activities from a critical viewpoint, we can reveal some taken-for-granted assumptions, which may eventually distort the intended outcome. When beginning this study, we already posed a question about the stakeholders' role in design evaluation practices. There are previous studies indicating that even settings of participatory design can be weighted with patronising attitudes towards users or other participants [87, 88]. By including potential stakeholder groups in the conceptual model, we aim to provide means for better power-balance between stakeholders.

When identifying stakeholders, it is important to position the centre of objectives, i.e., the dominant interests. Most often, a stakeholder analysis is organisation-centric, but it can also be conducted from a stakeholder-centric stance [89]. To keep the model on neutral grounds, we opt for focusing on the objectives of the design activity. Further, a choice has to be made about which entities to consider as stakeholders. The human-centric approach of the study determines that only human individuals or groups should be acknowledged. Thus, following these framings and applying them to the classic definition of stakeholders [89], a stakeholder in the model is any individual or group who can affect or is affected by the achievement of design objectives.

On the basis of the literature review, cost-benefit accounts seldom acknowledge a wide range of stakeholders as investors of time and resources. Nevertheless, case studies on public service design have clearly demonstrated how much stakeholders interests and contribution can differ [6, 37, 38]. In the tide of open innovation, there will be an increasing number of co-designed public services and co-produced public service content. Thus, if the public sector truly gives up its internal logic for the benefit of the wider society [cf. 2], public service managers should take into account a multitude of involved individuals and groups representing various fields or domains.

There are different ways to segment the range of stakeholders. In the literature review, we differentiated 9 distinct groups of stakeholders, whose involvement was explicitly expressed in the text (see Table 2). The classification should be context sensitive, and therefore we prefer relying on the contextual material or some existing stakeholder map [e.g., 89, 90]. Design theories or guidebooks provide appropriate classifications for design-centred analysis of involved people [e.g., 91]. The conceptual model presented here does not define the classification scheme for stakeholder groups, but just proposes the idea to classify individuals into purposeful groups. Figure 2 illustrates the design-centric stance and exemplary stakeholder groups derived from the literature review.
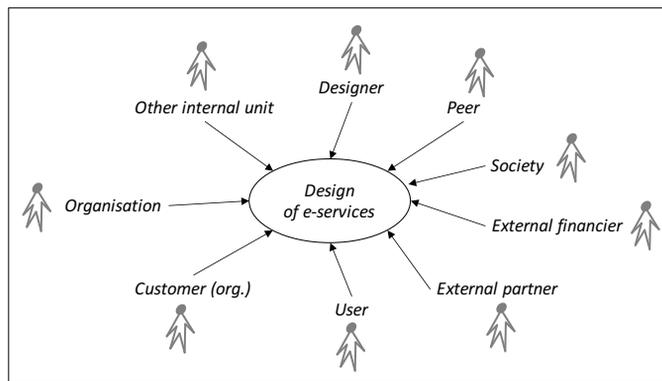
Fig. 2.. Exemplary stakeholder groups involved in design activities.

A thorough stakeholder analysis includes many phases of inspection and structuration, which aim at a better understanding of stakeholders, their priorities and concerns [30]. Because the focus of this study is on evaluating contributor's investments, only aspects that are relevant for this purpose need to be analysed.

### 3.2 Temporalities of Stakeholders' Investment

The second conceptual element of the new model is *Investment*, which represents stakeholders' contribution to design activities and consists of two parameters *cost* and *effort*. The third key element *Engagement* represents the dynamic influence of the parameter time over the Investment. These two key elements form a cognate pair *Investment-Engagement*, and therefore we define them in relation to each other.

As the literature indicates, investments can be added up from easily measurable financial costs, but an investment can also include more vaguely quantifiable human effort [e.g., 53, 58, 68]. Different stakeholders can contribute to design activities in different ways: financiers provide a budget, organisations allocate human or other resources, external partners contribute their expertise, and end-users their time and effort. Although stakeholders are said to perceive reward of their efforts in some way [90], from the viewpoint of assessment it is sensible to differentiate contributions that are compensated and uncompensated. It is particularly important to make the

uncompensated investments visible since some stakeholders in public co-design settings contribute to the process altruistically with their time and effort. By dividing the conceptual element Investment into two distinct parameters, effort and cost, we look at the compensated and uncompensated investments from a critical perspective.

The aspect of temporality in design cost-benefit evaluations, which was revealed in the literature review, may also carry hidden power presumptions. In public service provision, and also in profit-oriented open innovation environments, citizens and other stakeholders are eagerly encouraged to contribute and get involved in the collaborative design activities for shorter or longer periods of time [6, 38]. Their contribution is requested during different phases of the service development and implementation. The duration of engagement also matters; The design activity may involve contributors on occasional or ad-hoc basis, it may require frequent meetings or a more long-term relationship between people involved in it [92]. However, none of the existing conceptualisations of design activities' cost-benefits cover the temporal dimensions of different stakeholders' contribution. The frameworks, methods and examples in the literature review limited the calculation to a point or period of time, such as a fiscal year. Ease of control is undoubtedly the primary reason for this choice, but by hiding the potential continuation of stakeholders' contribution also hides its real value, stakeholders' commitment and engagement to the design activity. To enable examining the temporality of investments with a critical lens, we incorporated it in the model.

The dynamic influence of *time* binds together the elements Investment and Engagement. To enable meaningful application of the model, we attach the parameter time into the Work System Life Cycle (WSLC) model [93, 94], which represents the dynamics of work systems in four phases: 1) initiation, 2) development, 3) implementation, and 4) operation and maintenance. The WSLC model captures the different conditions of service systems, and can be plausible also from the service practitioners' perspective. Furthermore, design can take place in each phase of the life cycle. Keeping in mind the iterative and repetitive nature of processes in the WSLC model, we adopt the key concepts, the phases of the life cycle model, into our conceptual model. Figure 3 illustrates these phases on a single timeline. To tie this life cycle to the existing knowledge, the figure also depicts the temporalities of design investments, which were identified from the literature (see Table 4), on the timeline.
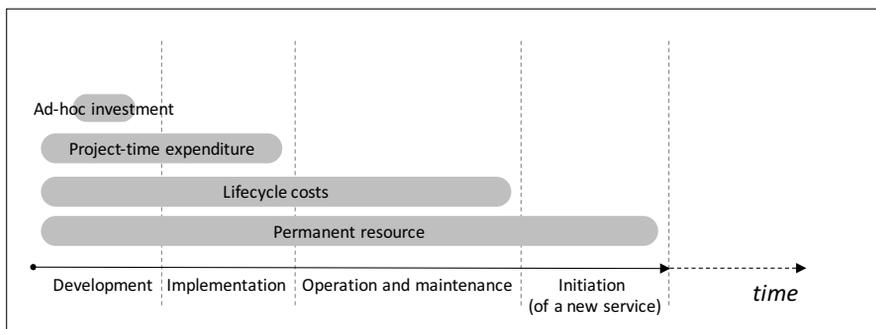

Fig. 3.. Identified temporalities of investment in design activities, set on the life cycle of a service (phases adopted from Alter's WSLC model [94, 95]).

The third conceptual element Engagement represents the dynamic power of time on the element Investment. Investment and Engagement are essentially interrelated, and thus, presented as a pair. The two-part element Investment-Engagement expresses a) the parameters effort and cost of stakeholder's investment and b) the dynamic influence of time on the Investment. Thus, the model indicates the essence of stakeholder's engagement in the investment. Figure 4 illustrates all three conceptual parts of the new model, which is hereafter called the *Stakeholder Investment-Engagement (SI-E) Model*.
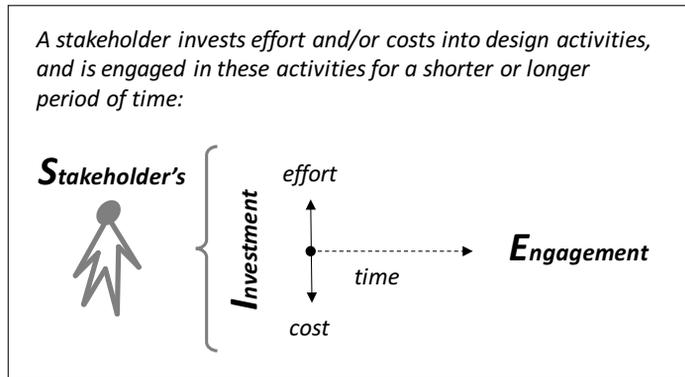
Fig. 4.. The three key concepts of the Stakeholder Investment-Engagement (SI-E) Model including constituent parameters effort, cost and time.

The conceptual model does not take a stand on the metrics used for the key concepts because they inevitably depend on the context and desired application of the model. In principle, all valuation concepts/instruments presented in the reviewed literature could be utilised at some point within the framework of the new model.
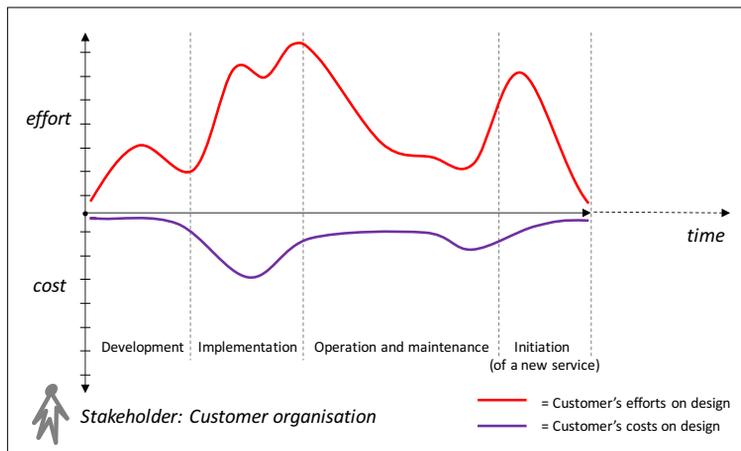
Fig. 5.. Example of possible efforts and costs invested on design by one stakeholder over the life cycle of a service.

As a final notion of the conceptual model, parameters effort (uncompensated) and cost (compensated) can be asymmetric: At a point of time, a stakeholder can contribute different proportions of effort and cost on the design activity. Figure 5 visualises this asymmetry by presenting possible efforts and costs invested by one stakeholder in design activities over the life cycle of a service.

3.3 The Stakeholder Investment-Engagement (SI-E) Model

The conceptual Stakeholder Investment-Engagement (SI-E) Model captures the situation, where one or many stakeholders invest their effort and/or costs into design activities and are engaged in these activities for a shorter or longer period of time. Because the structures and systems incorporated in a model can best be explained through narrative devices, such as questions and metaphors [43], this chapter describes exemplary steps for using the SI-E Model. The following considerations and questions suggest potential ways for applying the model in real-world contexts. Through these questions an evaluator can perceive relevant information for the value assessment and can understand each stakeholder groups' potential effect on the activity.

The conceptual element *Stakeholder*:

1. Identify and classify people, organisations, communities of practice, i.e., all relevant stakeholders whose contribution is purposeful for the design outcome: Which groups are involved?
2. Exclude those groups whose contribution is not relevant from the viewpoint of assessment: Whose role is only marginal?
3. Estimate the intensity of each groups' contribution: Which group is more involved than others?
4. Specify the type of stakeholders' investments: In which design activities each group are investing?
5. Estimate the volume of groups: How many people or organisations are involved in each group?
6. Estimate the coherence of groups: Will all representatives contribute with the same intensity? Are there great differencies between or inside groups?

The two-part conceptual element *Investment-Engagement*:

7. Valuate stakeholders' contribution to the design delivery: Do they invest money or resources to the design process (*cost*)? Do they invest their time without a (significant) compensation (*effort*)?
8. Assess stakeholders' engagement to the design process over time: Who takes part on a short-term basis only? Who is engaged for a longer period of time?
9. Consider the continuity of the engagement: When does the engagement start and end? Are there going to be planned or unplanned breaks in a continuous engagement?

The entire SI-E conceptualisation:

10. Examine the entire constellation: Did you forget some stakeholders or are there too many stakeholder groups to consider? Are all relevant investments (uncompensated and compensated) covered? Are temporal engagements (*time*) depicted correctly and justly?

The SI-E Model provides a common ground for assessing the investment on design with users, colleagues, sponsors, and other involved stakeholder groups. Representation of the three key concepts as elements in the conceptual model offers all stakeholders with an opportunity to acknowledge and align the effects of these elements. Being a conceptualisation, it serves best as a framework in which to embed a variation of practice-oriented instruments, such as ROI, CBA, or TCO. As a framework, the model can be used as a basis for communicating the contributions with all actors, for managing expectations, and for facilitating the process of assessment. The model can serve as a higher level steering instrument for managing stakeholders' involvement and resources. Figure 6 illustrates how the SI-E Model can capture a multiplicity of different stakeholder groups, some variations of their investments, and different types of engagement over the life cycle of a service.

Optimally, the SI-E model would serve as a starting point for constructing other models. By transforming these conceptualisations into an economic model or an information model their applicability in wider contexts could be tested.
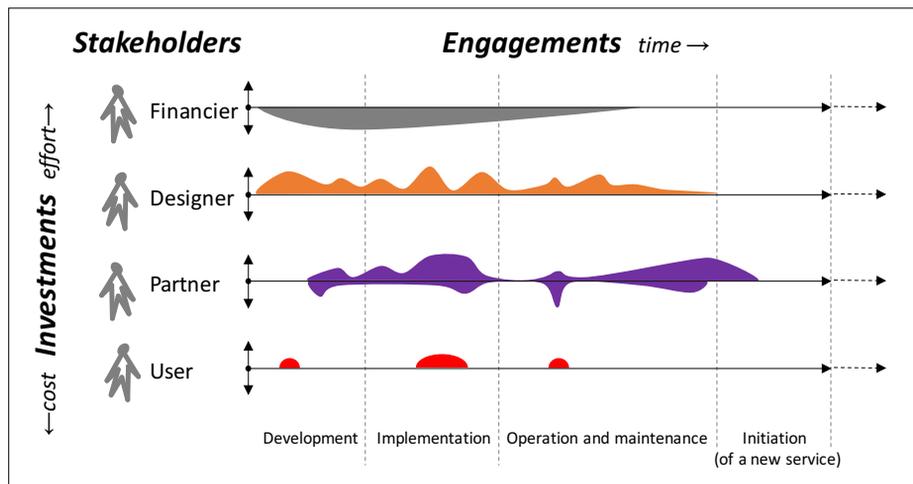
Fig. 6.. An example of a possible service case that involves several stakeholders, each investing either effort and/or costs and engaging for different spans of time to the design activity.

3.4 Applying the SI-E Model: Case Digital Library

As an example of potential uses of the conceptual SI-E Model, we applied the model to an existing case, the design process of a national Digital Library.

The Digital Library (DL) joins together the repositories of practically all libraries, archives and museums in one Scandinavian country. The users can access these materials via a joint online interface or via various interfaces of individual organisations. The development of the service began in 2008, the first version was published in 2013, but the project is still operational and the service has not yet reached its maturity. From the very beginning, a significant number of different types of stakeholders have been involved in the design of the service [95, 96].

The case project is related to a wider research, which examines user-centred design (UCD) strategies in public digital service production in one Scandinavian country. For that reason, the data was easily available for this test. The data consists of project documents between 2013 and 2016, and four project members' interviews that were conducted for another study [88]. To map the data to the concepts of the SI-E Model, we composed a table and by going through the previously mentioned questions, described the key stakeholders' and their contribution to the design of the DL. The results of applying the model to the case data of the Digital Library can be seen in Appendix A.

This was a tentative exploration with the SI-E Model. When mapping the concepts of the model with the case data, we noticed that some stakeholder groups are more uniform in their contribution than others. To capture the exact nature of investments within the more heterogeneous groups, they should be split into subgroups. This notion resonates with the stakeholder management principles that emphasise context-sensitive recognition of key stakeholders [30, 89, 90]. Moreover, the success of collaborative design can depend on identifying and recruiting the right contributors [11, 34]. At least, acknowledgement of people's contribution can have a positive impact on their motivation to engage in future design activities [8, 30, 34].

We also detected that if the financier is included in the analysis, there is a risk of double counting the budget investments. To avoid this, we marked cost-investments of some stakeholder groups (designers, other in-house team members and profit-making partners) as not-relevant. Still, for the sake of validity, it is important to include all identified groups in the analysis. In another context, e.g., service development by an open source community [cf. 65], contributions in design activities would distribute differently. In this case, the data about Digital Library partner organisations' monetary investments on the design activities were not available. Such data could help in recognizing the hidden resources that are invested in the development, e.g., external service providers' commitment to gain expertise in design matters of the public sector. Public sector organisations should learn to view their service production from more intraorganisational and polycentric perspectives [29, 35], and adopt or develop techniques of horisontal accounting [26].

As noted before, the model can be applied using different metrics for effort and cost, depending on the context. In the case of the Digital Library, the data available covered the official project budget and a variety of public memos and reports describing different project phases. The effort invested by partner organisations and end-users was summed up from various documents recording the details of meetings, workshops, student projects, surveys, etc. The task was time-consuming and indicates the importance of transparent documentation of service production details. Performance indicators are subject to change, but well-recorded data serves dynamic needs [25].

The results of the application suggest that the SI-E Model can serve as a high-level conceptualisation and a framework for an extensive analysis of design project's stakeholders and their contribution. The initial mapping in Appendix A already reveals unforeseen investment factors. For example, the DL Customers supposedly contribute their costly resources to the design of the service, but this investment is not considered in official documents that estimate the costs and benefits of the DL. Therefore, it was not available for the test, either. This can be seen as a bias in the

official cost-benefit analyses of projects that require collaboration between various groups of people, either individuals or organisations. Also, the number of work hours (uncompensated effort) contributed by non-profit partners, mostly university students, can be considered relevant for the value assessment of the case. As this example indicates, the model can uncover elements of co-production. Such bottom-up engagement of peers and partners fosters open innovation of public services, and has great individual and societal value [6]. On the level of everyday practices, design managers have to market the idea of collaborative design to their public or peers, who should be engaged in design activities, as well as to the managers or directors, who are in charge of the resources. The model can serve in this task by offering a framework for resource estimations and accounts.

The tentative application of investments in numbers indicates the scale of collaborative design activity in the case project. If similar data were available for other cases, the model could serve as a tool for comparative studies. Furthermore, such data could be useful for monitoring engagement during different spans of time. The motivational factors behind citizens' or other stakeholders' willingness to engage are many [11, 92], and understanding of their influence can be promoted with comparable field data.

The application of the SIE-Model to the Digital Library case also implicated a mismatch between the expectations and the evaluation policies in the public sector. On the one hand, there are strategies urging the modernisation and better quality of public services via innovative enterprises [1, 20, 97], as well as essential guidelines that support public sector organisations in the new areas. On the other hand, the evaluation policies and practical guidelines seem to centre around efficiency, and especially the reduction of the administrative burden [98]. There seems to be a conflict in public sector strategies between service efficiency and participative services' development. Chances for fostering prosperity through design and innovation will be lost if the assessment instruments and metrics do not take into account the nature and characteristics of design in the public sector.

The initial application of the conceptual model shows that the model needs further elaboration. Empirical tests with more data, including data and estimations on stakeholders' monetary investments, should be conducted to test the model's power as an epistemic tool. Such a full mapping might raise a question whether it is feasible to conduct an extensive and time-consuming valuation of a broad amount of stakeholders in a design case. The initial application awakened questions concerning the benefits, their time-relatedness, and the incentives that are behind stakeholders' investments and engagement to the design work: How to assess the benefits that stakeholders perceive gaining from the design of public services? With which incentives stakeholders justify their investments in the design activities?

4   Conclusions and Recommendations

This paper presents a two-phase study that examines various stakeholders' contribution to and engagement with the design activities in the context of public services. This study aimed at broadening the understanding of factors that are

significant when the value of collaborative design activities is assessed. We took a critical viewpoint to the settings of evaluation and assumed that there may be implicit contributions that prevent reaching the intended result: a just assessment of design costs and benefits. Conceptual exposure of these aspects may enable better management of design resources. Our study focused on the input-side of evaluation, i.e., the investments made by different stakeholders. The primary research question was: How to assess stakeholders' investment in the design of public services?

The first phase of the study was a literature review, which drew an understanding of the contemporary knowledge on the cost-justification of design activities. Despite the rather thin body of knowledge on this topic, the retrieved material provided enough evidence of used concepts and methods. It reinforced the assumption that there is a multitude of stakeholders whose contribution to the design activity should be accounted for. In addition, the literature clearly implied the time-relatedness of stakeholders' investments. The review showed that none of the existing conceptualisations sufficiently captures these two aspects, i.e., the multiple stakeholders in a design activity and temporalities of stakeholders' investments.

Analysis of the literature provided grounding for the second phase of the study: defining the conceptual Stakeholder Investment-Engagement (SI-E) Model. The SI-E Model depicts, on a conceptual level, three key elements in a design activity: the element Stakeholder, and the two-part element Investment-Engagement with their constituent parts effort, cost and time. The SI-E Model conceptually defines how a stakeholder invests effort and/or costs into design activities and is engaged to them for a shorter or longer period of time. As a tentative exploration on the SI-E Model, we applied it to an existing case of a Digital Library.

The initial application indicated that the new conceptual model has potential in the valuation of public services' design, particularly because it questions the taken-for-granted practices of cost-benefit evaluations. It can reveal stakeholders' costs that have been ignored in other accounts. Thus, the SI-E Model suggests a new approach to measuring and managing collaborative design activities in the contemporary public service landscape. More importantly, the new model can uncover uncompensated effort that various stakeholders put to the design of a service. Finally, it provides a framework for discovering the stakeholders' temporal engagement in the work.

The new conceptual SI-E Model provides an answer to the research question. By presenting a new model we suggest that the design theory and practice would be enhanced by the adoption of managerial viewpoints. With this paper we contribute to the discussion in the disciplines of design and public administration by recommending 1) critical examination of existing conceptualisations and practices of cost-justification in the public sector, 2) acknowledgement of various stakeholders' investments, and 3) temporal evaluation of stakeholders' engagement to design activities. Still, the SI-E Model captures only the investment-side of evaluations and ignores the payoffs and impacts, as well as the incentives for stakeholders' investments. Further studies should elaborate the concepts of benefit and incentive in relation to multiple stakeholders and temporalities. Construction of other models, especially an economic model, based on the concepts of the SI-E Model would widen the opportunities of testing and application. It was out of the scope of this paper to explore these perceptions, but the discussion in this paper, nevertheless, opens paths for future research.

References

1. Minin A.D., De Marco C.E., Marullo C., Piccaluga A., Casprini E., Mahdad M., Paraboschi A.: Case Studies on Open Innovation in ICT, Institute for Prospective Technological Studies, Joint Research Centre, (2016)
2. Recommendation of the Council on Digital Government Strategies, OECD Council, (2014)
3. Koch G., Rapp M., Kröger N.: Harnessing the Innovation Potential of Citizens: How Open Innovation Can be Used to Co-develop Political Strategies. In: Pfeffermann, N. et al. (Eds.) Strategy and Communication for Innovation. pp. 63–84. Springer (2013)
4. Botero A., Hyysalo S.: Ageing together: Steps towards evolutionary co-design in everyday practices, CoDesign, 9, pp. 37–54 (2013)
5. Tinholt D., van der Linden N.: eGovernment Benchmark 2016. A turning point for eGovernment development in Europe?, European Commission, (2016)
6. Botero A., Paterson A.G., Saad-Sulonen J. eds: Towards Peer Production in Public Services: Cases from Finland, Aalto University, Helsinki, Finland, (2012)
7. Daglio M., Gerson D., Kitchen H.: Building Organisational Capacity for Public Sector Innovation. Background Report, OECD Conference "Innovating the Public Sector: from Ideas to Impact", Paris, France, (2014)
8. Kujala S.: User involvement: a review of the benefits and challenges, Behav. Inf. Technol., 22, pp. 1–16 (2003)
9. Axelsson K., Melin U., Lindgren I.: Exploring the importance of citizen participation and involvement in e-government projects, Transform. Gov. People Process. Policy, 4, pp. 299–321 (2010)
10. Concilio G., Deserti A., Rizzo F.: Exploring the interplay between urban governance and smart services codesign, Interact. Des. Archit., pp. 33–47 (2014)
11. Hyysalo S., Kohtala C., Helminen P., Mäkinen S., Miettinen V., Muurinen L.: Collaborative futuring with and by makers, CoDesign, 10, pp. 209–228 (2014)
12. Sanders E.B.-N., Stappers P.J.: Co-creation and the new landscapes of design, CoDesign, 4, pp. 5–18 (2008)
13. Stickdorn M.: Service Design in Tourism. In: Miettinen, S. and Koivisto, M. (eds.) Designing Services with Innovative Methods. pp. 236–265. University of Art and Design Helsinki / Kuopio Academy of Design, Savonia University of Applied Sciences, Keuruu, Finland (2009)
14. Jäppinen T.: How to Manage a Service Innovation Process in the Public Sector: From Co-Design to Co-Production. In: Agarwal, R. et al. (Eds.) The Handbook of Service Innovation. pp. 707–726. Springer-Verlag, London, UK (2015)

15. Culén A.L., Gasparini A.A.: Student Driven Innovation: Designing University Library Services. Presented at the CECENTRIC 2013, Venice, Italy (2013)
16. Clarke J., Newman J., Smith N., Vidler E., Westmarland L.: Creating Citizen-Consumers: Changing Publics and Changing Public Services, SAGE, London, UK, (2007)
17. Dunleavy P., Margetts H., Bastow S., Tinkler J.: New Public Management is Dead—Long Live Digital-Era Governance, J. Public Adm. Res. Theory, 16, pp. 467–494 (2005)
18. Hyndman N., Lapsley I.: New Public Management: The Story Continues, Financ. Account. Manag., 32, pp. 385–408 (2016)
19. Andrews R., Guarneros-Meza V., Downe J.: Public Management Reforms and Social Cohesion in Europe: The view from the top, Public Manag. Rev., 18, pp. 558–582 (2016)
20. Communication from The Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. EU eGovernment Action Plan 2016–2020. Accelerating the digital transformation of government, European Commission, (2016)
21. Karlsson F., Holgersson J., Söderström E., Hedström K.: Exploring user participation approaches in public e-service development, Gov. Inf. Q., 29, pp. 158–168 (2012)
22. Candiello A., Albarelli A., Cortesi A.: Quality and impact monitoring for local eGovernment services, Transform. Gov. People Process. Policy, 6, pp. 112–125 (2012)
23. de Róiste M.: Bringing in the users: The role for usability evaluation in eGovernment, Gov. Inf. Q., 30, pp. 441–449 (2013)
24. Davila A.: New Trends in Performance Measurement and Management Control, Perform. Meas. Manag. Control, 25, pp. 65–78 (2012)
25. Van Dooren W., Bouckaert G., Halligan J.: Performance Management in the Public Sector, Routledge, London, UK, (2015)
26. Hodges R.: Joined-Up Government and the Challenges to Accounting and Accountability Researchers, Financ. Account. Manag., 28, pp. 26–51 (2012)
27. Voorberg W.H., Bekkers V.J.J.M., Tummers L.G.: A Systematic Review of Co-Creation and Co-Production: Embarking on the social innovation journey, Public Manag. Rev., 17, pp. 1–25 (2014)
28. Bélanger F., Carter L.: Digitizing Government Interactions with Constituents: A Historical Review of E-Government Research in Information Systems, J. Assoc. Inf. Syst., 13, pp. 363–394 (2012)
29. Osborne S.P., Radnor Z., Nasi G.: A New Theory for Public Service Management? Toward a (Public) Service-Dominant Approach, Am. Rev. Public Adm., 43, pp. 135–158 (2012)
30. Bryson J.M.: What to do when stakeholders matter? Public Manag. Rev., 6, pp. 21–53 (2004)
31. Laiho A.: Orchestration of External Resources, Aalto University, Helsinki, Finland, (2015)
32. Hyvärinen J., Lee J.-J., Mattelmäki T.: Fragile Liaisons: Challenges in Cross-organizational Service Networks and the Role of Design, Des. J., 18, pp. 249–268 (2015)

33. Wijnhoven F., Ehrenhard M., Kuhn J.: Open government objectives and participation motivations, Gov. Inf. Q., 32, pp. 30–42 (2015)
34. Thapa B.E.P., Niehaves B., Seidel C.E., Plattfaut R.: Citizen involvement in public sector innovation: Government and citizen perspectives, Inf. Polity, 20, pp. 3–17 (2015)
35. Tuurnas S.: Learning to co-produce? The perspective of public service professionals, Int. J. Public Sect. Manag., 28, pp. 583–598 (2015)
36. Holmlid S.: From interaction to service. In: Miettinen, S. and Koivisto, M. (Eds.) Designing Services with Innovative Methods. pp. 78–97. University of Art and Design Helsinki / Kuopio Academy of Design, Savonia University of Applied Sciences, Keuruu, Finland (2010)
37. Meroni A., Sangiorgi D.: Design for Services, Gower, Farnham, UK, (2011)
38. Miettinen S., Koivisto M. Eds: Designing Services with Innovative Methods, University of Art and Design Helsinki / Kuopio Academy of Design, Savonia University of Applied Sciences, Keuruu, Finland, (2009)
39. Jacko J.A.: The Human-Computer Interaction Handbook. Fundamentals, Evolving Technologies, and Emerging Applications, Taylor & Francis, Boca Raton, FL, USA, (2012)
40. Krippendorff K.: The Semantic Turn. A New Foundation for Design, Taylor & Francis, Boca Raton, FL, USA, (2006)
41. Zwass V.: Co-Creation: Toward a Taxonomy and an Integrated Research Perspective, Int. J. Electron. Commer., 15, pp. 11–48 (2010)
42. Commission Staff Working Document. Implementing an Action Plan for Design-Driven Innovation, European Commission, (2013)
43. Morgan M.S.: Models, stories and the economic world, J. Econ. Methodol., 8, pp. 361–384 (2001)
44. Dawidowicz P.: Literature Reviews Made Easy : A Quick Guide to Success, Information Age Pub corp, Charlotte, NC, USA, (2010)
45. Hart C.: Doing a Literature Review. Releasing the Social Science Research Imagination, SAGE Publications, London, UK, (1998)
46. Fink A.: Practicing Research. Discovering Evidence That Matters, SAGE Publications, Thousand Oaks, CA, USA, (2008)
47. Rosie H., O'Brien K.K.: Comparison of three web-scale discovery services for health sciences research, J. Med. Libr. Assoc., 104, pp. 109–117
48. Chowcat I.: Spotlight on the Digital. Recent trends and research in scholarly discovery behaviour, Jisc, Bristol, UK, (2015)
49. Fagan J.C.: Discovery Tools and Information Literacy, J. Web Librariansh., 5, pp. 171–178 (2011)
50. Hirsch S., Fraser J., Beckman S.: Leveraging Business Value: How ROI Changes User Experience, Adaptive Path LLC, (2004)
51. The Design Economy. Value of Design to the UK., Design Council, (2015)
52. Service Design Impact Report: Public Sector, Service Design Network, (2016)
53. Bias R.G., Mayhew D.J.: Cost-Justifying Usability. An Update for an Internet Age, Morgan Kaufmann, (2005)
54. Rosenberg D.: The Myths of Usability ROI, Interaction, 11, pp. 22–29 (2004)
55. Karat C.-M.: Usability Engineering in Dollars and Cents, Interface, (1993)

56. Mantei M.M., Teorey T.J.: Cost/Benefit Analysis for Incorporating Human Factors in the Software Lifecycle. Commun. ACM, 31, pp. 428–439 (1988)
57. Best K.: The Fundamentals of Design Management, AVA Academic, Lausanne, Switzerland, (2010)
58. Cockton G.: Designing Worth is Worth Designing. Presented at the NordiCHI 2006, Oslo, Norway (2006)
59. Donahue G.M.: Usability and the Bottom Line, Softw. IEEE, 18, pp. 31–37 (2001)
60. Herman J.: A Process for Creating the Business Case for User Experience Projects. Presented at the CHI 2004, Vienna, Austria (2004)
61. Kohno I., Yasu H., Sugawara S., Nishikawa M.: Pragmatic Approach to Cost Benefit Analysis of User Centered Design, LNCS. pp. 525–534. Springer-Verlag, Berlin Heidelberg (2013)
62. Kwiatkowska A., Szóstek A., Lamas D.: Design and Business Gaps: From Literature to Practice. Presented at the MIDI'14, Warsaw, Poland (2014)
63. Law E., Hvannberg E.T., Cockton G.: A Green Paper on Usability Maturation. In: Law et al. (Eds.) Maturing Usability: quality in software, interaction and value. pp. 381–424. Springer-Verlag (2008)
64. Lund A.: Another Approach to Justifying the Cost of Usability, Interactions, pp. 48–56 (1997)
65. Rajanen M.: Applying Usability Cost-Benefit Analysis – Explorations in Commercial and Open Source Software Development Concepts, University of Oulu, Oulu, Finland, (2011)
66. Rajanen M., Iivari N.: Usability Cost-Benefit Analysis: How Usability Became a Curse Word? LNCS. vol. 4663.2. pp. 511–524. IFIP, (2007)
67. Siegel D.A.: The Business Case for User-Centered Design: Increasing Your Power of Persuasion, Interactions, pp. 30–36 (2003)
68. Sorflaten J.: Making the Fuzzy Parts of ROI Clear. Interactions, 13, pp. 38–41 (2006)
69. Sousa K., Furtado E., Mendonça H.: UPi – A Software Development Process Aiming at Usability, Productivity and Integration. Presented at the CLICH'05, Cuernavaca, Mexico (2005)
70. Yousefi P., Yousefi P.: Cost justifying usability: A case study at Ericsson, Blekinge Institute of Technology, Karlskrona, Sweden, (2011)
71. Design in the Public Sector. An evaluation of a programme of support for local authority service transformation, Design Council, (2015)
72. Cockton G.: Putting Value into E-Valu-Ation. In: Law et al. (Eds.) Maturing Usability: quality in software, interaction and value. pp. 287–317. Springer-Verlag (2008)
73. Lockwood T.: Design Value: A Framework for Measurement, Des. Manag. Rev., 18, pp. 90–100 (2007)
74. Lockwood T. ed: Design Thinking. Integrating Innovation, Customer Experience, and Brand Value., Allworth Press, New York, USA, (2009)
75. Earley S.: Usability for Internal Systems: What's the Payoff? IT Prof., 16, pp. 66–69 (2014)

76. Kim M.-J., Park J.: A Return on Investment Assessment Model for a Mobile User Interface Project at the Predevelopment Stage, Hum. Factors Ergon. Manuf. Serv. Ind., 24, pp. 216–225 (2014)
77. Sikorski M.: HCI and the Economics of User Experience. In: Law et al. (Eds.) Maturing Usability: quality in software, interaction and value. pp. 318–343. Springer-Verlag (2008)
78. Løvlie L., Downs C., Reason B.: Bottom-line Experiences: Measuring the Value of Design in Service, Des. Manag. Rev., 19, pp. 73–73 (2008)
79. Whicher A., Raulik-Murphy G., Cawood G.: Evaluating Design: Understanding the Return on Investment, Des. Manag. Inst. Rev., pp. 45–52 (2011)
80. The role and value of design. Working paper: Measurng and defining design, Design Council, (2015)
81. The Value of Design. Factfinder Report, Design Council, (2007)
82. Aydin B., Beruvides M.G.: Development of a Decision Tool for Usability Cost Justification, Proc. of the 2014 Industrial and Systems Engineering Research Conference. pp. 2832–2838 (2014)
83. Knuuttila T.: Modelling and representing: An artefactual approach to model-based representation, Stud. Hist. Philos. Sci., 42, pp. 262–271 (2010)
84. Sugden R.: Credible Worlds, Capacities and Mechanisms, Erkenntnis, 70, pp. 3–27 (2009)
85. Phillips J.J., Brantley W., Phillips P.P.: Project Management ROI: A Step-by-step Guide for Measuring the Impact and ROI for Projects, Wiley, (2011)
86. Alvesson M., Wilmott H. eds: Studying Management Critically, SAGE Publications, London, UK, (2003)
87. Iivari N., Kinnula M., Kuure L.: With best intentions. A Foucauldian examination on children's genuine participation in ICT design, Inf. Technol. People, 28, pp. 246–280 (2015)
88. Kautonen H., Nieminen M.P.: Critical Look at User-Centered Design Competencies, Proc. of the 9th Nordic Conference on Human-Computer Interaction, Gothenburg, Sweden (2016)
89. Friedman A.L., Miles S.: Stakeholders: Theory and Practice, Oxford University Press, Oxford, UK, (2006)
90. Eskerod P., Jepsen A.L. (Eds.): Project Stakeholder Management, Routledge, Oxford, UK, (2013)
91. Löwgren J., Stolterman E.: Thoughtful Interaction Design: A Design Perspective on Information Technology, The MIT Press, (2005)
92. Pestoff V.: Innovations in Public Services: Co-Production and New Public Governance in Europe. In: Botero, A., Paterson, A.G., and Saad-Sulonen, J. (Eds.) Towards Peer Production in Public Services: Cases from Finland. pp. 13–33. Aalto University, Helsinki, Finland (2012)
93. Alter S.: Service system fundamentals: Work system, value chain, and life cycle, IBM Syst. J., 47, pp. 71–85 (2008)
94. Alter S.: Work System Theory: Overview of Core Concepts, Extensions, and Challenges for the Future, J. Assoc. Inf. Syst., 14, pp. 72–121 (2013)
95. Hormia-Poutanen K., Kautonen H., Lassila A.: The Finnish National Digital Library: a national service is developed in collaboration with a network of libraries, archives and museums, Insights, 26, pp. 60–65 (2013)

96. Kautonen H.: Making It Everyone's Finna – Cross-Sector Collaboration and User Experience Design in a Digital Library. Presented at the HCII Conference, Las Vegas, U.S.A. (2013)
97. Simulating Digital Innovation for Growth and Inclusiveness. The role of policies for the successful diffusion of ICT. 2016 ministerial meeting on the digital economy, OECD Publishing, (2016)
98. Gallo C., Giove M., Millard J., Thaarup R.K.V.: Study on eGovernment and the Reduction of Administrative Burden, European Commission, (2014)

Appendix A. Applying the conceptual SI-E Model to the case of a Digital Library (DL).

Stakeholder group	Description of stakeholder(s)	Description of investments: Effort and costs allocated to design activities	Investments in numbers bewween years 2013 and 2016; NB. Incl. data from project documentation only	Description of engagement(s): Temporalities of investments	Engagement between years 2013 and 2016
Financier	The ministry governing and funding the DL.	2013–2020: development and maintenance budget, incl. salaries and outsourcing allocated to design activities.	Effort: n/a Costs: total ca 456 000 € to design activities (ca 11 4000 €/y)	Mandate to invest on user-centred design of the DL throughout the project and for years.	Continuous
Designers	In-house interaction designer(s) whose time mainly allocated to the design of the DL. In 2013: two designers In 2016: three designers	Permanent employment, salaries incl. in the budget (see Financier). Execution of design tasks: planning, implementation and evaluation. Increasing professional competence on own time, e.g., through design studies and professional communities.	Not relevant (effort n/a and costs incl. in the project budget)	Permanent employment, avg. employment period 2 yrs. Strong commitment to increase professional competence.	Continuous
Other in-house team members	Members of the in-house development team (technical developers, planning officers, managers, etc.) who contribute to design activities at some level.	Part (2–60%) of persons' work hours allocated to design tasks that include execution of the front-end design tasks, monitoring and delivery of customers' requirements and needs to designers. Salaries incl. in the budget (see Financier). Individual employees very interested in design matters.	Not relevant (effort n/a and costs incl. in the project budget)	Permanent employment.	Continuous
End-users	Potentially all internet-using citizens in the country. In 2016: ca 4,8 million persons	Participation in workshops, tests and surveys with minimal or no compensation. Some user groups (e.g., pensioners) contribute eagerly, while some (e.g., researchers or journalists) more difficult to reach and recruit.	Effort: total 5 261 h – Effort, workshops: 92 h – Effort, surveys: 4 986 h – Effort, user studies: 183 h Costs: n/a	Mostly one-time only participation, between 10 min to 1,5 h per person. Some end-users have volunteered on more regular basis.	Occasional, 1 workshop/y, 1 survey/y, avg. 2 user studies /y
Customers	Organisations that have joined or planning to join the DL. In 2008: 8 organisations In 2016: 278 organisations UWG 2013–2016: 8–13 members	Participation in the Usability Working Group (UWG). During the entry phase, each organisation invests work hours to adjust their material to fit with the functionalities of the DL. Individual employees very interested in design matters.	Effort: total 304 h – Effort, UWG meetings: 239 h – Effort, workshops & seminars: 54 h – Effort, user studies (customer service): 11 h Costs: n/a	Long-term involvement. Individually strong commitment to serve organisation's own customers (end-users of the DL) and will to invest their own time on design.	UWG operational 2009–2015, avg. period of group membership 2 yrs. Planning & user studies: Occasional
Partners, profit	Design companies commissioned to conduct individual design projects. 2008–2016: 7 companies	Fees incl. in the budget (see Financier). Execution of design projects, such as visual design, usability studies, or usage analytics. References in the public sector a mandatory requirement in procurement.	Effort, pro bono participation in seminars or workshops: 18 h Costs: incl. in the project budget	Project-based involvement. Time-span of a project: 2–12 months. Commitment to public sector needs and service design.	Occasional, avg. 2 projects/y, avg. 1 workshop or seminar /y
Partners, non-profit	Universities and schools offering the DL as a case for their students or researchers. 2013–2016: ca 110 students	Students/researchers conduct a project on some design topic, e.g., concept design, usability evaluation, or accessibility evaluation.	Effort: total 14 460 h – Effort, student projects (1 ECTS = 27 h): 14445 h – Effort, pro bono participation in seminars or workshops: 15 h Costs: n/a or incl. in the project budget	Project-based involvement. Time-span between 1 and 12 months/student.	Occasional, avg. 1 workshop or seminar /y