Knowledge Flows in Service Design - A Framework

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Abstract

Service design processes are structured ways of finding solutions which effectively address certain needs. Research on service design has heavily focused on provider-user interactions. Knowledge flows have been largely neglected although in service design it is essential to have knowledge available where it is needed and when it is needed. Introducing the concept of knowledge flows to service design can therefore provide valuable insights and e.g. inform ways for targeted and meaningful stakeholder engagement. Most importantly, understanding knowledge flows would enable a general shift from “best practice” to a “best process” approach. Drawing on work in several fields, we propose a classification for the knowledge components typically encountered in a service design process, both as design in- and outputs. The components differ in their flow characteristics, which in turn has implications for their management.

1. Introduction

In a time of financial austerity, understanding how to improve service design in the public sector is of increasing importance. “Design” can be used in a variety of meanings but we understand design thinking an iterative way to consciously fashion an object or service in order to solve a problem or meet a demand. Design thinking is characterized by a particular emphasis on a thorough exploration of needs and constraints. A further characteristic feature is the generation of a variety of different solutions, rather than focusing on a single idea early on. Good design management is crucial to the success of an organization. In product design only one in every three products which reaches the market place is a success. The other two are costly design failures which could have possibly been avoided with better design management [1].

Service design is a very young field that although its importance has been recognized for example by IBM, has not yet been formed into a coherent discipline. There have been strong influences from interaction design, product design as well as management [2],[3]. Recently issues arising from the involvement of multiple stakeholders, especially in public services design have attracted attention [3],[4]. At a conference co-organized by the United Nations Institute for Disarmament Research it was stressed how important knowledge is for service design and that appropriate approaches and methods are just being developed. Many current approaches which rely on imitating what works best elsewhere (“best practice”) do not deliver. Instead it was suggested to learn from the underlying processes, for example by identifying which knowledge is needed, ensuring its flow and building situated theory for action, all supported by appropriate design processes. [5]

This paper provides a high level theoretical framework for this new “best process” approach. We propose a classification of knowledge components for services design, which integrate the concept of knowledge flows with design thinking. This framework allows to draw conclusions for individual knowledge components about their flow speed, adequate modes of transmission and the range over which they are transmitted. Awareness of these characteristics allows more effective design management and ultimately more successful uptake of innovations. For example it could inform the analysis of knowledge flows in successful projects and guide the creation of analogue flows in other sites.

We will draw on the exiting framework by Garud who classified knowledge components in technical product development according to how they are acquired [6] as well as the work by Duguid on determinants of flow speed [7] and Collins on modes of knowledge transfer [8]. Combining the last two with insights from Nonaka and Takeuchi [9] as well as the work of Nissen [10],[11] gives further insights into how flow rates relate to acquisition, retention, transfer and use of knowledge.

We differentiate in this paper between particular sets of steps which are specific ways of approaching
a design task and will refer to these concepts as “design processes”. The “Design Process” on the other hand is the use of design thinking to solve a problem. Which design process is appropriate will depend on the type of problem and contextual factors. However this seems to be an under-theorized subject as the design literature appears to lack meta design models to explain how design processes fit particular problems or circumstances.

A good design should be sustainable. In service design this means that the change in performance is permanent and becomes routine [12]. Research on innovation has shown that organizational interventions are most acceptable when they were locally developed [13] or locally reinvented [12]. Therefore while it is important for successful design to know the needs and constraints, knowing the context is also crucial. Contextual knowledge enables the identification and integration of hidden stakeholders; this is essential to achieve a universal sense of ownership.

Early literature on knowledge conceptualizes knowledge as an object, which can be created, stored, retrieved and applied [14]. However, according to Davenport and Prusak [15] knowledge is “a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers.” This definition captures the variety of types of knowledge; but by postulating an absolute subjectivity of knowledge, it implies that knowledge management is futile. Conceptualizing knowledge as a flow allows integration of the more traditional view of knowledge as stock or object with recent work stressing the dynamic nature of knowledge [10].

The Design Process represents a work flow which is crucially dependent on knowledge flows [11]. Design literature acknowledges the need for input, such as marketing information or requirements, [1],[16] but usually on a functional level and does not specify what types of knowledge are needed [17]. Knowledge is assumed to be available when needed and there is no further specification of its properties. In models of design processes it is usually assumed to flow uniformly between the different stages of the process.

From the knowledge literature we know that different types of knowledge have different properties. Examples include modes of transmission [8] or flow speed [10], i.e. how fast knowledge is disseminated. Flow speed is also sometimes also referred to as stickiness [3],[7],[9],[11]. It has been suggested that different types of knowledge might predominantly be found in different places of the organization [6] and vary in terms of their reach [9]. There appears to be a general consensus that tacit knowledge is stickier and is transmitted over shorter ranges, while explicit knowledge can flow faster and reach further. Flow speed on the other hand also relates to acquisition and transfer [10],[11].

2. Knowledge and design processes

In classic engineering design, a project starts with the exploration of an idea or a need. This exploratory stage leads to the identification of requirements. Then a set of concepts is generated, representing different approaches to meeting these requirements. A decision for a particular concept is made by comparing the generated concepts with the initial requirements [16],[18],[19].

These stages can also be found in design processes for service design [1]. This implies that the success of a design project will crucially depend on how well the needs and constraints are known and how much on room there is for divergent thinking. The latter is important as more ideas increase the chances of finding the best possible solution.

However, in our experience many service design projects - particular in the public sector - do not allocate sufficient time to exploration. Instead they tend to jump quickly to setting requirements. This tendency is repeated in concept generation. Teams tend to settle quickly on a solution which appears promising, neglecting the generation and exploration of alternative concepts. We found this in multiple instances when we analyzed design processes in local authorities and the English National Health Service. Key decisions are made on a high level and the ones that have the knowledge of the real issues and local circumstances, frontline personnel and users, are only consulted once a proposal has been developed.

The selection of a concept is followed by another divergent phase, the detail design. Following evaluation of the different approaches against the requirements, one solution is selected. At this stage the actual artifact is complete. However, design does not stop there. If the artifact is a product, it goes through production, distribution, operation and ultimately disposal; the equivalent stages for services are implementation and monitoring [1]. In recent years, significant attention has been devoted to studying effective and sustainable implementation [12],[13],[20-22]; the “active and planned efforts to mainstream an innovation within an organization” [12]. Some design processes include implementation [1], while for others conceptualize implementation as a separate process [23]. Both cases however imply an
active management of the artifact after it has been
developed. But they neglect that a Design Process
produces more knowledge than just how the need
should be met. Boyne and co-workers studied study a
policy project which aimed to increase the
performance of local government. They also pointed
out coming up with a solution and implementing it in
the organization might not be the end. If the design is
successful and achieves an increase in performance,
this performance change is likely to itself drive
organizational change [24],[25]. Also the design team
will have generated new knowledge on how they
approached and solved the problem. Approaches to
managing these additional knowledge components
which go beyond the artifact itself, are lacking from
the seminal design literature.

Alternating phases of divergence and
convergence are a general feature of design
processes; this also has implications for the
knowledge flow into the process. In the divergent
phases a large amount of content knowledge flows
into the Design Process. This can be different views
on how to translate the need into requirements or
different concepts to fulfill the requirements. In the
subsequent convergent phases decisions about
feasibility and appropriateness are made. As a
consequence some of the content acquired in the
divergent phase will be discarded.

3. Knowledge in- and outputs

When looking at which knowledge flows are
essential for good design it is advisable to separate
between the design process itself and the design
artifact or product [26], in this case the service which
is designed (figure 1). Thus the design work flow
requires two streams of knowledge flows. This
distinction is similar to, for example computer
programming. For a successful programming project,
knowledge about different programming languages
and about the product, in this case the program, is
needed. The programming language corresponds to
the design process, which can also be seen as a
“language” of design. On the other hand knowing
what the actual computer program has to do, on
which operating systems it will have to run or who
the customers are, is equivalent to looking at the
content and context on the design artifact side. The
two streams consist of two knowledge components
each. For the artifact stream these are content and
context, while the process stream consists of methods
and context.

3.1. Inputs

 ![Figure 1. Two dimensions of service design (process and artifact) and the corresponding knowledge components which form the in- and outflows of the Design Process.](image)

Input on the artifact side is usually associated
with content of the service. Service content addresses
the question “What is the service supposed to do?” In
the early stages, inputs are the idea the new service is
based on or a need it has to address; subsequently the
level of detail increases as the project progresses.

In order to make these decisions about feasibility,
the content component has to be complemented by
contextual knowledge. This can be the nature of the
organizational superstructures, team climate or
applicable rules and regulations. While content seeks
to answer the “what” question, context can be seen as
addressing the question “Where is the service
operating?”, both geographically and socially. As
with content knowledge, the demand for contextual
knowledge will vary in the different phases of the
Design Process and some of the acquired knowledge
will be discarded again. Context has been
acknowledged as an important factor in service
design [12],[27],[31],[28-30] but more attention must
be paid to actively and adequately managing it. We
will be return to the differences between the
knowledge components and what consequences these
have for their flows and therefore their management.

A service design project also needs input on how
to conduct the design process itself. Method
knowledge can be knowledge about different types of
design processes or how to select an appropriate one.
Design processes can be linear, cyclic or mixed [32-34], incremental or radical [32],[35] and the management can range from collaborative via co-design to a single champion-led [27] approach. There is no one-size-fits-all design process.

As a design process will usually rely on a set of tools and techniques, these are also part of method knowledge. A particular group are knowledge handling techniques. They allow to create new knowledge (e.g. by studying), channel knowledge (e.g. by user consultations) or combine knowledge (e.g. design processes). They can be used for all three knowledge components. An example for a technique that generates content knowledge are exercises to develop creative ideas together with potential service users [23],[36]. Interview techniques, on the other hand, could be used to channel contextual knowledge about relevant regulations.

The suitability of design processes and tools depends on contextual factors. It is important to take into account the environment where the design is taking place. This context can be similar to the context in which the final service will be operating. This is the case if a service is redesigned and the design team is chosen from the staff of the existing service. However, the design context can also be very different from the service context. This is the case if external consultants are brought in or if the design team has a restricted view of the organizational context in which the service operates. This can happen if the design is carried out exclusively at management level with minimum input from the frontline – or if a frontline design team lacks management input and is thus unaware of higher level agendas and constraints.

Design is a highly iterative activity [37]. In order to select an appropriate method, the design team requires contextual knowledge about where the design is taking place. However, in order to create or uncover this contextual knowledge, they will need method knowledge. One way to break out of this cycle is to start by using a number of different methods to generate context knowledge. Subsequently the choice of methods and the resulting knowledge are iteratively refined.

The importance of context highlights a common problem in “best practice” approaches [8],[9],[38]. These look for a successful service design and then attempt to copy it. This is often includes imitation of the design process. However, usually insufficient attention is paid to the context of the design process and the service itself. Here the concept of context has to extend beyond the particular industry. Two services in the health care sector can be significantly different in their context, for example due to different prosperity level in the area they serve. On the other hand, context can also span industries. It is theoretically possible for a public library to learn from a pizza delivery company - if an analysis of the context reveals parallels that make a transfer appear feasible. Therefore it is essential to understand the causal relationships in order to identify which contextual factors are relevant. If the relevant context of the service is comparable but the design context is not, it might be necessary to adapt the design process. A pizza delivery company may be owner-run while a public library has a large number of stakeholders. Thus decision processes which in the pizza company involve only the owner, have to be adapted for the library to accommodate the much wider range of stakeholders.

3.2. Outputs

During a Design Process new knowledge about appropriate methods is generated. If the project has been perceived as a success, this could also lead to the creation of new contextual knowledge concerning the acceptance of design approaches. Most conventional design processes neglect this. However these flows must be managed to ensure that new knowledge is disseminated and does not dissipate. We will show in the next section that methods and context differ in their flow properties and will thus need different dissemination strategies.

The different knowledge components are created either through “learning-by-doing”, “learning-by-studying” or “learning-by-using” [6]. Engaging in the Design Process involves doing design activities as well as using design tools; thus new knowledge is created. As mentioned, a design process also combines individual pieces of knowledge and thereby produces new knowledge; this newly created knowledge can belong to any of the three categories (content, context, methods). A design process can also transform knowledge, e.g. by making a piece of contextual knowledge part of a new method. The outputs of the Design Process can thus either be new knowledge or selections as well as refined versions of its inflows.

The most prominent output will be an approach to address the need that triggered the Design Process. This output is content knowledge as it describes what the service will do in order to meet the need. It consists of knowledge which was part of the content flowing into the Design Process as well as knowledge which was created during the Design Process. Besides the content flows, there will also contextual knowledge flows originating from the process. This is knowledge concerning the spatial and social
environment in which the service will operate, such as a certain culture shaped by professional values which are set through the staffing of the service. These contextual components can be different from the ones which flowed into the process but they do not necessarily have to be. A change in context can either be caused by the design processes itself or have an external trigger, such as changed legislation. Internal changes can be direct, for example changing the staffing of a services to include professionals with different mental models, or indirect. An example for indirect change is a redesign which leads to a performance increase. Stress levels of staff decrease, which will improve the team climate. Contextual factors need to be managed to ensure for example compatibility of professional values with other parts of the organization.

While the role of contextual factors is acknowledged in the implementation literature [12],[13], little allowance is made for changes of these factors either by the design process itself or through external agents. Even if a solution has been carefully matched to contextual factors, if no attention is paid to for example a shift in policy, the solution might not fit the context anymore by the time it is implemented. Knowing that the environment is fast changing, for example in the healthcare sector, can be a contextual inflow in itself. It can influence the selection of concepts, favoring solutions which are adaptable to changes.

4. Knowledge components

The three knowledge components identified in the previous paragraph, content, context and methods, are related to the components Garud identified as “know-how”, “know-why” and “know-what” [6]. He links these three knowledge components to three types of acquisition, namely “learning-by-doing”, “learning-by-studying” and “learning-by-using”. “Learning-by-using” involves using an object which cannot be changed [6]. The user generates knowledge on how well the artifact satisfied his or her needs and which needs are unmet. For example a user who is experiencing a service which he or she cannot change immediately, may realize possible improvements and communicate these back. “Learning-by-doing” on the other hand allows direct modifications. A professional delivering a service may be able to directly make modifications. Thereby knowledge is generated how to delivery better services. In this section we explore how the knowledge components which Garud identified in technical product development relate to a service context and which conclusions we can draw about their flow properties in terms of range, speed and modes of transmission.

When studying scientists, Collins identified five ways in which knowledge can be transmitted [8]. If it is explicit it will be definition be transferable by formulae, diagrams or verbal description [9]. Another option is to increase understanding. Deeper understanding allows to codify more tacit knowledge. Tacit knowledge itself can be disseminated through social interaction, shared practice or turnkey methods. The latter is a mechanical solution which eliminates the need for tacit knowledge through a “black box” approach [8]. An example would be a commercial laser. It works by pressing a button, eliminating the need for detailed knowledge on how to set up a lasing system. Turnkey methods do not work for services because context plays an important role and is highly unique and individual. Typical environmental factors which influence, e.g. a laser, are fewer and much more predictable. However, the remaining four methods, verbal or diagrammatic communication, deepened understanding, social interaction and shared practice, are also viable ways to transmit knowledge in a service environment.

From the seminal work of Nonaka and Takeuchi [8], we know tacit knowledge is confined to short ranges while explicit knowledge flows can reach beyond personal contacts and disseminate on an organizational level. Tacit knowledge is always sticky, which means that it flows very slowly. The flow of explicit knowledge on the other hand depends according to Duguid on shared background. Even explicit knowledge still draws on unarticulated assumptions, beliefs and conventions. With such a shared background explicit knowledge will flow quickly, while without it also explicit knowledge can be remarkably sticky [7]. This demonstrates the importance of analyzing contextual factors. In general, and in particular if the context is comparable, explicit knowledge will flower faster and wider than tacit knowledge.

Although we clearly had the challenges of service design in mind when developing our framework, as it is based on theories from other fields many of the basic ideas are applicable beyond just service design. However to explore general applicability further is beyond the scope of this work.

4.1. Methods

Know-how is the product of “learning-by-doing” and has been defined as the “understanding of generative processes” [6]. The generative processes required for a new service are the different design processes, tools and methods. Thus, know-how in
service design is knowledge about design methods. This knowledge is path-dependent and cumulative [6]. Therefore we expect generation of new method knowledge as a design output. However, knowledge about design methods is not purely based on know-how. It can also be based on know-why via “learning-by-studying”. Design research attempts to generate know-why by establishing the principles and theories of design and their implications for design methods. Knowledge about methods can also be based on know-what, acquired through “learning-by-using”. For example, the use of design guidance may generate know-what through realizing the short-falls within the guidance.

The “Plan Do Study Act” cycle is an example of a design method that is based on a combination of know-how, know-why and know-what. Its use in the United Kingdom’s National Health Service (NHS) has been both widely promoted and critiqued [32],[28],[39],[40]. It was developed based on insights from a systemic view of production [41] and later generalized to situations where learning and improvement is important [42], respectively “learning-by-doing” and “learning-by-studying”. Supporters of its use in healthcare argue that it “mirrors prudent clinical work” [32] and thus can be rooted in a “learning-by-doing” experience. Finally, in the ongoing discussions about the suitability of this process [39],[40] for healthcare, “learning-by-using” is taking place; much of the critique focuses why using the process is inappropriate and that it should be restricted to certain applications or needs augmentation.

Method knowledge is largely explicit but it has an important tacit component, which can be e.g. confidence and experience. As such it can to some degree be learned from books and documents or by other classical methods of teaching and transmitting explicit knowledge. For tacit components shared practice or social interactions are ways to ensure the flow of what has been learned. More insight into e.g. into psychology or group dynamics is likely to allow more tacit knowledge to be codified. For a given design project method knowledge will be shared and transmitted within the project team. However, ideally also other teams in the organization and possibly even beyond will benefit from the generated knowledge. A widened range of the knowledge inflows is also desirable to access as much knowledge as possible.

4.2. Content

We introduced content as “what the services are supposed to do” on the input side and “what will be done to meet the identified needs” on the output side. Thus there is a strong connection to Garud’s “know-what”, which is acquired through “learning-by-using”. “Learning-by-using” in the product development world is situated between the vendor and the buyer. The customer is using the product in different ways to how it was originally designed and feeds his experiences back to the vendor [6]. This process creates knowledge about needs for new products. The difference to “learning-by-doing” is, that the actual artifact cannot be changed. Changes can only be made by the producer. In service design an equivalent concept are experiences the client but also other key stakeholders, such as staff or in public services commissioners, have had with services. On the design input side, these experiences lead to the realization of an unmet need which is the know-what input for the new service. Previous experiences will shape ideas around how this meet could be met. This can be a beneficial resource but it also carries the danger of getting stuck in a certain way of thinking. In order to bring new approaches and ideas to the solution generating process it can be useful to bring other people from different backgrounds to the process who were faced with a comparable challenge in a contextually similar situation.

While content is strongly aligned with “learning-by-using”, know-how and know-why also have a contribution. In order to develop the best way of solving the challenge posed by the need, research can be of crucial importance. This is for example the case in medicine where studies provide essential knowledge to compare treatment options. Content input can also come from staff and people experienced in delivering the service. Their knowledge on what works to address particular needs, derived by “doing”, can be an essential input into finding an effective solution.

The typical content knowledge in a design processes is highly explicit. Need and solutions have to be clearly articulated as they will have to win support either within the organization or often also from outside the organization, e.g. from commissioners or politicians. Thus flows are long range and typical methods of transmissions are documents and consultations.

5. Implications

5.1. Links to existing approaches

The three knowledge components can be found in the literature on strategic planning. Bryson outlines a strategic planning process for public organizations
[29] which can be seen as a macro process guiding and providing input to design on the micro level [27]. He does not mention service design but strategic planning sets the stage for the design of the particular services offered by an organization. Strategy can be seen as framing service design in terms of organizational triggers and inputs. Among other factors Bryson identified purpose, external mandates, mission and values as well as strategic issues as knowledge inputs on the content level. He acknowledges that external mandates can be formal or informal, thus either content or context. His process also provides method knowledge to elicit relevant context. He suggests a stakeholder analysis focusing on the stakes and performance criteria of involved parties as well as looking into how an organization deals with conflicts.

However, while purposeful planning, exploration and the need for contextualization are acknowledged in the strategic planning literature, their impact on the actual design of individual services appears limited. In our own research on one of the most prominent public services in the United Kingdom, the NHS, we found several initiatives in recent years to improve services by increasing attention on design and development processes. There is no single preferred approach but the NHS Institute for Innovation and Improvement provide a range of methods [23],[36],[43]. However, there has been comparatively little observable change in service design practice. On the other hand, where change happens personal contacts seem to play an important role in the dissemination of new approaches and methods. Method knowledge will thus be very heterogeneous, dependent on professional background, social network and previous experiences. When it comes to content knowledge, UK Government advocates user-centered public services. Therefore consultations with potential service users are part of most service design projects. However, the level of content input by other groups, for example front-line staff, is variable. An example are co-creation methods [35] which focus on the content contribution of the client or user but only have a limited range of methods and ignore key stakeholders, such as regulators.

Jun and Clarkson [44] conducted a literature review of healthcare quality and safety improvement approaches. Quality and safety are the main drivers behind much of the recent service design and redesign efforts in health care in the UK. The authors identified 40 methods which they classified according to their “primary information source”. These sources, e.g. people’s behavior or medical records, correspond to our methods of transmission.

For three exemplary quality issues the authors identified the main methods for transmission which underlie typically applied methods. Patient experience relies on people-based methods of transmission, while for example effectiveness of care relies on document-based methods. However this illustrates the typical neglect of contextual information. While the chosen methods enable the recovery of relevant content, additional knowledge flows will be needed to supply the context. Thus even when addressing needs around experience, document-based knowledge will still be necessary to understand the context of the service.

Lindstaedt [45] and co-workers describe an activity-centered mapping environment for knowledge management approaches. While our work is concerned with classifying knowledge as opposed to knowledge management approaches, the six broad categories of activities which the authors distinguish are still relevant. They are: business goals, process-, learning-, culture- and technology-oriented activities. These areas can be mapped upon our knowledge types, for example business goals can be identified with knowledge about the desired content while process activities depend on method knowledge. The authors suggest that their classification is useful for orientation in a broad field of different approaches but do not discuss further the possible implications of categories on flow properties.

In general our framework is compatible but more high level than many of the existing approaches. These have been developed for specific tasks but usually do not provide a coherent approach to the bigger picture, which is what our framework could add.

### 5.2. Different flow properties

Many models and approaches in the seminal design literature share that knowledge is regarded as having uniform properties. No allowances are made that different knowledge types flow at different speed or in different ways. Our classification addresses this point and can enable more effective dissemination of innovations.

Besides stressing the importance of contextual knowledge our framework also raises awareness of the need to manage the knowledge flows associated with the design process. It is not uncommon that in an organization one person is most knowledgeable about design processes and as a result manages most of the design projects. This is a potential risk. If the person leaves the organization, a large share of the organization’s design process knowledge will be lost. Individual knowledge can become collective
knowledge via training, if it is embedded in organizational cultures and routines [46]. Our framework can help to identify appropriate timescales and ways for knowledge transmission according to whether it is context, content and methods. Analyzing the knowledge flows can also be a useful tool in determining reasons for project failure - possibly tacit contextual knowledge was expected to flow fast to a distant point in the organization or it had not been taken into account that context was prone to change over the course of the project. In the latter case, appropriate solutions might suddenly not be appropriate anymore because e.g. collaborators go out of business. Being aware of knowledge flow properties can help anticipate and manage these issues. Types of knowledge which flow slowly are less likely to change on short notice. However, if there are explicit components to the context it might be advisable to assess how frequently they have changed in the past and if any changes which might have an impact on the project seem likely.

5.3. Managing information sources

Insights from our framework can help make stakeholder involvement more effective within a “best process” approach. It is recognized the involvement of key stakeholders, parties which have something to lose or gain from the project, is vital to successful design projects [47],[29],[4]. McNulty points out that stakeholders can be actors due to either role, organizational status or experience [30]. Classically stakeholder identification is centered on role; this neglects that people can in reality have more power than their role implies, due to experience or status [47]. A solution to this can be to use the framework as a guide to consider which knowledge is required and then plan the acquisition by selecting people who are able to provide this knowledge as well as appropriate methods of transmission.

5.4. Critique

A point of criticism which can be leveled at our framework is that it deals with “know unknowns”. We agree that not everything about a design can be known beforehand. But we believe that structured exploration and reflection can help anticipate and avoid some of the problems which are often observed in service design projects. Our framework acknowledges that knowledge gathering is an ongoing, iterative process. Therefore the initial knowledge requirements will also evolve to include aspects which had not been anticipated from the beginning.

Design processes can be very situation-specific. It is thus a question of ongoing research to which degree general rules for stakeholder engagement concerning the timing and types of knowledge flows can be derived. We hope to offer more practical considerations in a follow-up paper. We also invite other researchers to employ our framework and welcome feedback.

6. Conclusions

This work lays the foundation for introducing knowledge flow concepts to service design and provides a theoretical foundation for recent attempts of moving from “best practice” to “best process”. We identified three types of knowledge, content, methods and context, needed for the Design Process, their flow characteristics both in terms of speed and range, as well as their modes of transmission.

The three knowledge components for services can be found in existing service design approaches. However, usually these do not consider the implications of the different nature of the components. Considerations of sources and modes of acquisition are largely absent from the literature. Thus the presented framework fills a gap and can directly inform actions on how to ensure and manage timely knowledge flows both going into the Design Process and emanating from it.

Our framework stresses the importance of contextual knowledge and of paying attention to its flow properties. One insight is that highly explicit contextual knowledge is more likely to change on short time scales than more tacit knowledge. Thus highly explicit context may susceptible to change over the course of a service design project. This can cause costly planning errors, such as housing projects which once they have gone through all stages from planning to completion, are not consistent with government strategy anymore. Increased attention to context will also enable situation-specific identification of the essential elements of a design process. Thus this framework can be seen as a first step towards a meta model of design processes. Such a model will capture how design processes fit particular problems or circumstances and, vice versa, how situations require particular processes. Better understanding of service design processes which are going on all around us and are a complex interplay of artifacts, systems and infrastructure, is also likely to yield interesting insights for the field of information science in general.
7. References


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