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SUPPORTING THE THERAPIST IN ONLINE THERAPY

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Abstract

In the last decade, eSupport (Internet-reliant therapy) has gained substantial attention, both in research and practice. Several studies in psychology show that structured eSupport (e.g. Computerized Cognitive Behavioural Therapy), is promising both with regard to therapeutic efficacy and cost-effectiveness. However, the transition from face-to-face therapy to eSupport creates new challenges for therapists, such as lack of (traditional) structure and access to secondary information (e.g. body language) about their patients. In this paper, a design science research approach has been employed in the context of eSupport. Drawing on the knowledge base of face-to-face conversations, face-to-face therapy, and pragmatic IS theory, a framework for patient indicators has been designed. The design has been justified through both (i) descriptive evaluations based on the selected knowledge base, and (ii) experiences collected in a stakeholder-centric design process, including experimental evaluation of an eSupport platform that implement the indicator framework. The framework was designed to allow new indicators to be 'plugged in' dynamically and inserted into tailorable lists. New indicators can be created either through specialization of an indicator base class, or by configuring metadata for generic indicators that tap into an action log. Indicator values are cached, both to boost performance and to support trend analysis of patient indicators. We conclude that the indicator framework serves to improve support for therapists: It offers structure and access to both primary and secondary information in new ways. In doing so, it meets some of the key challenges that therapists encounter in the transition to eSupport.

Keywords: ePsychology, eSupport, Framework, Indicator, Therapy.

1 Introduction

Since the inception of the World Wide Web, there has been a growing number of trials on Internet-reliant therapy, both for psychiatric disorders and for promoting health behaviours (Ström, 2000; Riley, 1999; Barak, 2008). Most trials have employed computerized cognitive behaviour therapy (CCBT), which is well suited to be computer- or Internet based due to its structure, and the existence of written manuals and self-help books published for a number of problem areas. The Internet-based interventions that are without therapist support could be regarded as online self-help, while online interventions supported by therapists are more alike face-to-face therapy. This later kind of Internet-reliant psychosocial care – hereby referred to as eSupport – is promising both with regard to treatment efficacy and costs, by using less therapist time per effectively treated patient compared to face-to-face therapy (Tate 2009; Warmerdam, 2010).

Face-to-face therapy is effective for many different reasons including the support given by a therapist, the personal bond, the feeling of responsibility and the ability to easily communicate questions and comments (Ilardi, 1994; Castonguay, 2010). There has long been an interest in the affective interpersonal dimension, the *therapeutic alliance*, in psychological trials. Some preliminary results imply that a good therapeutic alliance can form also via the Internet (Knaevelsrud, 2007). There is, however, less research on how communication is perceived and whether online communication is an enabler (or an obstacle) for effective treatments and the establishment of therapeutic alliance.

While eSupport research tends to focus implications for medical efficacy and costs, corresponding to a patient and societal perspective, there has been little attention paid to the character of the support from a therapist point-of-view. Clearly, eSupport differs significantly from face-to-face therapy. Face-to-face conversation has a number of characteristics with regard to *immediacy*, *medium* and *control* (Clarke, 1996). Immediacy concerns the co-presence of actors in conversation. Medium refers to the way utterances persist, and the simultaneity of action among actors. Control includes how actors are enabled and constrained to express themselves during a conversation. When bringing communication online, these characteristics change in a way that creates new challenges (Ågerfalk, 2004) and new opportunities.

The view of Clarke (1996) may serve to point out changes to the immediacy, medium and control of conversation in an online setting. Literature in psychology informs us about the transition to the online medium in a different way. Two radical changes concern *secondary information* and *structure* (Ekman, 1969; Harrigan, 2008; Townend, 2009). First, in eSupport, the therapist no longer has access to secondary information (such as facial expressions, the patient's gestures, and intonations). Second, going online challenges the structure in face-to-face therapy (e.g. scheduled counselling meetings). A challenge in the design of eSupport is to find alternative ways to provide secondary information and support to the therapist. The online medium may also offer new opportunities to improve the situation for different stakeholders.

In this paper, we draw on the knowledge base from face-to-face therapy to better understand how to design eSupport solutions. We aim at contributing with conceptual design knowledge to provide support for therapists in online therapy. The paper draws from a design science research (DSR) initiative in a multi-disciplinary research context in Sweden. We seek to develop relevant and useful design knowledge (Hevner et al, 2004). In doing so, we follow Orlikowski & Iacono's (2001) call to contributing to theorizing the artefact in a specific domain (i.e. eSupport).

The paper proceeds as follows: Section 2 highlights design issues from the perspectives of face-to-face conversations and face-to-face therapy. Section 3 accounts for the DSR initiative, and section 4 shows the 'DSR artefact' – an framework for patient indicators that reflects challenges presented in section 2. In, section 5; we assess the framework from both a theoretical and a practical perspective. Finally, in section 6, the paper is concluded.

2 Drawing from the Knowledge Base

The theoretical foundation for this work is to a large extent an exaptation (Gregor & Hevner, in press) of knowledge from face-to-face conversations and face-to-face therapy into the context of eSupport. We embrace the emerging sociomaterial perspective of an assemblage view of the social and the material (Orlikowski & Scott, 2008). Following a sociomaterial perspective, we seek to explore the difference in character of interaction in face-to-face therapy and in eSupport. In eSupport, therapist and client will not meet in person. Instead, there are several IT-reliant interaction possibilities. Our journey to characterize the transition from one assemblage (face-to-face therapy) to another one (eSupport) starts out from Clarke's (1996) characterization of conversations, and established concepts in psychology.

Section 2.1 highlights a number of differences between face-to-face conversations and eSupport conversations. A superficial interpretation of the discussion above is that the focus of design should be to build technology that efficiently supports the conversation between therapists and patients. The risk, however, is that technology design is limited to the lens of *verbal information*. Verbal information refers to the utterances from the patient, e.g. the way s/he describes their feelings and behaviour. However, in delivering therapy, the therapist also relies on *secondary information* and *structure*, which are further discussed in sections 2.2 and 2.3. These three sections as a whole provide us with an instrument to inquire into the sociomaterial assemblage of eSupport.

Feature		Face-to-face therapy	eSupport
Immediacy	Co-presence	Actors share the same physical environment	Actors do not share the same physical environment
	Visibility	Actors can see each other	Participants can possibly see each other through images and video transmission
	Audibility	Actors can hear each other	Participants can possibly hear each other through audio transmission
	Instantaneity	Actors perceive each other's actions at no perceptible delay	Both synchronous (real-time) and asynchronous communication is possible
Medium	Evanescence	Medium fades quickly	Medium may be persistent
	Recordlessness	Actions leave no record, unless the therapist records sessions or takes notes.	Internet-reliant actions (e.g. e-mails) may be logged in detail
	Simultaneity	Actors can produce and receive at the same time	Actors are typically switch between interpretation and intervention actions.
Control	Extemporaneity	Actors act 'in real time'	Actors may formulate and execute their actions reflectively during extended amounts of time
	Self-determination	Actions are constrained and enabled by the structure of care	Actions are constrained and enabled by technology
	Self-expression	Actors are governed by norms related to their role in the institutional context.	Actors are governed by norms related to their role in the institutional context; and constrained by the way communication is formalized in the appropriated technology.
		Identities are known (or at least actors are recognizable).	Identities may be completely anonymous.

Table 1. Features of face-to-face therapy and eSupport (after Clarke, 1996 and Ågerfalk, 2004)

2.1 Conversations in eSupport

In order to systematically reflect about eSupport conversations, we appropriate Clarke's (1996) model of features of face-to-face conversation (Table 1). The purpose of this exercise is to show how the online medium changes the character of interaction between therapists and patients. We reflect about these changes and their implications for designing eSupport solutions.

Face-to-face conversation is characterized by *immediacy*. Following Clarke (1996), actors are co-present, audible and visible, and able to instantaneously respond to a situation.

Online communication could also 'mimic' co-location through video conferencing. Such 'virtual' therapy sessions enhance the audibility, visibility, and instantaneity of the conversation. However, it also increases the resources (e.g. therapist time and technology costs) invested in online therapy. More commonly, other forms of communication are supported in eSupport platforms, such as messaging, forum and chat. This implies that the character of 'immediacy' in eSupport is *subject to design*.

The notion of interaction forms is further understood when discussing the online *medium*. The online medium – in contrast to face-to-face conversations – is persistent and possible to log (or 'record', to paraphrase Clarke). It enables various types of conversation with regard to simultaneity. Technology allows for both synchronous (e.g. chat or video conference) and asynchronous communication (e.g. forum or e-mail). These types of communication are likely to impact treatment efficacy in different ways.

The degree of *control* is also affected in the transition to eSupport. With regard to extemporaneity, eSupport may provide more time for reflection and peer consultation, while face-to-face therapy requires the therapist to respond in real-time to the situation at hand. With regard to self-determination, face-to-face therapy allows the actors to express themselves freely within the given boundaries (e.g. during a therapy session). In eSupport, these boundaries are different. On the one hand, eSupport increases the freedom to communicate at any given time (e.g. submit a question or a response in the middle of the night). On the other hand, the way technology is designed may constrain our actions: E.g. technological problems or usability problems may hinder an actor from doing what they want to do.

The same line of reasoning goes for self-expression. In a face-to-face conversation, we are only bound by our language to express ourselves. In eSupport, communication may be formalized in a way that constrains us. As an example, we tend to express ourselves differently in spoken and written language (consider the e-mail example). So, in a way the degree of control may interpreted as 'higher' in eSupport, e.g. through communication on a mobile eSupport platform. It may also, however, affect the way that we express ourselves. When using e-mail, for example, there is a tendency to communicate shorter messages. Further, it may also take more to actually start a communication compared to when we meet face-to-face.

Another important difference with regard to self-expression is related to the way that anonymity may affect our behaviour. In face-to-face therapy, the therapist typically knows the identity of the patient – at least by appearance. In addition, eSupport allows for complete anonymity.

2.2 Secondary information

With secondary information we mean information that is not explicitly revealed in verbal or written form. Instead, secondary information is deducted by observation or indirect means. Secondary information comes from cues that are not necessarily openly discussed in therapy but can none the less give valuable pieces of information. Therapists often try to read the body language, to notice intonations and reactions, *et cetera*, of the patient. There can also be information about the client and the treatment in how the client behaves in the session, for example if the client is always late or if s/he avoids eye contact. Hence, apart from what the patient say in therapy the therapist typically also use more sublime cues in forming a picture of the patient's problem and situation. How the patient behaves in the waiting room or how home work assignments are filled in can give clues to problems or issues not raised in therapy. Some of these cues are not readily available in eSupport.

In eSupport, the Internet platform corresponds to the office where the therapist and the client meet. As designers, we need to embrace the potential in this new technology to make use of behaviours exhibited by patients that may provide valuable cues for the therapist. Is the patient always logged in at 3 am? Is the patient checking his mailbox every hour? Is she delivering her assignments long before deadline each time? The exact value of this kind of information needs to be further investigated, but it is clear that the loss of secondary information in face-to-face situations may be substituted by other cues that are enabled when an IT platform facilitates the interaction between therapist and client.

2.3 Structure

The therapist's working day in face-to-face therapy is usually well structured. The therapist has a schedule and the patients arrive, one at the time, and each has their own appointment. This is practical but it also forces therapy into a certain shape. Many therapists use a standardized amount of time for each appointment, e.g. 50 minutes, regardless of other factors such as the patient's state, motivation and progress in treatment. There are notable exceptions to this - some treatment protocols states variability in time and scheduling depending on such factors. In most protocols, however, standardizations are the norm (Wilson, 1998).

Therapy depends on structure. This is so fundamental that it tends to be taken for granted. Structure has probably served therapy well (Waller, 2009; Huppert, 2006). One of the reasons Internet-based therapy is effective is arguably that it presents a very formalized and structured form of therapy. But structure is not only in the therapy but also *for the therapist*. In eSupport, 'traditional' structure disappears. Patients may seek counselling at any time. Control has moved from external factors to the patient, maybe even empowering him/her. While this increases the flexibility for the patient, it is also a significant reduction of control for the therapist. In face-to-face therapy the therapists typically do not have to prioritize and choose among patients sitting in a waiting room. Typically there are not a number of homework assignments lying on the desk, which the therapist is expected to prioritize, analyse and provide feedback for. Instead, the therapist is used to focusing a patient at a time in scheduled therapy sessions. In eSupport, on the other hand, the patient may hand in assignments and ask questions at an arbitrary time. This creates a need for the therapist to overview, prioritize, and decide on what actions to take (e.g. provide feedback to assignments or encourage patients through e-mail or other communication channels). These therapist activities need to take place frequently, typically on a daily basis.

The loss of typical structure is a design challenge. The Internet platform can provide a new form of structure, e.g. by showing items in a preferred order and based on rules set by the therapist. The platform can prioritize the most recent e-mails, those that have waited the longest or those having special content. The platform can flag important topics or other signs. In summary, the platform needs to provide a new type of structure for therapists, to compensate for the loss of 'traditional' structure that characterizes face-to-face therapy.

3 Method

This paper, although partially adopting a conceptual/analytical approach (Järvinen, 2000), is an appropriation of IS design science research (DSR) in the context of the research programme U-CARE at Uppsala University. In brief, DSR guidelines (Hevner et al, 2004) state that *design* cycle should be informed by a *relevance* cycle and a *rigor* cycle (Hevner et al, 2004; Hevner, 2007).

First, U-CARE offers a good environment for to promote *relevance* in research. The overarching goal of U-CARE is to promote psychosocial health among patients struck by somatic disease and their significant others, ideally at a lower cost to the benefit of individuals and society. Research is conducted in close collaboration between research groups in clinical psychology, information systems, and economics. Initial research activities are performed within the areas of paediatric oncology, adult oncology and cardiology in close collaboration with clinicians at Uppsala University Hospital. The studies are designed in close collaboration with clinics and patient organizations. The design process was set up in accordance with agile values (Conboy, 2009). Development sprints lasted for 2–3 weeks, followed by sprint reviews where various stakeholders were exposed to the latest version of the platform. In addition, external specialists and patient groups were invited to explore the software, followed by workshops in which they provided feedback to the design team. In total, more than 30 design workshops have been organized, engaging a great variety of stakeholders.

Second, with respect to *rigor*, researchers from multiple disciplines have contributed to the design process. Through collaboration with psychologists and researchers in psychology, knowledge about previous software platforms and the knowledge base from psychology was factored in to the design process. IS researchers ingrained the design process with knowledge from the IS field and its sibling disciplines (primarily interaction design and software engineering). The IS input is based on a pragmatic stream of IS research, focusing social interaction through instrumental use of technology (e.g. Sjöström, 2010). Rigor also concerns the evaluation strategy through which the qualities of design artefacts are demonstrated. It is beyond the scope of this paper to go into details of the overall evaluation strategy for the entire software platform. Instead, we focus on two types of evaluation: Informed arguments and experimental evaluation. These evaluation types are relevant here since they have directly addressed the DSR artefact in focus in this paper. This is further elaborated upon in section 5. Essentially, we embrace rigorous evaluation methods (Hevner et al., 2004) to demonstrate the qualities of the artefacts that emerged in the design process. While the actual trials have not started yet, this paper draws from the design process; in which the platform was formatively evaluated primarily through the workshops described above.

4 A framework for eSupport patient indicators

In this section, we present a framework for patient indicators in eSupport. While the driving idea behind our work is that the software we build needs to support conversation, we base our design upon a pragmatic framework. We use the term 'framework' here to include a conceptual model of information related to indicators, as well as the characteristics of related software components.

Conceptual modelling has been in considerable focus in the IS field over the years (Wyssusek, 2006). A common perspective is that information systems *represent* reality (e.g. Wand & Wang, 1996). When adopting such a perspective, designers aim at creating accurate representations of reality in their models. While the representation perspective still stands strong in the IS field, there is an emerging criticism towards it (e.g. Hirshheim et al., 1995; Holm, 1996; Ågerfalk, 2010). The criticism is mainly based on the philosophical insight that language does not merely represent the world. In contrast, the way we express ourselves using language should rather be seen as a fundamental way to bring about change to the world (Austin, 1962; Searle, 1969; Habermas, 1984). Following this perspective, information systems are instruments used to perform action (Goldkuhl & Lyytinen, 1982; Sjöström, 2010) and mediate actors' intentions. Designing information systems is primarily to be seen as enabling and empowering social interaction, typically in a multiple-stakeholder context (Sjöström 2010). These pragmatic ideas influenced our conceptual model in several ways. It ingrained our design with the following ideas:

i. Design our platform on basis of a model-view controller (MVC) pattern, since this clearly delineates user-accessible software functions that has a one-to-one correspondence to human action
ii. Manage metadata for all actions that are implemented as controller actions in the software
iii. Allow for detailed logging of actions to support both (i) therapists in providing therapy and (ii) researchers in collecting and analysing data
iv. Support indicators that are easily implemented and configured through definition of indicator metadata, that may be revised, thus evolve over time
v. Support personalization to satisfy the preferences of different therapists

Idea (i) will not be in focus in this paper, but it needs to be quickly elaborated upon. Parnas (1972) was an early proponent of separation of concerns, and dependencies between interfaces rather than dependencies between concrete implementations. A contemporary approach based on this idea is the model-view controller (MVC) pattern, in which business logic (models) is separated from user interface logic (views) through a controller. The 'actions' in the controller are software functions that can be accessed from a web client, thus *controller actions constitute a map of the software as an instrument for user actions.* In contemporary software development environments, and in multiple programming languages, there are numerous available implementations of MVC frameworks for adoption in software development. Thus, the MVC pattern is a good choice for conceptual solutions, since it is supported on all major development platforms.

Idea (ii), to store metadata about actions in the conceptual model, enables a pragmatic logging of user actions. The architecture does not allow any action to be performed, unless there is metadata for the action in the database. The MVC framework, through its controller actions, makes it possible to build a one-to-one relationship between action metadata objects and user-accessible functions in the software (i.e. controller actions). The metadata describes several aspects of action, including whether or not the action should be logged and if it should be included in a patient journal. Thus, idea (ii) is a pre-requisite to implementing idea (iii). In principle, any action performed by any user can be configured to be part of the log and/or patient journal.

Idea (iv) deals with the concept of 'indicator', which we define as some named, quantifiable piece of information regarding an actor. From a therapy perspective, we typically mean a patient, but the conceptualization allows for indicators for any actor using the system. The architecture does not in any way constrain how the indicators are calculated; or where data comes from. Idea (v) is based on the ambiguous view of indicators that emerged in the design process: The therapists did not agree on what indicators to use to support their work. Thus, we adapted the conceptual design to support personalization of indicators for therapists.

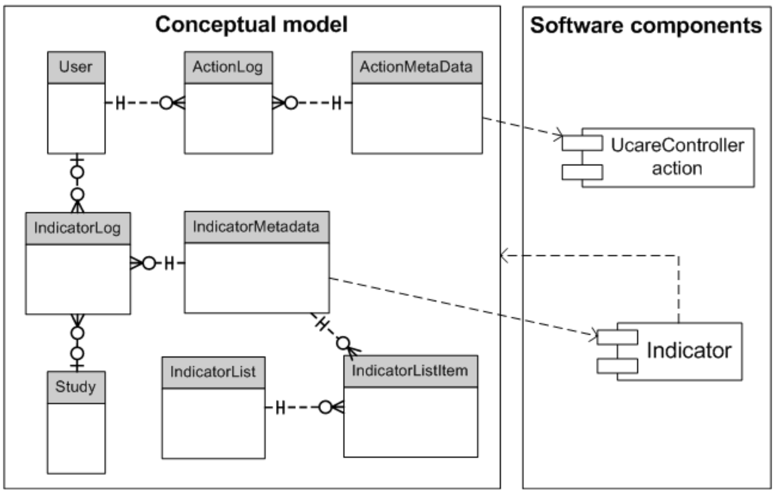

Figure 1. The eSupport Indicator Framework

Figure 1 shows a framework that resonates with the five ideas presented above, while also being coherent with ideas on action-oriented conceptual modelling (Ågerfalk & Eriksson, 2004). Attributes and identifiers in the model have been left out, since such level of detail would be more confusing than clarifying in the context of this paper.

The *ActionMetadata* entity has a direct correspondence to a user-accessible software function (a so-called controller action) on the platform. The *ActionLog* entity represents a record of a performed action, pointing out the user who performed it and metadata about the action performed. Detailed data about the action is also stored here, such as a timestamp, parameters to the action, and data about any objects created and their identities. This allows for a detailed re-construction of the performed action when needed. The ActionLog also stores the execution time of an action, which allows for a continuous monitoring of performance.

The *IndicatorMetadata* entity is at the core of the architecture. In the software implementation, the basis for the architecture is a base class called *Indicator,* containing the logic that is common for all indicators. A few examples are given here. First, an indicator does calculations either for a specific *user* or for all users in a *study*. Second, an indicator may be valid for all users; or valid for patients only. Third, indicator values are cached in a hash table in the server memory, to promote high performance even though some calculations may be complex. Historical calculations are stored in the *IndicatorLog* table to enable trend analyses without time-consuming analysis of historical data. Fourth, indicators produce calculated values as well as annotations related to those values.

The architecture is designed to make it simple to plug-in new Indicators. This can be done in two ways: (a) A specialized indicator class is designed or (b) an existing indicator class is configured/used in a new way through definition of new metadata. Scenario (a) requires a programming effort. A new class is created, specializing the Indicator class. This allows the new indicator to be ‘plugged in’ into the architecture. In addition, the platform needs to be re-compiled and a record needs to be added to the IndicatorMetadata table to make the new indicator accessible to the users. Scenario (b) is merely a matter of adding a record to the IndicatorMetadata table. Most indicators identified in the design process rely on logged data about the patients. Since the architecture stores metadata about all user actions, and logs those actions, it is possible to create generic indicators that are configured through parameters (e.g. count forum posts, count logins, count internal messages, show relative activity between patients *et cetera*). There are generic indicators to count log entries (filtered by certain parameters) both for a study and for a user, as well as some other generic indicators.

id	6
name	PARTICIPANT_FORUMPOST_COUNT
type_name	ConfigurableUserActionIndicator
description	Number of forum posts for a participant
participant_only	true
data_interval	14
update_interval	60
recommended_format	0
parameters	{actionId=1949}
study_wide	false

Table 2. Example of a record in the IndicatorMetadata table

Table 2 shows the ConfigurableUserActionIndicator as an example of indicator metadata: a generic indicator subclass is used to count the number of forum posts (actionId 1949) for a patient. The data interval is set to 14 (days) and the update interval is set to 60 (minutes). The recommended_format attribute is a format string using standard syntax that defines a standard presentation for the indicator (e.g. as a percentage). The final attribute (study_wide) states how this indicator is to be cached: For a user or for a study. The IndicatorLog serves as a repository of historical indicator values to facilitate trend analyses. The final part of the indicator architecture enables dynamic configuration of indicator lists. By creating an *IndicatorList* and associating it with IndicatorMetadata, we enable a new view of the patient. This enables presentation of different measures such as 'connectness', 'adherence', 'dose' and 'attrition' – all typical indicators in eHealth programmes – in different lists. Further, it makes it possible to allow therapists to design their *own* lists.

5 Evaluation

The indicator framework remains to be tested in clinical trials and in implementations in practice. Therefore, there is no evidence to the efficacy of the framework when applied in practical therapy situations. However, we are able to demonstrate various qualities of the framework. First, in section 5.1, the presented knowledge base is appropriated to enable a structured argument. We classify this as an analytical approach that corresponds to Hevner et al's (2004) notion of an *informed argument* as *descriptive evaluation*. In section 5.2 we account for the stakeholder-centric design process and its impact on the indicator framework and its qualities. We classify this as *experimental* and *scenario-based evaluation* (Hevner et al, 2004), based on formative design workshops, and execution of the platform with both (i) artificial data and (ii) data rendered while stakeholders explored the platform.

5.1 Evaluation based on the knowledge base

In this section, we assess the indicator framework based on the theoretical discussions in sections 2.1 – 2.3: Character of conversation, secondary information, and structure.

Character of conversation

In section 2.1, we discussed the characteristics of conversation in an eSupport setting. We use this characterisation primarily to delineate the context in which the indicator framework is useful.

First, Clarke suggests the concept *immediacy* to characterise conversation. The logging in the framework (also the base for assessment of most indicators) manages requests to the web server. This means that streaming data (video/audio) is not the managed in the framework. Thus, the framework design is based on eSupport without video/audio conferencing. However, any other type of action that is supported through HTTP requests to the server is managed. This means that the framework targets eSupport conversations with a low degree of immediacy. It does, however, support 'instantaneous' conversations (e.g. chat) as long as they are text-based.

Second, Clarke puts forward the concept of the *medium* of conversation. Logging makes conversations persistent. The medium is persistent, and it also allows for an analysis of the pragmatics of a conversation (it is not 'recordless', to paraphrase Clarke). The action logging adds value to the semantic data (such as a forum post). It adds a layer of pragmatics onto the typically semantic representations of objects, allowing us to track the performer of action, a timestamp for action, and other details. A further pragmatic function is that an aggregation of the log may be used to present the context of action. With regard to simultaneity, we may conceive of the indicators as support for therapists to interpret a complex situation, in order to make well-informed decision about what intervening action to take.

Third, Clarke proposes *control* as an important feature of conversation. The indicator framework principally supports *any* action, as long as it is implemented as an MVC controller action. It adds a pragmatic layer to actions through the metadata and the logging. Thus, with regard to self-determination and self-expression, the framework does not constrain the design of any type of action, whether synchronous or asynchronous (with the already mentioned exception of streamed content). Further, the framework allows for both identified and anonymous users.

In summary: (i) The framework does not support detailed logging of audio/video streaming, which makes it suitable primarily for text-based conversations (both synchronous and asynchronous communication). (ii) The medium becomes richer due to 'pragmatic' records of action. Such records enable indicators based on a detailed analysis of patient behaviour. (iii) The indicator architecture allows for the designer to design an eSupport platform that provides the actors with a high degree of control (self-determination and self-expression).

Secondary information

The framework is not limited to logging actors' utterances (verbal information). It can log any request to the web server. This makes it possible, for instance, to design indicators that measure the idle time for users, the frequency of general use, the length of their utterances, changes in use patterns, or some other arbitrary aspect of patient behaviour. From this follows the possibility to provide therapists with views that reveal verbal information as well as secondary information, based on patient behaviour exhibited while using the platform.

Structure

The composition of lists in the indicator architecture allows the creation of various views of patient behaviour. One view could show indicators of 'connectedness' by including indicators concerned with social interaction between a patient and other patients, such as the number of people a patient has been in contact with through internal messages. Another view could focus patient adherence to therapy. The architecture also allows for personalized lists. This can be operationalized in different ways to provide structure for the therapist. For instance, the starting page for a therapist may contain a general overview including some high-level indicators (see the example in Figure 2). Depending on the context, e.g. if the therapist views a profile page for a patient or if they view the discussion forum, we may present other lists of indicators that enriches the therapist's contextual understanding. By allowing therapists to sort these lists in different ways, we provide further support in exploring different views. The framework allows us to 'zoom in' on patient data, and to present annotations and show trends for indicators as well.

5.2 Evaluation based on the design process

As discussed in the research design section, 30+ design workshops were organized. These workshops were formative evaluations, rendering feedback that governed the continued design. It was early recognized that the software needed to provide an overview of patients. Further inquiry showed an uncertainty among stakeholders regarding the character of such an overview. Initially, a tentative patient overview was 'hard coded' in the platform, including indicators such as progress in the CBT program and unread internal mails. This list was however far from stable: Its content was a recurring topic of discussions. Meetings with external specialists, and a survey made among the therapists (and other professionals) in the U-CARE signalled divergent requirements, and uncertainty about how to provide patient overviews to therapists. The divergent requirements among stakeholders was the basis for a mutable artefact (Gregor & Jones, 2007) with support for personalization for therapists. Two therapists that were invited to explore and discuss the software expressed that it would be "a dream" to be able to have a dynamic list of indicators; the indicators by themselves.

At the beginning of 2012, the psychologists in U-CARE agreed upon a list of seven indicators to include in the patient overview. After the agreement, two additional indicators emerged in subsequent design workshops. A few experimental indicators have also been implemented. Figure 2 shows the current default list, including eight indicators (out of the nine decided upon). By hovering the list with the mouse pointer, annotations are displayed as tooltips (e.g. the names of the active modules). The current version of the indicator overview has been well received by all stakeholders, and in the last 8 design workshops there have been no further change requests. This 'saturation' in the requirements process signals that the indicator framework and the implemented indicators are likely to support therapists well in their work.

Nickname	Registration date	Missing feedback	Latest Activity	IM to therapist (unread)	IM from therapist (unread)	Has CBT	Active modules	Completed modules
Patrik	2011-03-28	3	2012-03-18 20:00	0	0	True	2	2
snowday	2012-02-09	0	2012-02-09 14:51	0	0	False	0	0

Figure 2. Excerpt from the default indicator list rendered in the U-CARE software

On basis of successful software implementations of all indicators, we conclude that all indicators proposed by stakeholders during the design process are *implementable* using the proposed framework. Most of the known indicators do not require any further programming; it is rather a matter of adding new metadata to the database. New indicator subclasses require a minimum amount of coding to implement, since they only need to implement the actual indicator calculation and (sometimes) render the annotations for the calculated value. The framework (through the Indicator base class) contains the rest of the logic. We can therefore state that the indicator framework has a high degree of *flexibility*.

Through testing with scenario-based data, performance problems were identified in the initial design of the indicator framework. The re-designed version (with in-memory and hash table based caching on the web server) has radically improved performance. The therapists accepted the performance in the new version. Built-in performance monitoring in the indicator architecture shows an average loading time of around 400 milliseconds, in a list of indicators with 30 patients and 9 indicators (in total 270 indicator values). This is about twice the time consumed by 'trivial' controller actions on the web server, e.g. viewing the library. Thus, we can show that the *performance* of the indicator framework is acceptable for the therapists.

6 Conclusions

Using the DSR knowledge contribution framework (Gregor & Hevner, in press), we characterize our work as *exaptation*, which means to "extend known solutions to new problems" (Gregor & Hevner, in press, p. 21). We have drawn primarily from the knowledge base of face-to-face conversations, face-to-face therapy, and pragmatic IS theory. A framework for eSupport indicators has been presented, and justified through both (i) descriptive evaluations based on a theoretical instrument to inquire into the transition into eSupport (a new sociomaterial assemblage), and (ii) descriptive and experimental evaluations drawing on stakeholder-centric design. Following Gregor & Hevner, there is also to some degree invention in our work, since we address eSupport design from a therapist point of view, in contrast to the predominant patient/societal perspective. We have demonstrated that our indicator framework is flexible, implementable in software, that it performs well, and that therapists in the design process are likely to find it relevant and useful while providing eSupport. A future open source release of the software will give developers access to the platform design and source code. In terms of practical implications, designers may find value both in (i) this conceptual description of the indicator framework, and (ii) the software platform as such, including the framework implementation.

Regarding the implications for psychotherapy research we conclude that there has been surprisingly little discussion in the research community of the theoretical implications, possibilities and difficulties in transforming face-to-face therapy to the Internet. We have tried to show that one should identify and scrutinize the effects on this transition on fundamental therapeutic concepts like structure and secondary information. Our work may be interpreted in the light of sociomateriality (Orlikowski & Scott, 2008). We have performed an initial exploration of therapy when interpreted as an assemblage of the social and the material, and how we may further our understanding of therapy by investigating it as a sociomaterial assemblage. This could possibly not only help in improving therapy effectiveness, but also provide insight into the mechanisms of therapy and therapeutic change. A better understanding of psychotherapy, its theoretical foundations and axioms will give us a better chance in making sound design decisions.

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