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Studying Communication Patterns in Projects

Abstract

Projects are one of the central forms of work organisation. In such settings, communication between the diverse players has turned out to be a critical factor (Freitag 2011a: 13). Agile project management models are discussed as an answer to project failure and disappointments. With interaction strongly centred on concrete work outcomes, such methods promise to make project communication less abstract. However, there are not sufficient studies on whether this really works, and why. The following article presents an approach with which project communication can be studied. To this end, an analytical framework is developed based on the situated paradigm, communicative events (meetings, briefings, presentations, user tests, etc.) and communication contexts (one-on-one/group talks, media, "artefacts") forming specific combinations called communication patterns. Based on this, a literature-based comparison of the classical "Waterfall" and the agile "Scrum" models is carried out, preparing the ground for targeted data-collection in real projects, as explained in the concluding section.

1   Introduction

In today's knowledge-intensive economy, projects have become a central form of work organisation. One of the reasons is the ever increasing complexity of products and services. The IT industry is a case in point here. Software is no longer geared to the needs of a single user working alone at a single PC, but adapted to the co-operation of a larger number of people, spread around the globe and using less-than-perfect technical infrastructure for their tasks. The demands stemming from the development of such systems are hard to meet by a single person. Another reason for the proliferation of project work lies in the necessity for firms to be innovative and reduce costs at the same time (Freitag 2011a: 11).

There is no book on projects that does not emphasize the eminence of communication for their successful completion. At the same time, faulty communication has been shown to be a major factor in project failure (Freitag 2011a: 14). As Freitag states: "Nur wenn Kommunikation bewusst gestaltet und zielgerichtet eingesetzt wird, kann sie zum Projekterfolg beitragen" (Freitag 2011a: 14; 'Communication can only contribute to a project's success if it is consciously conceived and targeted'.)[1]

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[1]   All translations from German are by the author of this article.

However, a second glance at the project management literature quickly reveals that it is mostly based on the over-simplified transmission model of communication conceived by Shannon (1948) and Weaver (1949) (s. Freitag 2011b: 113f.). Consequently, we are not supplied with what we need to devise the kind of targeted communication that would really help projects thrive.

What is lacking, according to Freitag, are insights into the "Spezifik der Projektkommunikation" (Freitag 2011a: 15; 'specifics of project communication'). This concerns the description of communicative practices in projects, as well as empirical observations on their effects.

This article intends to build a basis from which more in-depth, empirical analyses can be undertaken.[2] After a short overview of the literature (section 2), it provides a working definition of project communication and introduces "situatedness" as an analytical concept for its study (section 3). It then presents a framework for guiding the collection and interpretation of empirical data on project communication (section 4). Following this, the communicative differences between two divergent types of project management are worked out, based on the practice-oriented literature and the author's own experience (section 5). In this step, management approaches are mapped onto situatedness and other analytical concepts with the aim of raising awareness of relevant aspects. This can be seen as important groundwork for the comparative empirical study of projects laid out in section 6, and for understanding project communication in general.

2   Overview of Potentially Relevant Literature

Looking at the literature of potentially relevant disciplines, the academic void concerning project communication becomes immediately clear: the concept of "Integrierte Kommunikation" ('integrated communication') was established in the field of organisation studies with their marketing and public relations heritage (Bruhn 2005/2010). It designates communication with internal and external audiences, including the interplay and interference between the two. What is more or less completely ignored, however, are those communicative practices which are directly woven into task-related work. The extensive works on organisational communication by Zerfaß are a case in point here.

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[2]   Along these lines, this article owes much to the works on *Adoption Centric Usability Engineering (ACUE)* by Seffah/Metzker (2009). With regard to *project communication*, it must be noted that *the concept has not even been established in academic literature* up to now. With the name ACUE, Metzker and Seffah have developed a framework which allows them to determine fit between methods and projects in the field of usability engineering (which, as a socio-technical practice, is akin to project management). In order to achieve this, methods as well as projects are described using the same set of characteristics. Upon completion of a project, users of certain methods are asked to give their estimation of the usefulness of the respective method. This yields a method's context profile (Seffah/Metzker 2009: 62ff.). After a number of iterations, *profiles* become more and more exact, i.e. they allow for increasingly precise predictions of a method's effectiveness in a given context. The conclusion on which Metzker and Seffah's model is based draws on the theory of fuzzy sets. For a comprehensive account, see Seffah/Metzker (2009: 73ff.).

After spending a lot of time explicating numerous sub-types of communication, there is no hint as to how the "laufende Strukturierung und Steuerung" ('continuous structuring and control') of the "Leistungsprozess" ('basic work process') really functions (Zerfaß 2004: 290ff.).

Only very recently has the communicative aspect of work processes stirred the interest of specialised communication researchers. Using the terms "Professionelle Kommunikation" (Tiitula/Piitulainen/Reuter 2007; 'professional communication') or "Unternehmenskommunikation" ('enterprise communications') (Becker-Mrotzek/Fiehler 2002), the respective authors concentrate on the linguistic acting out of a professional role, or on the achievement of abstract communicative goals such as 'decision-making' or 'declining an offer' (s. Scheiter 2002; Tiitula 2007). Jakobs et al., in an article published in 2011, establish a typology of communication problems arising from the industrial process modelling method. In doing so, they consciously leave aside what they call "modalitäts- und transformationsbezogene Probleme" ('modality and transformation-related problems') (Jakobs et al. 2011). The term "Modalitätsbezogene Probleme" ('modality problems') is used by the authors to refer to all those arising from the typical switches between oral and written communication (including outlines and the use of specialised software tools) in work processes. The term "Transformationsbezogene Probleme" ('transformation-related problems') points to the fact that the same piece of information is communicatively treated at different moments in a work process (Jakobs et al. 2011: 259).

For the study of project communication, however, context and the artefacts present there appear especially crucial. For, as Freitag describes it, both are intimately interwoven: "[m]it jedem Prozessschritt entsteht eine neue Situation und mit ihr neue Rahmenbedingungen für den nächsten Schritt" (Freitag 2011a: 21; 'every step of the process brings about a new situation, thus creating new conditions for the next step'). The issue raised by Freitag finds a possible solution in more recent, "agile" project management models. These tie communication more strongly to a project's concrete (intermediate) products, such as the prototypes of a user interface. They further base their planning for the following steps on what has in fact been achieved.

The factors which brought about this turn shall now be explained based on selected studies. The key concept here is the *socio-technical system*. In short, a socio-technical system is made up of *people*, a *technology* (analogue to a project's product or outcome) and an *organisational structure* (Koch 2008: 43). All of these are targeted towards the system's *primary goal* that exists outside the technological part. This aspect is particularly meaningful because the goal constitutes the principal motivation and influences what users do with the technological part. As Baber and Noyes (1999: 9f.) have pointed out, the fact that the primary goal is separate from the technological component also opens up the potential for its being used in creative ways which differ from the original planned purpose.

As part of an overview on computer supported collaborative work (CSCW), Koch points out that understanding the users' needs and the dynamics of groups of users is

at least as important as the technical side of a virtual workspace. He thus suggests "die Einbeziehung der Benutzer […] in allen Phasen […] durch die Beobachtung der zukünftigen Benutzer und später durch deren aktive Mitarbeit" (Koch 2008: 47f.; '[that] users are integrated during all stages [...] through observing their working behaviour and, later, through active participation'). Along these lines, Lindgaard and Parush (2008) argue for the integration of future users, but put more emphasis on taking the social, medial and task-related contexts into account in the software development process. Ambler (2008) accentuates the importance of "artefacts" in communicating about design goals. He defines "artefacts" as conceptually rooted, but easily perceivable representations.[3]

Lackus and Rothbucher (2008) have also worked on the close connection between the "product" and the "production process". The companies studied by these authors are exceptional here in that they do not come from the field of software development. Instead, they were selected based on the red dot awards received for their "design orientation". Lackus and Rothbucher's study uses a *comprehensive view of design* (2008: 464). Instead of seeing the "design" as the last, merely accessory step in a long line of designated phases, Lackus and Rothbucher define it as follows:

> [Das] Zusammenwirken funktionalen, ästhetischen und semantischen Produktnutzens[.] […] [Dieses] rechtfertigt die Fokussierung der Produktentwicklungsprozesse in Unternehmen unter den Gesichtspunkten sowohl der Kooperation und Kommunikation unter den beteiligten Abteilungen und Personen […] als auch der Produktkommunikation über Produktgestaltungsparameter. (Lackus/Rothbucher 2008: 464)
> 'The interrelation between the functional, aesthetic and semantic functions of a product. [...]. This is the basis for a company's product development process focusing on the co-operation and communication between the departments and people involved on the one side [...] and on product communication, using design parameters, on the other'.[4]

From this definition, as well as from the fact that the authors characterise their design-oriented firms as *discursive*,[5] the importance of communication can easily be discerned (Lackus/Rothbucher 2008: 469). The comprehensive view of design as understood by Lackus and Rothbucher (2008) contributes to the study of project communication by *making communication visible as a structure and as a process*. Especially as we are dealing with an empirical study, it is interesting to note the different levels at which communication is detected: on the operational and structural levels as well as in the company's basic philosophy.

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[3] For another definition of "artefact", as related to the agile methods presented above, see section 5.2.2 or Wirdemann (2009: 26).

[4] This design concept has much in common with the criticism of the "peanut-butter-approach to design" (Seffah/Metzker 2009: 35).

[5] "Discursive" ("diskursiv" in the original German text) is used here as a specialised term signifying the way in which a company's departments and relevant external players cooperate during the design process (see Lackus/Rothbucher 2008: 469). This is not to be confused with the general English meaning of "discursive" as "moving from one point to another without any strict structure" (Hornby/Turnbull 1948/2010: entry "discursive").

The *operational level* comprises as its central element the discursive character of all activities. This translates into "die Integration von Personen, Abteilungen oder externen Gruppen in den Entwicklungsprozess" ('the integration of people, depart-ments and external players into the development process') and "der bewusste Transfer von Produktnutzen […] in konkrete Produktmerkmale" ('the conscious translation of the product's functions [...] into concrete product characteristics') (Lackus/Rothbucher 2008: 469). On the *structural level*, the "integration of design" is addressed with respect to the venue and overall organisation of the work process (Lackus/Rothbucher 2008: 468). With respect to the *company's basic philosphy*, the authors point to the general misunderstanding of communication as the oral or written transmission of messages, or as an equivalent for marketing (Lackus/Rothbucher 2008:466). In conclusion, Lackus and Rothbucher make it clear that successful communication relies on an adequate and mutual concept of communication, adequate structures and the ability to make good use of these structures. A separation between types of communication related to the task itself and its coordination does not come up.

As this section has shown, much remains to be desired for project communication research. At the same time the pre-eminence of communication for projects was demonstrated, based on the few studies that treat related subjects. The following section brings into play definitions of such central concepts as "project", "project management" and "project communication". A particular emphasis is placed on "situated" communication, a concept which allows for task-related and coordination communication to be treated jointly. In Section 4, the analytical framework is presented that will make it possible to collect and systematise empirical data on project communication.

3   Defining Project Communication

As mentioned in the introduction, no proper project communication theory has been proposed up to now (see Freitag 2011b). Consequently, the following definitions are working definitions. As they were taken from diverse sources, this section concentrates on working out the parallels and on detecting any incompatibilities.

According to the German Standard DIN 69901-1 (2009), a "project" is defined as

> […] ein Vorhaben, das durch die Einmaligkeit der Bedingungen in ihrer Gesamtheit gekenn-zeichnet ist, z.B. Zielvorgabe, zeitliche, finanzielle, personelle und andere Begrenzung, Abgrenzung gegenüber anderen Vorhaben, projektspezifische Organisation.
>
> (DIN 69901-1 2009)
>
> '[...] an endeavour characterised by the uniqueness of the totality of conditions, i.e. its target definition, temporal, financial, manpower and other restrictions, distinction from other endeavours, and a project-specific organisation.'

This definition has certain parallels with that put forth by Rusch (2011: 50). From a systemic perspective, Rusch lists characteristics such as the target definition ("Erledi-gung einer konkreten Aufgabe" – 'completion of a well-defined task'), temporal

("termination") and financial ("limitation") restrictions. What is interesting, however, is what Rusch alludes to, but does not mention directly, and what is not mentioned – and is thus not seen as problematic – by the DIN Standard either: does "project-specific organisation" refer to an organisational structure, or rather a set of processes, or both? And how does "culturally and professionally inhomogeneous staffing" (Rusch 2011: 50) relate to this? Comparing the two definitions, it turns out that there is a common core to what is designated by the term "project". It encompasses the meanings of having a specific goal and working towards this goal given certain restrictions. What it does not encompass, though, is an important role attributed to communication.

The term *project management* invariably comes up when dealing with projects. Usually, this is taken to mean the process of planning, steering and checking the outcome of the productive process. Thus, one might expect it to answer some of the questions left open by the insufficient definition of "project-specific organisation". However, for the purpose of this article, the DIN standard turns out to be too vague here, too. Project management, according to the standard, is defined as follows:

> […] die Gesamtheit von Führungsaufgaben, -organisation, -techniken und -mitteln für die Abwicklung eines Projekts.   (DIN 69901-2 2009)
> '[...] the totality of the leadership tasks, organisation, techniques and means needed for the completion of a project.'

This definition poses two difficulties. First, the range of concepts defining project management is rather wide. Secondly, these concepts do not belong to the same type or level: if we take "leadership tasks" to mean those goals one person or several people must accomplish for the project to succeed, then "means" are the technical (not forcibly computer-based!) tools used to do this. But "means" may also be of the social type, such as gratifications for good performance. Then, however, they are hard to distinguish from "techniques", which may include things like incentives to keep a deadline. For the purpose of this article, we must keep in mind that the standard's definitions are rather rough and thus inadequate for the more fine-grained analysis of the interplay of the concepts mentioned.

As Freitag (2011b: 117) points out, the standard strictly distinguishes between project *management* and project *work* – the core productive activity. This distinction, ironically, seems inadequate in project situations where one day's work results often form the basis for the next day's tasks (s. Freitag 2011b). As we will see, it constitutes a hindrance to grasping the specifics of project communication. In his paper, Freitag overcomes the problematic distinction of project management from the actual task-related work by defining project communication as follows:

> Projektkommunikation ist jede Kommunikation, bei der sich die Akteure beim Kommunizieren auf das Projekt und seine Ziele beziehen.   (Freitag 2011b: 117)
> 'Project communication is any communication with which those communicating refer to the project or its objectives.'

Note that reference to the project is a characteristic determined by the perspective of the person or group in question. Freitag frames project communication as constructivist (Freitag 2011b: 117).

3.1 Emphasis on Context

Turning to the specifics of project communication, Freitag (2011b: 124ff.) points to the fact that task-related communication can no longer be considered a subtype of internal communication. This goes back to the finding that project work must often be coordinated with representatives or project teams from outside the organisation. What is much more important, however, is that the customer is integrated into the production process (Freitag 2011b: 125). Reichwald, Möslein and Piller (2008: 104f.) extend the concept to encompass all outside players and coin the term "interaktive Wertschöpfung" ('interactive productivity'). Their concept has a strong resemblance with those discussed above: Lackus and Rothbucher's idea of comprehensive design and the development of socio-technical systems (see Koch 2008; Lindgaard/Parush 2008). It underlines the conclusion cited above that a divide between task-related and coordinating activities is not reasonable from a practice point of view.

Menold's (2006) study on knowledge integration in groups is different from those mentioned before in that it puts more emphasis on the non-technical aspects of the socio-technical process. Menold works out what exactly group and context characteristics contribute to successful communication. The ability to switch perspectives ("Perspektivenübernahme") figures prominently. It is described as "kognitive Fähigkeit, die Welt mit den Augen eines anderen zu betrachten" ('the cognitive ability to see the world through an interlocutor's eyes') (Menold 2006: 43). Switching perspectives is made possible by *spatial perception* on the one hand and *communication* on the other. Another theory mentioned by Menold is that of *shared mental models* (SMM). According to Menold (2006: 40), these can be of different types, referring either to "Werkzeuge und Technologien" ('tools and technologies') or "Arbeit und Aufgaben" ('work and tasks') ("aufgabenbezogene SMM" – 'task-related SMMs'), or to "Interaktionsmuster in der Gruppe" ('a group's interaction patterns') or "einzelne Gruppenmitglieder" ('individual members of the group') ("teambezogene SMM" – 'team-related SMMs').

What is interesting from an applied linguistics point of view is the close relationship with the concept of *common ground* as put forth out by Clark (1996). Clark's concept is a model of semiosis in which the signing process is informed by a wide variety of aspects: the physical things in the immediate surroundings of the interactants, the knowledge activated during the present interchange, or by the group or cultural background. Clark's common ground possesses close links to "situatedness". Approaches known by this name share the basic assumption that our behaviour and thoughts are determined by our "Interaktion mit Umwelt, Artefakten und Artgenossen" (Risku 2000:

83; 'interaction with the environment, artefacts, and fellow beings').[6] In this way, a conceptual link can be established between approaches asserting the dependency of a system's functionalities on its environment and the communication about these same functionalities in the course of a project.

In conclusion, *situatedness* will be used as an analytical concept in the study of project communication. It will be defined here as *the degree to which project communication refers to concrete tasks and objects of decisions.* What is meant by concreteness here is that a task or decision is genuinely derived from the project's product, and that, as such, it is identifiable and discernible for those involved. This comprises a social, physical and medial dimension (context).

3.2   Personal and cultural factors

Another aspect that will not be treated in-depth here is the interplay between project management models and the human dimension of project work. Maugain (2003) has developed a framework of success factors for multicultural research and development teams. Along a similar line of thinking, Imcharoen (2011) has studied the influences of team members' cultural values on project management outcomes. In both cases, the authors state that there is no literature on the cross-sectoral subject they are under-taking to tackle respectively (Maugain 2003: 22; Imcharoen 2011: 12). Maugain (2003: 23) in particular stresses the absence of the average team member and his or her daily work in the literature.

Both authors give a central place to communication as a factor in team work and team productivity. Maugain's work emphasises the role of communication in the "knowledge co-creation process" (Maugain 2003: 141), while Imcharoen concentrates on the influence of project management techniques on "communication and coordina-tion between team members" (Imcharoen 2011: 62). Communication and coordination are considered as playing a crucial role in the "new product development (NPD)" teams the author sets out to study.

Imcharoen (2011), in order to conceptualise the presumed complex relationship between project management techniques and cultural values, establishes a list of mediating factors that are tied to "communication" and "coordination". Still the established inventory mirrors much of the imprecision found in the literature on project management (cf. this section). Both key concepts stay rather coarse-grained, with communication ranging from structures to abstract definitions of outcomes, and coordination involving such diverse aspects as feedback and pre-defined, computer-supported processes (see Imcharoen 2011: 3ff.). In addition, the difference between these two does not become very clear, either.

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6   Within the "situated cognition" approach different schools exist called the "embodied", "embedded" and "extended mind". The difference between them lies in how radically they are opposed to the Cartesian dichotomy of mind and environment (Robbins/Aydede 2009).

There are remarkable parallels between these two works from the domains of management and team dynamics and the previously mentioned works. The need for communication in establishing the theme of group (or project) work might be the most obvious, and the most widely discussed need in recent years. The close kinship to Menold's (2006) deep insights into the psychological processes behind shared knowledge can hardly be overlooked. In fact, there are reasons to claim that her work with its central emphasis on the group process should be placed here. Given the applied linguistic position I propose in this paper, it appeared more appropriate to introduce Menold's study above given her explicit reference to Clark (1996). Imcharoen's (2011) conceptualisation of the link between specific project management techniques and their impact on team members from different cultural background can be considered as sharing a central concern with this contribution: understanding the exact mechanisms behind project and team performance, respectively.

In this section, central concepts and theories which are useful in researching project communication were presented. It was shown that the communicative component is completely missing in common definitions of project management. In contrast to this, the importance of communication for projects was demonstrated. Situatedness was introduced as a concept which allows for a differentiated description of communicative practices. In the following section, a framework will be introduced which makes it possible to study and compare different projects from a communicative point of view.

4   Modelling Project Communication

The previous section showed that communication is, in fact, central for a project's successful completion. This pre-eminence of communication stems from the necessity for collaboration between humans to be coordinated by communicative means. It is amplified by the fact that the products and services presently produced in projects make it necessary to integrate the target audience into the production process, and to reach an agreement on product characteristics by discursive[7] means.

Many of the project management models developed more recently reply to the need for more intensive communication. Project communication is thus no longer confined to a handful of people and occasions at the outset of a project (see Koch 2008; Lindgaard/Parush 2008). The question here is whether the promises of more adequate communication actually yield any results. This study is based on the following assumptions:

(1) the project management model influences project communication
(2) the degree of situatedness is one of the differentiating characteristics
(3) the degree of situatedness in agile projects is higher than that in projects using classical methods

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[7]   See above, footnote 5 for a definition of "discursive" as used in the study referred to here.

These assumptions will be tested using a three-step approach, as follows: First, in this section, a framework is introduced which makes it possible to study *communication patterns* empirically. Secondly, a literature-based comparison is carried out between two extreme variants of project management models, the agile *Scrum* and the *Waterfall* model (Section 5). The characteristics thus worked out can then be used to guide data collection and analysis in the comparative empirical study of projects, as outlined in the concluding Section 6.

Communication patterns will be understood as the interplay between communicative events and communicative contexts. By *communicative events*, we mean any occasions for communication that are stipulated by the project management model or its adaptation to the respective project. *Communication contexts* are linked to communicative events. They comprise any aspects of the medial, physical and social environment within which a communicative event takes place, and which – following the situatedness paradigm – can be used as a semiotic resource[8] in that environment. Consequently, kick-off meetings, team meetings, presentations, user tests or the coordination between designers or programmers working together are considered communicative events, depending on the stipulations of the model in question. Communicative contexts may include a diverse range of conditions such as real or virtual rooms and workspaces, within which different representations of the product's result (artefacts[9]) may be accessible.

Another analytical distinction which turns out to be important in characterising model-specific communication patterns is the one between task-related and coordinating communication. As mentioned above, this distinction is not unproblematic in project management practice. But it is for this very reason that we will undertake tracing it in real-life project communication, using situatedness as the key criterion.

Concerning the *social dimension of situatedness*, the separation of communication types reveals itself in cases where any communicative events lead to – and spring from – the formal definition of any further steps. As we will see below, communicative events in the Waterfall model are really oriented towards formal aspects. This translates into them being rather removed from the actual state of the project's progress. Instead, they tend to simply assume that what is supposed to be completed by a certain date really is at the time in question.

More interestingly, the separation or amalgamation of task-related and coordinating communication can also be mirrored during the course of interactions, which can be

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[8]   "Semiotic resources are the actions, materials, and artefacts we use for communicative purposes, whether produced physiologically – for example, with our vocal apparatus, the muscles we use to make facial expressions and gestures – or technologically – for example, with pen and ink, or computer hardware and software – together with the ways in which these resources can be organized. Semiotic resources have a meaning potential, based on their past uses, and a set of affordances based on their possible uses, and these will be actualized in concrete social contexts where their use is subject to some form of semiotic regime." (van Leeuwen 2005: 285 as cited in Jewitt 2009: 22f.).

[9]   See above for the definition.

observed empirically during real projects. This involves the *physical* and possibly the *medial dimension*. The empirical phase of the approach presented here aims at results in that range. One – hypothetical – result might be that a certain communication pattern (that might be typical of model A) treats the goal of a certain phase of project work in-depth at first, and then derives any temporal, staffing or financial needs from it. In contrast to that, it is possible that project B starts with the assumption that a certain amount of resources are sufficient to produce certain product functionalities.

Figure 1 is an overview of the analytical framework presented here for studying communication patterns in projects.
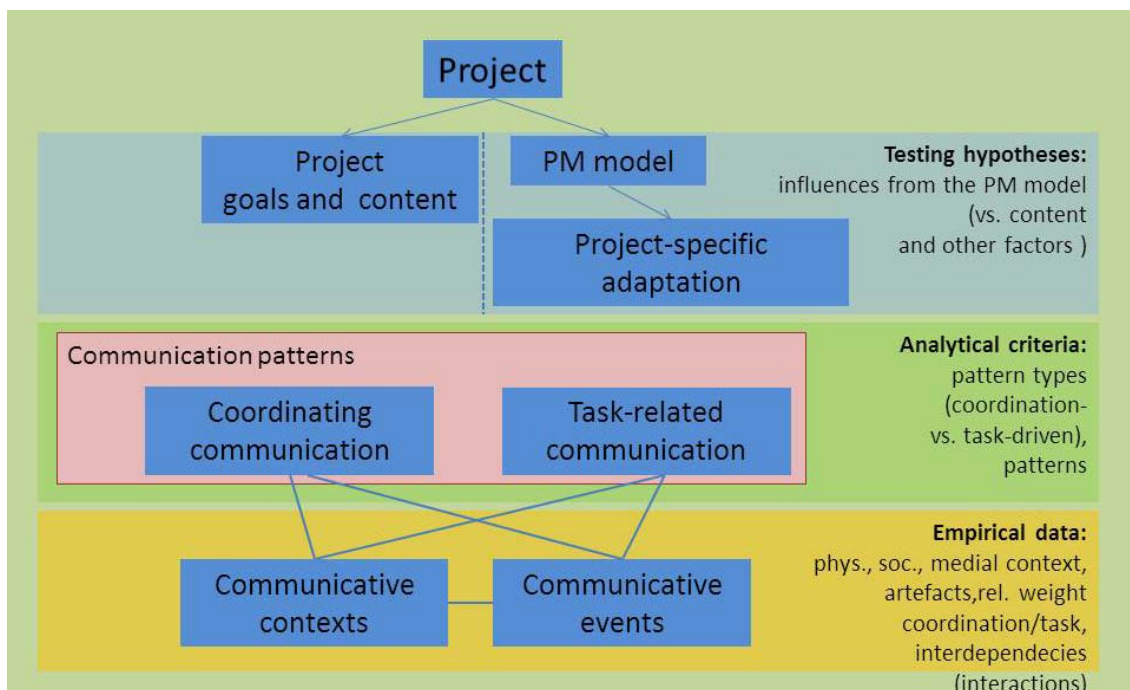
Fig. 1: Analytical framework for the study of communication patterns

Before we proceed with the literature-based comparison of project communication, two remarks will be made regarding the framework. The first concerns the distinction between project content and project communication. This caters to the need for the framework to be applicable across projects and across developmental stages of the same project. It is not to be confused with that introduced by DIN between task-related and management components of projects (see above).

The second aspect concerns the relationship between communicative contexts and events and the two types of communication. Communicative contexts and events are empirical facts that result in different proportions of task-related and coordinating communication. This is what is meant by the lines connecting these four elements. From an empirical perspective, then, a communication pattern is the concrete relative weight of task-related and coordinating communication resulting from the interplay of

event and context. Accordingly, a project or project management model is *characterised by several patterns*.

Based on the framework presented here, we will now proceed with the comparison of two different project management models in the following section. This will show what is meant by different communication patterns. It is also needed to prepare the ground for the empirical phase described in Section 6.

5 Comparing the Communicative Characteristics of Project Management Models

Project management has been presented above as the totality of organising activities in projects. *Project management models*, according to Fähnrich, are defined as

> allgemeiner Rahmen für den organisatorischen Prozess in der Softwareerstellung.
> (Fähnrich 2009: slide 3)
> 'a general framework for the organisational activities of software creation.'

This definition must be read against the backdrop of what was worked out above: that coordination should not be separated from the actual task-related work if project communication is to be successful. Project management models link the goal and restrictions of the project to the concrete activities (including communication) under-taken for its successful completion. According to Bullinger and Meiren they

> […] beinhalten eine ausführliche Dokumentation von Projektabläufen, Projektstrukturen und Projektverantwortlichkeiten und unterstützen damit die Planung, Steuerung und Über-wachung von Projekten. (Bullinger/Meiren 1998/2001: 160)
> '[...] comprise extensive documentation of processes, structures and responsibilities and enable the planning, steering and control of projects.'

This definition is still rather generic. All models refer to the "planning, steering and control" of projects. Where they differ from each other is the kind of "processes", "structures" and "responsibilities" they stipulate.

To illustrate this, we will now proceed with the comparative analysis of the *Waterfall* and *Scrum* models. This choice of models deliberately mirrors the divide between phase-oriented, more formal types of project management, and others that give more weight to the content and actual progress made by the project, (Kuster et al. 2011, esp. chap. 5 and 6). In the literature, the latter, more recent model type is often presented as an enhancement of previous ones. From this point of view, the Waterfall model is used here as an example of a long-standing, classical project management method.[10] In contrast to that, Scrum is a very recent, agile method (Hanser 2010: 61).

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[10] The fact that we are dealing with a classic approach is not mirrored in the least by the fact that widespread software like Microsoft Project is based on the Waterfall model, thus implicitly conveying a certain ideal of project management. The software makes it possible to give names to phases and sub-phases of a project, and to set deadlines when phases need to be complete. Specifically, sub-phases that are attributed to one main phase cannot have a completion date after the starting date of the following. This rule is strictly enforced by the software, even in cases where the phase in question

5.1   Communicative Implications of the Waterfall Model

What are the characteristics of the Waterfall model? Of course, the literature on such a classic model is vast. The presentation that follows is based on the *Handbuch Projektmanagement* (Kuster et al. 2011; 'project management manual') already mentioned above. Another source is an overview prepared by students from the Vienna Institute of Technology (TU Wien) during coursework (Müller/Rerych/Zittera 2002).

The Waterfall model starts with the assumption that a problem, such as designing a technical product or developing software, can be broken down into smaller parts. These parts are then divided up into work packages and assigned to consecutive, distinct phases. Each work package can then supposedly be completed without interference from any of the others. Upon completion of one phase, the next begins. After completion of the last phase, the problem is assumed to be solved (Kuster et al. 2011: 17).

The name "Waterfall" stems from the image of the project's workflow "dropping down" to the level below, just as water falls from one rock onto the next across cascades. In some versions of the model, the dropping points are called *milestones*. Kuster et al. (2011: 17) mention that these are points for course correction, implying that the results achieved thus far are being critically investigated and further planning attuned to the actual state of the project. Much of the practical criticism of the Waterfall model is, however, directed at the fact that results are not critically reflected. Instead, what is supposed to have been completed is all too often declared to be complete in order to (superficially) satisfy the customer. It is interesting to keep in mind that no feedback at all was stipulated in the original Waterfall model (Müller/Rerych/Zittera 2002, link "Entstehungskontext").

As part of the Waterfall model, an ideal order of phases exists which, in the version of Kuster et al. (2011), comprises "Initialisierung", "Vorstudie", "Konzept", "Realisierung" and "Einführung" ('initialisation', 'preliminary study', 'concept', 'realisation' and 'introduction').[11] Still, they all have the strict separation of conceptual/creative and productive steps in common. These, in turn, are strictly separated from the introduction of the product or service into the designated context of use.

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yields an input for a sub-phase that only starts long after the beginning of the main phase it is attached to.

[11]   Other versions are slightly different, comprising a greater or lesser number of phases, and referring to them with different names. What they all have in common, however, is the strict separation of conceptual/creative and productive steps, which, in turn, are strictly separated from the introduction of the product or service in the designated context of use. For an adaptation for IT-projects, see e.g. Ambler (2008: 85).
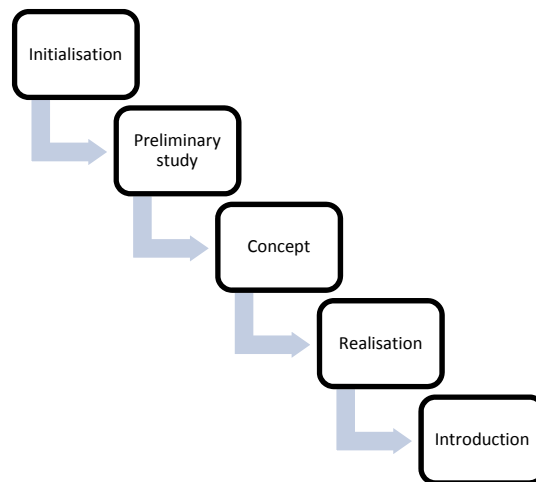
Fig. 2: A typical representation of the Waterfall model, based on Kuster et al. (2011)

We will soon turn to the main question of how these basic assumptions are mirrored in the typical communication patterns of the Waterfall model. Before that, however, a short look at the advice concerning the different phases is in order. What is most interesting here is how the authors treat their selected topics (cf. Kuster et al. 2011). Their *Handbuch Projektmanagement* ('project management manual') is thus a show-case of the problems associated with the Waterfall model in general.

The manual's main part contains a sub-section called "Organisation" ('organisation') for each of the phases presented above. In these respective sub-sections, aspects related to the project's organisation structure are treated alongside the involvement of further players, questions of leadership style, and the way outsiders are to be addressed.

It is exactly this kind of eclectic treatment of organisation and communication issues that is typical of the older generation of project management models: Such issues are merely mentioned, and recommendations of a very general type are some-times made. For example, the manual advises that during "initialisation" a sponsor and a project manager be designated as the central roles. One of these persons is to have "gewisse" ('certain') previous experiences with respect to the project, e.g. "mit ähnlichen Projekten (ungefähres Vorgehen, möglicher Methodeneinsatz)" (Kuster et al. 2011: 43; 'from similar projects (procedure, applicable methods)'). The experience and detailed knowledge which are called upon by the manual here cannot properly be considered part of the model's stipulations. This is because there is not detailed advice on how they can be fostered or even detected.

The differences between what is presupposed and what is explicitly stipulated by the model become even clearer for the concept, realisation and introduction phases. It was already mentioned above that the strict separation of planning and realisation is characteristic of the Waterfall model. The specifications given for the different phases now reveal how this affects the working style within the project. For example, in the

concept phase, representatives of different stakeholder groups are integrated through a rather complex structure of committees. Yet the advice as to how to deal with this broad participation remains vague: for projects that have as their goal to produce a new product, "Fachkompetenz" ('professional knowledge') is recommended for the people involved, whereas projects addressing organisational change call for "Prozesskompe-tenz" ('process competence'). Along these lines, unavoidable commonplace attributes like "Kreativität" ('creativity'), "Teamentwicklung" ('team development') and "Querdenker-rollen" ('out-of-the-box thinking') are mentioned. An explanation how any of these can be found or achieved is blatantly absent from the text (cf. Kuster et al. 2011: 61).

In the *realisation phase*, "[werden] die Lösung bzw. das System hergestellt und getestet" ('the solution is produced or the system is tested') (Kuster et al. 2011: 69). For this, a "hierarchiebetontere Projektorganisation" ('a more hierarchic project organisation') marked by "Machertypen" ('highly committed men [or women]') and "Verbindlichkeit in der Führung" ('reliable leadership') is called for (Kuster et al. 2011: 70). If applicable, "[werden] Abweichungen kommuniziert" ('deviations are communicated') and "Beteiligte informiert" ('those involved informed') (Kuster et al. 2011: 70). The *introduction phase* then involves the "Einführung und Schulung der künftigen Benutzer" ('introduction [of the product] and training of future users') (Kuster et al. 2011: 76). This is "planned" in the realisation phase (Kuster et al. 2011: 69) and then the product is handed over to the new users, supposedly enabling them to use the system competently and swiftly from the moment they first see it (cf. Kuster et al. 2011: 76). The recommendations given are – again – limited to commonplace ones. This demonstrates that all interaction is seen from the project's perspective, and that it is strongly dominated by formal specifications ("Abnahme" – 'acceptance procedure').

The preceding paragraphs have made two things clear with respect to the influences of the Waterfall model on project communication: First, interaction is strongly marked by general, rather abstract specifications. Deviations from the original plan are considered as defective, and are "mitgeteilt" ('transmitted') (i.e. communicated without any need for interaction) to those who caused them. If the procedure is adapted to make up for any inadequacies discovered in the process, this is not in line with the model. The Waterfall model does not specify how to react in such cases. Secondly, project management is considered independent of the project's goal or content, as well as from the context for which its product is intended. The concept of a "socio-technical system" is thus not taken into account, the degree of situatedness remains low. This is particularly obvious in the way the introduction phase is conceived (see above).

5.2 Communicative Implications of the Scrum Model

The Scrum model, as already mentioned, is a widespread and well worked-out variant of agile project management models. This type of model goes back to the Agile Manifesto. The Manifesto brandishes the following guiding principles (Beck et al. 2001):

(1) Individuals and interactions over processes and tools

(2) Working software over comprehensive documentation

(3) Customer collaboration over contract negotiation

(4) Responding to change over following a plan   (Beck et al. 2001)

Agile models come from the domain of software development, where they were intended as an antithesis to models from the aviation or pharmaceutical industries, perceived as "dokumentationslastig" (Hanser 2010: 9; 'heavy on documentation'). Meanwhile, the literature on Scrum and other agile models also abounds. Here I use the overview presented by Hanser (2010), alongside the comprehensive account by Gloger (2008/ 2009), to introduce the basic assumptions and procedures stipulated by the model.

Many proponents of agile approaches claim that these are "mehr als ein Vor-gehensmodell" ('more than just a project management model'). An example of this is Gloger's heading for section 2.1.1 in his book (2008/2009: 10). It cannot be denied that this stance is partly ideological, the new approaches being much in need of justification with respect to the older, established ones. But what exactly are the characteristics of Scrum, and to what extent does it differ, e.g., from the Waterfall model treated in the previous section?

5.2.1 Planning and Organisation Structure

The most important differences can be put into two categories, the *project manage-ment model proper* and the *artefacts.* As we will soon see, the Scrum community uses "artefact" much in the same sense as was explained above with respect to Ambler (2008).[12] A third meaningful aspect is the holistic approach inherent in Scrum. Hard to grasp with academic concepts, this is reflected, among other things, in the acceptance that projects and human collaboration tend to go haywire. Gloger (2008/2009: 11) provides a telling image of this, with a photograph depicting the scene from which Scrum got its name: rugby players scrimmaging in a seemingly chaotic fashion. Contrary to what appears to be the case, rugby is referred to as "ein sehr diszipliniertes Spiel" ('a game with a high level of discipline'). "[Es] steht für die [rigide] Einhaltung weniger Regeln" (Gloger 2008/2009: 11; 'It stands for the strict observation of a small number of rules').

For Scrum, as well as for all other project management models, the framework for project work and coordination is made of rules. The fact that Scrum rules are strictly observed is understandable from the details of the model. In Scrum, *planning* consists of a strategic and a tactical level. On the strategic level, what is to be achieved by the project is determined (cf. Gloger 2008/2009: 129). This corresponds to what is generally understood as "Festlegung von Projektzielen" ('defining the project's goals') (see Section 5.1). On the tactical level, plans are made as to how exactly, or more precisely,

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12   See above, Section 2.

by whom in how many hours of work, the goal or sub-goal is to be attained (Gloger 2008/2009: 130).

What makes Scrum so different from models like the Waterfall model is the way in which planning at the strategic and tactical levels are carried out. The feedback loop connecting the tactical level back to the strategic level is also unusual. This is illustrated by Figure 3.
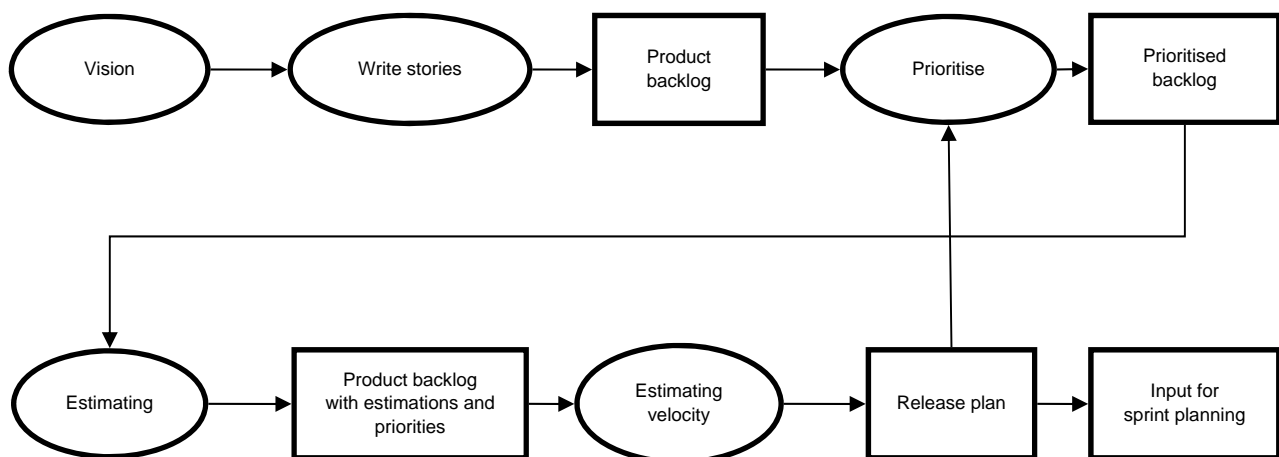

Fig. 3: Planning with a feedback loop according to the Scrum model, adapted from Gloger (2008/2009: 135)

The oval shapes indicate activities, the rectangles stand for Scrum artefacts, the details of which will be discussed below. What matters here is the line linking the "release plan" to the "prioritise" activity. This establishes the back loop between the concrete plans for realisation (tactical level) and the vision as an idealised project goal (strategic level). The process shown in the upper row reflects how the project sponsor's vision is made more and more concrete. This results in the "product backlog", the list of functionalities derived from the vision (Gloger 2008/2009: 16).

As not all product functionalities can normally be realised promptly or at all, given the limited resources sometimes attributed to projects, functionalities are at first given a priority by the sponsor. In the next step, the team members – those really doing the work – have the right to change the order of priority. They base their recommendation on the "velocity", the team's real working speed. To arrive at feasibility and priority judgements, the velocity is seen relative to the size of the different functionalities on the list. The estimation arrived at by the team then flows back in the form of a re-prioritised product backlog.

At this point in the Scrum model, the concretisation of the project seamlessly turns into the plans of the concrete tasks that constitute the project's productive process. From the prioritised backlog and release plan – which by this time may have already been re-prioritised – product functionalities in the form of "backlog items" are put into the first working phase of the project ("first sprint"). This is done until the estimated capacity is exhausted. This amount of work corresponds to the estimated "velocity" calculated during previous planning loops. What is also very special about Scrum is that the velocity can be adjusted, based on experience from previous sprints: if the team notices that they are able to realise more or fewer functionalities than originally foreseen, more or less backlog items are taken on during the following sprint.[13] The fact that sprints are rather short – 2 to 4 weeks – and that realisation criteria are specified in simple language are an advantage to this procedure.

Finally, let us take a look at the *internal organisation* of Scrum projects. This is rather simple to describe: for one, there is a non-hierarchical team, one in which each member has the same rights and competencies. Correspondingly, each team member may participate in all aspects of the planning and realisation of project work. Secondly, there are the roles of the sponsor, called "Product owner" and that of the "Scrum master". The Scrum master is a kind of project manager whose job it is to support the group process by dissolving impediments, e.g. a lack of supplies or other kinds of adverse working conditions (see Gloger 2008/2009: 14f.; Wirdemann 2009: 28). Note that, as Gloger (2008/2009: 23) points out, the Scrum master does not possess any power and cannot be considered as holding a higher-ranking position than other members of the team.

The rather simple organisational structure of Scrum projects is supported, one might even say completed, by a sophisticated assortment of meeting types. All Scrum meetings have in common in an exemplary fashion the limited number of rules and the fact that these rules are to be strictly kept in Scrum. The "sprint planning" preceding each new sprint and the "daily scrum" are prototypical cases.

During *sprint planning*, the team members determine how much will be realised during the following 2 to 4 weeks of the sprint. They do so on equal footing and based on a common estimate of the amount of work and the capacity. *Daily scrums*, held at the beginning of each working day (or once a day during core working hours) serve team members to inform each other about what exactly they are doing at that point. Any problems related to team members' mutual interdependencies can also be solved there. In this way, the social and physical dimensions of situatedness come into play. The team gets the possibility to organise themselves. By handing over the responsibility for the project's content and coordination, trust is put in the team members with regard to the successful realisation of the project. According to Gloger (2008/2009: 39ff.),

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13 The number of functionalities is measured in a unit called "story points" – the term being borrowed from the user stories discussed below. Thus, the unit is a relative one, but it has its strong points in giving a rather exact account of the demands of a specific project (Wirdemann 2009: 70f.).

these are important aspects of "Managements in der wissensbasierten Organisation" ('management within a knowledge-based organisation').

5.2.2 Artefacts

What was said above concerns the communication structure of Scrum. Nothing has yet been said about *communication processes* during a Scrum project. To understand these, the (Scrum) artefacts are crucial. Gloger lists 10 different ones in his overview (Gloger 2008/2009: 16f.). Wirdemann defines the term "artefact" for Scrum as follows:

> …die Produkte oder Zwischenprodukte […], die Scrum als Input für seine verschiedenen Phasen benötigt. (Wirdemann 2009: 26)
> '...the products or intermediary products [...] that Scrum produces or needs as input in its different phases'.

This implies that some artefacts are intentionally created for the purposes of project communication. Others are produced as part of the project work and put to a secondary use as the basis for communication. In the following paragraphs, we will concentrate on *backlogs*, *backlog items*, *tasks* and the *product increment.* As prototypical artefacts they are very handy in explaining the Scrum perspective on "Planung als Kommunikationsprozess" (Gloger 2008/2009: 135f.; 'planning as a communication process'). This perspective encompasses the assumption that artefacts "den Prozess des gemeinsamen Denkens [dokumentieren]" ('document the process of joint thinking'), and that they are "Kommunikationsmittel, nicht die Kommunikation selbst" ('means of communication, and do not constitute communication in and of themselves') (Gloger 2008/2009: 135f.).

How is this reflected in prototypical artefacts? Some paragraphs back, the process leading to the creation of the *product backlog* was explained as part of the feedback loop linking strategic and tactical planning. The product backlog is thus the result of one or two meetings specifically devoted to the sponsor's specification of product functionalities. These functionalities, in turn, are written down and thus turned into *backlog items*. As backlog items are treated in the working phases (sprints) only if they fit wholly into the sprint – starting with the highest priority, they are subject to postponement and switching by the team (tactical level) and the product owner (tactical and strategic levels). For example, if the sponsor prefers an order of priority different from that coming from the team, he may switch items so that those he finds particularly important are completed earlier. The team helps him in his priority setting process by indicating the capacity needed for each single item. The backlog item thus immediately represents tasks planned, and reflects changes in the overall plan.

As the small parts of which the different Scrum backlogs[14] are made up, backlog items reveal another central characteristic of Scrum artefacts. Putting desired product functions into words constitutes a large hurdle in many projects – not only in the

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14 In fact, the same items occur on the product backlog and the sprint backlog, in that they are taken over to the latter as long as the "priority and sufficient capacity"-rule allows for this to happen for the sprint in question.

software industry. This is due to the different professional backgrounds and knowledge of the customer and the provider, but also within interdisciplinary teams. In Scrum, *user stories* are a much-used way of dealing with this difficulty (Wirdemann 2009: 1). A user story "describes a functionality that will be valuable either to a user or purchaser of a system or software" (Cohn 2004: 4). This is done by means of natural language descriptions which are understandable for the team as well as for the product owner. It is understood that communication is not limited to the sentence visible on a small paper card, as explained by the general Scrum view of communication. It is rather a process spanning the whole interaction during which the respective card (artefact) is produced. Another important aspect concerning user stories is that the criteria which must be met for a functionality to be considered as successfully implemented are added to the card. This interplay is summed up by Cohn with reference to Jeffries (2001) in the alliteration "card, conversation, confirmation" (Cohn 2004: 4).

The criteria and methodological steps of writing good user stories are presented in depth by Cohn (2004) along with critical aspects. Here, we will limit ourselves to the general conclusion that user stories – represented by paper cards – serve to establish communicative links on all sides. The team can self-check the completion of items using criteria jointly formulated with the product owner. In some cases, tests based on these items are even carried out with real users. Thus, stories form the basis for communication with sponsors, customers and users. They link task-related to coordination activities throughout the project using its content and contextual factors.

If we now look at the *product increment*, the circle of prototypical Scrum artefacts is complete. The product increment is nothing more than the totality of the product functions completed after a given number of sprints (referred to as the *release*). A Scrum increment is strikingly different from the result of any of the phases of the Waterfall model: one of the most important Scrum principles is to deliver "running software". This means that all releases must provide a discernible contribution to the product's value. In the Scrum community, this is known by the term "sushi delivery": very small, thin-sliced packages are delivered during releases, but their (additional) contribution can be understood by laypeople.[15] In contrast, there are cases where the supplier spends a large amount of work and money on the installation of a server, which – however central this is to the project as a whole – is hard to convey to nontechnicians. Thus, the product increment functions in a way not unlike the backlog item. It helps the team and other interested parties inform each other about product functionalities and their successful realisation. The relationship with the corresponding backlog item or task is complementary: if the sponsor or customer is able to establish the link between what he has put down on the story card and what the team has put into practice, the item can be considered complete.

So how does the Scrum model influence communication? It has become clear that Scrum makes a type of communication possible that is marked by direct reference to

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[15]   See Cohn (2004-2012), 9 February 2005 entry.

the product. Product characteristics are often directly accessible during interactions or are represented by artefacts. These, in turn, are thought of as embodying the discussions which have produced them. This is true of single backlog items – often physically represented by a story card, but also for the backlog as a whole. The order of the items – and as a result, the priorities this order stands for – can be changed in exactly two ways, stipulated by Scrum. First, the order can be changed by the team if they feel that their estimate conflicts with the product owner's assumptions. And secondly, the product owner can make changes whenever new functional needs come up or priorities change. Feedback loops between the planning and productive phases of the process are supported under the Scrum model by different kinds of meetings and their governing principles "shortness" and "goal orientation". The product owner may interfere with the process, but only at pre-defined points. In this way, the team is shielded from outside interference during the sprints. By means of the product backlog, changes are made visible for everybody involved, and fed back into the process at predefined points. Finally, what is called the acceptance procedure in other models is helped by the direct comparison between backlog items and recognisable product functionalities.

In conclusion, Scrum makes a form of communication possible which is deeply rooted in the situation and highly context-oriented. This is true for the different people's tasks and competences as well as the functionalities derived from the project's goals. In the next section, an overview will be given, comparing the communication characteristics of the Waterfall and Scrum project management models.

5.3 Comparing the Communicative Characteristics of the Project Management Models

In the two sections above, the Waterfall and the Scrum models were analysed with respect to their communicative implications. It turned out that communication was a neglected aspect in the Waterfall model. There, the project management process is defined from a formal point of view with communication only being treated implicitly. Scrum, in contrast to that, explicitly considers all planning to be communicative. In addition, it allows for feedback loops from the tactical to the strategic level. The communication necessary for this to happen is facilitated by artefacts, which can be said to have a very low level of abstraction (such as the product functionalities themselves).The following table contrasts the two models' influences on communication.

Characteristic	Waterfall	Scrum
Decisions on the procedure	Directed by a generic order of phases	Directed by the demands of the specific project goals
Perspective on communication	It is considered as a secondary aspect of organisational structure or a personal competence of those involved	Planning means communication
Communication structures	It takes place during planning phases between committees; during realisation, it is sometimes strongly hierarchical	Strictly defined meeting types; integration of the sponsor at specific points; team-centred during the realisation phases ("sprints")
Determination of goals	Decreed by the hierarchy	Established by the sponsor; range and priorities are subject to feedback by the team
Documentation of product specifications	In written form and very detailed	Common language representations seen as part of a discursive process
Way of dealing with deviations	Comparison of target and actual result and reports on "deviations" if applicable	Regular adaptation of the range and length of time, based on the results of designated meetings and methods
Contents of communication as stipulated by the model	Abstract planning; comparisons between target and actual state; possible exchange of views during concept phase	Vision and project goal are formulated with increasing detail; during the working phases questions pertaining to concrete realisation problems; (user) tests based on criteria expressed in simple language
Context of communication	Hardly any stipulations by the model; oriented towards abstract, ideal phases	Artefacts stipulated by the model link communication to the project's progress; all meetings involve planning and problem solving based on information and representations of concrete project content

Fig. 4: Communicative characteristics of the project management models compared

The table once more elucidates what the differences between the Waterfall model and Scrum are based on. Not surprisingly, the explicitness with which communication is treated by the respective models plays a pivotal role. More exactly, this is mirrored by two aspects. First, there is the degree of content-orientation of communication: this measure – if one may speak of one yet – turns out much higher for Scrum, where even the strategic level of planning is quick to concretize its objectives, than it is for the Waterfall model. There, the phases are determined by an ideal type of project, any concrete references to content as well as possible deviations are left out.

Secondly, the models differ in the *degree of contextualisation of communication.* This is mirrored by the fact that the Waterfall model insists on an all-encompassing, written requirement specification and an official "acceptance procedure" that formally marks successful implementation. In between, during the "concept" and "realisation" phases, no feedback by the project team is stipulated. Neither the team members' professional skills nor their experiences are taken into account during the definition or adaptation of project planning and realisation. In comparison, this is all built into Scrum, as described above, through artefacts and regular, systematic contacts, supported by the different meetings.

In conclusion, the two models turn out to have very different implications for project communication indeed. These implications can be ascribed to the factors *use of artefacts* and *content orientation* (project goal and present state of completion). The question that has not yet been answered is whether these differences, which appear so clear on paper, are just as distinct in real projects. A method for testing this – the third step in the research process proposed by this article – is presented in the next and final section.

6   Future Study: From Typology to Empirical Verification

The above sections have explained what project communication is and how it is possibly influenced by different – extreme – variants of project management models. It was also argued that possible differences can be conceptualised based on *situatedness.* With this, a first step towards a deeper understanding of project communication was taken, namely by establishing a conceptual basis and by testing this basis with relevant scenarios.

Yet, these scenarios were restricted to the abstract – if not purely theoretical – domain. What is still missing is the *empirical verification of the hypotheses* worked out above. It is clear that this will demand a lot of time and effort. Yet, with the knowledge of communicative implications for project management above, it is now possible to systematically collect the data needed. This would include:

- General information on the project management model chosen and adaptations for the specific project
- An overview of artefacts used
- An overview of regularly held meetings
- An analysis of meeting communication

What is the most interesting step, of course, is the analysis of what really goes on in the meetings. In addition to the meetings officially set up by team leaders or members, this should include meetings which have informally established themselves. The analysis should focus on the content of the communication – task-related vs. coordinating – as well as on the use of artefacts. Rather than comparing meetings and content on the macro-level, this should aim at establishing what type of communication has higher or less weight in what kinds of meetings. Methods lending themselves to this kind of study are naturally found in conversation analysis, as the works quoted above show (see Tiitula/Piitulainen/Reuter 2007; Jakobs et al. 2011).

For artefacts, it is also possible that the list established by a mere survey is incomplete – or that interviewees name more artefacts because they feel these are supposed to be used. Both possibilities should be considered and worked out. Ideally, the analysis of meeting communication should also contribute to answering the question how the meeting type, artefact use and content orientation influence each other. To do so, aspects of multimodal data collection and analysis should be integrated into the approaches mentioned above, as demonstrated by the contribution of Luff, Heath and Pitsch (2009) on "Artefacts and interaction in design". This is very challenging for transcription, coding and the development of descriptive categories. Still, from my experience involving an in-depth study of technical communication work processes, it yields very revealing insights. Especially with project management models like Scrum that leave more space for personal interaction, cultural and personality factors should be taken into account as in the work by Imcharoen (2011).

The general value of the further study of project communication lies in the possibility of producing a detailed description of its success factors. In this way, well-founded advice could be proposed on how to improve project communication, with project communication know-how finally rising above the level of over-simplification. From an academic point of view, the large number of projects offers possibilities to study the relationships between diverse factors. One example could be researching the validity of concepts such as "situatedness" and "socio-technical system".

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