APPLYING PSYCHOLINGUISTIC CONCEPTS TO IS PROJECT MANAGEMENT TOOL DESIGN

Stephanie Missonier  
*University of Lausanne Faculty of Business and Economics (HEC Lausanne), Lausanne, Switzerland,*  
stephanie.missonier@unil.ch

Hazbi Avdiji  
*University of Lausanne Faculty of Business and Economics (HEC Lausanne), Lausanne, Switzerland,*  
hazbi.avdiji@unil.ch

Stefano Mastrogiacomo  
*University of Lausanne Faculty of Business and Economics (HEC Lausanne), Lausanne, Switzerland,*  
smastrog@gmail.com

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APPLYING PSYCHOLINGUISTIC CONCEPTS TO IS PROJECT MANAGEMENT TOOL DESIGN

Complete Research

Missonier, Stéphanie, Faculty of Business and Economics (HEC), University of Lausanne, Lausanne, Switzerland, stephanie.missonier@unil.ch
Avdiji, Hazbi, Faculty of Business and Economics (HEC), University of Lausanne, Lausanne, Switzerland, hazbi.avdiji@unil.ch
Mastrogiacomo, Stefano, Faculty of Business and Economics (HEC), University of Lausanne, Lausanne, Switzerland, smastrog@gmail.com

Abstract

This paper illustrates how we build on psycholinguist Herbert Clark (1996)’s works to develop a project management tool that would contribute to higher project success rates. Prior literature on IS project success/failure and coordination failed to grasp the emergence of projects and did not specifically address the interactions between the project’s participants. This literature did not give coherent explanations as to why and how project failure occurs and did not provide project actors with tools to act in real time to avoid failure. Since language is the main mechanism through which participants get coordinated, we suggest using a linguistics approach to design a tool that helps project’s participants manage their project in real-time. We assume that Clark’s (1996) theory has the potential to improve our understanding of IS project success/failure. From a previous study based on a Design Science research, we adapted and instantiated Clark’s theory. This paper aims at strengthening this adaptation to IS project management by presenting a step toward this direction: a new instantiation to design a tool in the form of a mobile application (called Coopilot App). This new instantiation provides a means to visualize and materialize common ground in real-time during project meetings.

Keywords: IS project, real-time, coordination, common ground.
1 Introduction

Truex et al. (2006) and Holmström and Truex (2011) remind us that there are continuous calls for “good theory” in Information Systems (IS) as scholars explore facets of novel theories and how they should be adapted to IS research. Bernroider et al. (2013) note that the door is open to continue developing IS and studying problems from various viewpoints.

Based on Design Science research (Holmström and Truex, 2011) and from a previous study, the current paper aims to present and improve the adaptation in the field of IS project management of a new theoretical approach that has rarely been explored in IS: Clark (1996)’s theory of joint activity. We believe that such a new approach can open a new avenue for IS project management. Clark’s model encompasses crucial elements, such as activity, language, time, intention, commitment and decision processes.

More specifically, in a previous study we adapted and instantiated main concepts of this theory into a conceptual model (called Coopilot¹). In this context, and drawing on prior literature on IS projects success/failure and coordination, the goal of the current study is to strengthen the adaptation of Clark’s theory to IS project management field by presenting a step forward in this direction: a new instantiation to design a tool in the form of a mobile application (called Coopilot App). This new instantiation and its future empirical evaluation will bring the first premises to assess the relevance of the notion of common ground as a new basis for improving the understanding of the becoming (evolution) of a project in real time. Common ground is defined as the set of knowledge, beliefs, and suppositions people believe they share (Clark, 1996, p. 93). For example, X is in A and B’s common ground when A knows X, B knows X, and A knows that B knows X and B knows that A knows X. The goal of this tool design is to materialize and give a relevant visualization of common ground.

Our approach is different in that it concerns the micro-level of projects – it addresses the daily interactions between project team members – and considers the “becoming of the project” instead of taking a static and retrospective perspective, as is the case with current research.

The remainder of the paper is structured as follows. First, we analyze the current state of research in IS project success and failure as well as previous works on coordination in project success and failure. This analysis allows us to define research gaps and clarify our study’s contribution. We then examine the current state of language in both organizations and IS fields and propose Clark’s joint activity model as a new theoretical approach in the IS field. For that purpose, we explain the theoretical bases of his model, our adaptation and instantiation from a previous research, and its new instantiation as a mobile application. We thus discuss implications and contributions of the new instantiation and propose empirical investigations to test the usefulness and usability of such a tool to improve the becoming of an IS project.

2 Theoretical background

2.1 Success/failure in the field of IS

A desire to reduce IS (project) failure rate has led researchers to seek out new project management concepts and theories (Cičmil et al., 2006). For some time, researchers have been interested in the

¹ Blinded for review.
reasons for project success and failure. Their investigation of this topic led to two research streams: the **objective perspective** or the **subjective perspective**.

Researchers who adopted the **objective perspective** have been interested in the critical factors that appear associated with project success and failure (Al-Ahmad et al., 2009; Nelson, 2007; Peffers et al., 2003; Sauer et al., 2007). This research is based on an ontological assumption that project success or failure exists as a discrete and determinate state, and on an epistemological assumption that success and failure can be objectively determined, measured and predicted by the presence or absence of certain factors. For instance, they have found that factors such as senior management commitment and support, active user participation, clear project goals, business planning and project planning among others, have been causally related to project success. The other way around, the lack of these aspects is associated with failure (e.g. Baker et al., 1988; Cooke-Davies, 2002; Ewusi-Mensah and Przasnyski, 1994; Ika, 2009; Rademacher, 1989). Research contributions are considered relevant for practice since the identification of factors that are critical to achieving project and system success enables managers to focus their attention on managing and controlling a limited number of aspects in notoriously complex projects (Remus and Wiener, 2010).

In contrast, researchers who take the **subjective perspective** assume the elusive, political or subjective nature of success and failure in projects (Bartis and Mitev, 2008; Fincham, 2002; Smithson and Hirschheim, 1998). Research has sought to understand projects’ success and failure as they emerge within changing organizational, social and political contexts. This perspective rejects the assumption that success and failure are definite states and proposes that they emerge through various individuals or stakeholders’ sensemaking, interpretation and attribution of the state (Fincham, 2002). The subjective perspective underlines the difficulty of objectively determining a project’s success or failure (Gemino et al., 2007; Sabherwal et al., 2006). Here, success is a moving target and depends on when projects are evaluated and who evaluates them (Larsen and Myers, 1999, p. 396). Prior research has developed a multi-dimensional and multi-observational project success model using various criteria by disparate groups of people. One of the main criteria is “satisfaction” (Bryde, 2005), which is either related to the perception of the project’s value and clients’ needs or defined by internal project groups, such as the project managers and project team members.

### 2.2 Coordination and project success/failure

Research focusing on the understanding of IS (project) success/failure has revealed that effective coordination increases project performance (Hoegl and Gemuenden, 2001; Hoegl et al., 2004; Parolia et al., 2007), and that IS project failures often partly results from coordination problems (Espinosa et al., 2007a; Kraut and Streeter, 1995). Most of these studies are based on the classical perspective of coordination taken from organization literature, such as the coordination theory (Malone and Crowston, 1994, 1990), the information processing model (Galbraith, 1974) and the fit and contingency model (Lawrence and Lorsch, 1967; Thompson, 1967). Various studies have completed and enriched this view of “explicit” coordination mechanisms (used purposely to coordinate) by determining that in addition to explicit components, implicit components of coordination (i.e. those used without a conscious effort to coordinate) are necessary for a project to succeed (Cannon-Bowers and Salas, 2001; Espinosa et al., 2004; McChesney and Gallagher, 2004). For instance, to manage their dependencies more effectively team members use cognitive mechanisms (Espinosa et al., 2007a, 2007b; Kotlarsky et al., 2008) such as shared knowledge – team members’ common ground for a given project (what participants know they share concerning a project) – or team awareness of who is available and who has previously done what, where and for whom. Shared knowledge about the team or the task helps team members anticipate what others are likely to do and what is required from them (Cannon-Bowers and Salas, 2001; Klimoski and Mohammed, 1994). In addition, when team members know that they share knowledge their communication is more effective because they have more common ground (Cramton, 2001; Krauss and Fussell, 1991).
2.3 Research gap

Despite the strengths of prior research on project success/failure and coordination, contemporary studies on project performance continue to indicate that current literature has had little impact on project management practices (Remus and Wiener, 2010; Sauer et al., 2007). Accepting and applying the widely promoted project management “best practice” standards and following recommendations from previous studies inscribed in the objective perspective does not eliminate project failure, nor does it guarantee project success (Williams, 2004, Cicmil et al., 2009). Additionally, owing to its complexity and wide scope, the subjective perspective has not proved easy to use and suffers from a lack of legitimacy in practice (Introna and Whitaker, 2002; Smithson and Hirschheim, 1998). As a result, the IS project failure rate has not really decreased. There are two main reasons for this lack of relevance.

First, the existing literature takes a static and time-end perspective and thus does not provide coherent explanations as to why and how success and failure occur (Fincham, 2002). Indeed, from both the objective and subjective perspectives, the evaluation and understanding of the project’s success/failure is elaborated at the end of the project, that is a posteriori. Yet, the most significant limitation of retrospective research is the difficulty in determining causes and effects from reconstructed events (Léonard Barton, 1990, p. 250). Moreover, this literature analyses and understands project outcomes in terms of success or failure, namely as a “state of being”. It thus provides static analyses without considering the real time of a project and thus its becoming– that is its emergent progress – in order to observe the project in the making (Missonier and Loufrani-Fedida, 2013). Specifically, such ontology of becoming inscribed in Whitehead’s (1929) thinking emphasizes movement, process and emergence (Whitehead, 1929). Consequently, with such static perspective, what happens and emerges throughout a project in real time, i.e. between team members during meetings, is not sufficiently addressed. As a result, our understanding of the issue of projects (failure or success) is limited and project actors are not provided with recommendations on the actions they should undertake during the making of the project to avoid its failure and potentially increase the chances of success.

Second, following a macro-level analysis of projects, aspects related to what happens daily in the field – specifically interactions between participants – are not comprehensively considered in the current literature (Introna and Whittaker, 2002). Contemporary studies on coordination do not consider how cooperative work is carried out and pay too little attention to coordination issues between team members (Tellioglu, 2006). Prior research places coordination at the organizational level of processes and structures; it thus adopts a relatively high-level view of coordination (Faraj and Xiao, 2006; Okhuysen and Bechky, 2009) and no pragmatic suggestions are made concerning how people should coordinate (Faraj and Xiao, 2006). Although prior research has established that effective coordination implies that team members know that they share knowledge, several questions remain unanswered in this regard. For instance, how can team members know that they share enough knowledge to minimize false predictions and coordination surprises? How do we ascertain that team members understand their roles and the project goals? And what we consider the most important question: How do we know who knows what?

We investigate these aspects by considering what we regard as our primary device of coordination: language. Indeed, our main assumption is that conversation is the main mediating mechanism between individuals, specifically in terms of how they understand each other’s intentions as the project unfolds. We argue that a perspective based on language can fill these two gaps.
3 A new approach: linguistic perspective

3.1 Language matters in the organizational and IS fields

Recently, there has been growing interest in language both in organizational theories (Alvesson and Kärreman, 2000) and in the IS field (Dreiling, 2006), what is referred to as the linguistic turn. Organizational theories regard organization as social constructions in which language plays a constitutive role (Gergen et al., 2004; Putnam and Nicotera, 2009; Taylor and Van Every, 1999; Weick, 1979). McPhee and Zaug (2008) identify four types of messages necessary for organization’s communicative constitution which involve coordination. Barnard (1968) defines organizations as cooperative systems and recurring achievements of human coordination, a view shared by Taylor and Van Every (2010, p. 36) who posit that “[f]or there to be organization there must be coordination of action”. Moreover, coordination is often a conversational experience (Boden, 1994). In fact, the role of language and communication in organizations is often determined by conversations between organizational members (Hardy et al., 2005; Tsoukas, 2005). Even if several scholars in the field have recently embraced conversation analysis and other microanalytical approaches to studying workplace interactions (Asmuss and Svennevig, 2009), little attention has been paid to real-time coordination per se, i.e., the linguistic acts through which coordination is accomplished during meetings.

In the IS field, information systems are considered as socio-technical systems serving the purpose of human communication through technical implementation (Beynon-Davies, 2009; Goldkuhl and Lyytinen, 1982). Consequently, the importance of investigating the role of language in IS became evident (Lyytinen, 1985) leading scholars to use linguistics approaches in a variety of domains including information systems development (Auramäki et al., 1988; Flores and Ludlow, 1980; Goldkuhl and Lyytinen, 1982; Lehtinen and Lyytinen, 1986; Winograd and Flores, 1986), database and knowledge management (Dreiling, 2006; Holm and Karlsgren, 1995), computer supported cooperative work (De Cindio et al., 1986; Kaplan et al., 1992; Whiteside and Wixon, 1988) or an IS project of supply chain management (Laumann and Rosenkranz, 2009). However, to our knowledge, no studies the IS field have investigated the role of conversation in real time coordination in depth. In the context of project management, “real-time coordination” refers to the coordination that occurs during project meetings. More broadly, researchers that have studied coordination in IS projects do not suggest how conversation constitutes and influences real-time coordination.

The lack of studies examining the role of conversation in real-time coordination in organizational theories and IS studies leads us to another perspective, one that exists outside the organizational and IS fields. That perspective stems from psycholinguist Herbert Clark (1996)’s work, which we used as a theoretical foundation and that we will present hereafter. To our knowledge, except a few studies (Laumann and Rosenkranz 2009), Clark’s theory has not been mobilized in the IS field.

3.2 A new theoretical approach in the IS field: Clark's joint activity model

Several researchers including Klein et al. (2005) in the field of psychology, Bechky (2003) in organization studies, and Dillenbourg and Traum (2006) in computer supported collaborative learning (CSCL) have noted the relevance of Clark’s joint activity theory. Clark (1996) described how people use language to coordinate joint activities, i.e. activities carried out by an ensemble of people acting in

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2 We know that Clark’s views have been heavily criticized in his own field by such scholars as Sperber (1984). In particular, criticism has been directed at the scientific validation of his notion of common ground. Even though we do not dismiss such criticisms, we have decided not to enter the debate since Clark’s model offers new insights that can help us move forward.
coordination with each other. According to Klein et al. (2005), Clark’s ideas bring added value to prior coordination approaches: “Though previous accounts of team coordination (e.g., Klein, 2001; Malone & Crowston, 1994; Zalesny, Salas, & Prince, 1995) have identified features of effective coordination, Clark’s description of joint activity during conversations seems to provide a much stronger basis for understanding team coordination” (Klein et al., 2005, p. 143). Hereafter, we specify Clark’s concepts we used to adapt his theory to IS project management (see Table 1) and design our tool.

Clark’s approach specifies the cognitive conditions necessary for effective coordination and the linguistic acts through which coordination is accomplished. Clark introduces his approaches with a strong statement. Coordination is concerned with what team members do when they solve coordination problems, mainly using language. Coordination problems are related to the issue of interpredictability, i.e. when team members – or individuals in general – must infer what actions they can expect from each other in their joint effort to reach the common goal. To solve coordination problems, people need to establish and maintain a sufficient level of common ground: the set of knowledge, beliefs and suppositions that people believe they share (Clark, 1996, p. 93). The concept of common ground is different from “shared knowledge” or “common understanding” insofar as it includes the recursive notion that participants are aware that they share knowledge they have (Wilkes-Gibbs and Clark, 1992). In the current paper, when referring to common ground, we mean the subset of the participants’ common ground relevant to the project, that is team members’ awareness that they share knowledge about their intended job. We do not consider their overall common ground which could include anything from cultural affinities to food preferences. We focus on the knowledge that is related to the project.

Klein et al. (2005) pointed out that people too often discover a serious loss of common ground. They refer to this as the fundamental common ground breakdown (i.e., when there is confusion about who knows what) that creates coordination surprises. Such surprises occur when something happens that doesn’t make sense in terms of their beliefs. For example, a project team expected one of its members to get a prototype approved by the key users within 10 days but this team’s member was unaware that he was dedicated to this task. As common ground is the premise for effective coordination and joint activities, it should constantly be updated to avoid such breakdowns and coordination surprises. One of the most efficient ways to construct and maintain a sufficient level of common ground is through language.

Such concepts prove particularly important in the context of IS projects as they evolve in ever-changing environments whether because new cost or time constraints emerge, the specifications of the solution need to be modified, unforeseen risks are identified, or new members are integrated in the team. Such cases stress the need for a project team to update its common ground with the new information in order to avoid that members perform actions or make decisions based on obsolete information, thus triggering a domino effect that leads to coordination surprises and potential shifts in terms of scope, time, quality, and cost.

Clark and Schaefer (1989) suggest that coordination surprises can be reduced by helping team members “artificially” raise their level of common ground. While it may be sufficient for two spouses to nod, say “okay” or “yes” when discussing the purchase of new curtains, participants in professional settings such as during a project meeting may need more explicit evidence of mutual understanding (see Cahn and Brennan, 1999). In such a case, if there is any doubt about participants’ understanding, the project manager may need to trigger a discussion or ask questions in real time to decrease the potential discrepancies in common ground between the participants.

For that purpose, we decided to design a conceptual model (called Coopilot) (Mastrogiacomo et al., 2014) to help project managers assess the level of their team’s common ground and act accordingly. We based our work on Clark’s definitional requirements for joint projects. A joint project corresponds to an interaction in which person A proposes something to person B and B responds positively. Clark (1996, p.191) points out that joint projects require joint purposes. For A and B to commit themselves
to joint purpose \( r \), it is necessary to satisfy four conditions: (1) **Identification**: A and B must identify \( r \), (2) **Ability**: It must be possible for A and B to play their part in fulfilling \( r \), (3) **Willingness**: A and B must be willing to play their part in fulfilling \( r \), (4) **Mutual belief**: A and B must each believe that (1), (2), (3), and (4) are part of their common ground.

<table>
<thead>
<tr>
<th>Clarkian Concept</th>
<th>Description</th>
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<tbody>
<tr>
<td>Joint activities</td>
<td>Activities that involve more than one person and where individuals’ actions depend on each other.</td>
</tr>
<tr>
<td>Coordination</td>
<td>What people do to align themselves, i.e. when they try to solve coordination problems.</td>
</tr>
<tr>
<td>Conversation</td>
<td>Face to face dyadic exchange, the basic setting for using language.</td>
</tr>
<tr>
<td>Common goal</td>
<td>What participants want to reach through their joint activities.</td>
</tr>
<tr>
<td>Coordination problems</td>
<td>Interpredictability problems that automatically arise when people engage in joint activities (because everyone has a different brain).</td>
</tr>
<tr>
<td>Communication and language</td>
<td>The primary instrument for humans to coordinate.</td>
</tr>
<tr>
<td>Common ground</td>
<td>Mutual information created through language use that helps people solve coordination problems: the knowledge, beliefs, and suppositions people believe they share.</td>
</tr>
<tr>
<td>Coordination surprise</td>
<td>What happens when participants make wrong predictions about each other.</td>
</tr>
<tr>
<td>Common ground breakdown</td>
<td>Where coordination surprises originate: misbeliefs on what people believe they know about each other. Can result in wrong predictions that lead to coordination surprises.</td>
</tr>
</tbody>
</table>

*Table 1. Clark’s main concepts used in our research*

4 Adaptation of Clark’s Theory to IS Project Management

In this section, we present our approach for adapting Clark’s theory to IS project management. We first report a study we have already conducted (Mastrogiacomo et al., 2014) in which we introduced our conceptual model (Coopilot) mentioned above and the related instantiation as a set of cards called the Coopilot Cards (4.1.). Then, in order to improve its adaptation and assess the relevance of the notion of common ground as a new foundation to improve the understanding of the **becoming** of an IS project in real time, we provide a description of a new instantiation of Coopilot that we have developed as a mobile application (Coopilot App) (4.2.).

4.1 Previous Study: Adaptation and first instantiation of Clark’s theory

In our previous study (Mastrogiacomo et al., 2014), we have adapted Clark’s theory to IS project management in our conceptual model Coopilot. Coopilot is a simple conversational guide to help IS project managers minimize the number of coordination surprises that arise for teams during their project meetings. We translated and adapted the four requirements from Clark’s model of joint activity (**Identification**, **Ability**, **Willingness**, and **Mutual belief**) into the four variables that constitute our conceptual model (**Joint objectives**, **Joint resources**, **Joint risks**, and **Joint commitment**). These variables represent four different families of knowledge, presuppositions and beliefs that participants need to share to act jointly in their IS project:

• **Identification (1)** is related to the variable **Joint Objectives** which describes the amount of common ground between the project’s participants with regard to what they are supposed to achieve together.
• Ability (2) corresponds to first the Joint Resources and Joint Risks variables. Joint resources refer to the amount of common ground between participants with regards to the resources available for achieving their task and Joint risks are the obstacles that could prevent participants from playing their part.

• Willingness (3) is related to Joint Commitment, which describes how much is shared about what to expect from whom. For reasons of preference and pragmatism, we assumed that participants’ willingness was reflected in their commitments and decided not to over-theorize about the relationship between willingness and commitment. We acknowledge that this area requires further investigation, but it is beyond the scope of this study.

• Finally of Mutual belief (4) is interpreted as the setting in which project manager must manage these four variables with project conversations. Indeed, conversation is the basis for human coordination (Clark, 1996, p.8) and is therefore the best medium for establishing evidence of mutual understanding.

We assumed that project managers have to continuously monitor these four variables if they want their participants to act as a team and ensure that their individual contributions will harmoniously converge into a joint outcome through a proper and consistent division of labor. Therefore, we instantiated these four variables in a set of cards called the Coopilot cards.

The cards described our conceptual model’s four variables using visual iconography to facilitate understanding and illustrated the amount of common ground using sliders with minimum and maximum values. In this research, (only) project managers used the Coopilot Card in every project meeting and evaluated in real time their team’s common ground regarding the four variables. More precisely, they evaluated their perception of each team member’s position on each variable during the meeting based on the proceedings of the aforesaid meeting. This allowed them to appreciate the perception gaps between team members. The project manager used the Coopilot Cards before the closing of the meeting so that they can evaluate whether the proceedings of the meeting related to the four variables were clear for everyone and avoid that participants leave the meeting with misconceptions, wrong perceptions, or biased inferences. If the evaluation raised the need for clarification, project managers could use the conversational guide that the Coopilot Cards incorporated. The latter contained a set of questions for each of the four variables, allowing the project managers to trigger a discussion on when they perceived that the team lacks common ground in any of the variables. The project manager could then target the participants’ lack of knowledge and raise a discussion between the team members to assure that they reach a satisfactory level of understanding and avoid coordination surprises.

This previous research was anchored in design science (DS) research (Holmström et al., 2009), in order to make Clark’s approach accessible to IS project management. According to the process proposed by Holmström et al. (2009), we started with the development of new ideas (Phase 1: Solution Incubation), then moved on to tested ideas (Phase 2: Solution Refinement), mid-range theory (Phase 3: Explanation I), and formal theory (Phase 4: Explanation II). Our study is currently at the end of Phase 3. This version of Coopilot was implemented in three case studies (projects) in three organizations from different sectors and subsequently evaluated. In this study, only project managers used the Coopilot Cards and evaluated the team’s common ground in real time.

Our results, which are being published in an A-ranked IS journal (Mastrogiacomo et al., 2014), illustrate the value that Clark’s theory can add to the IS field. This research offers new theoretical insights for IS researchers first by thoroughly investigating the role of conversation and evidence of understanding in real-time coordination and second by providing a tool to guide conversations in order to improve real-time coordination. Indeed, in the aforesaid study our evaluation of Coopilot demonstrated that frequent use of thereof over a period of several months helps managers repair
common ground breakdowns, reduces the number of coordination surprises in the project, and it thus can increase a project’s potential for success as perceived by the project managers.

To our knowledge, Coopilot is one of the first attempts (maybe the first) to design a tool to manage a team’s common ground in real time. Consequently, in order to improve the adaptation of Clark’s views to IS project management and thus provides premises for a formal theory (Holmström et al., 2009), we have improved our instantiation of Clark’s model by developing an additional tool. More precisely, in the current paper, our goal is to extend Clark’s theory by proposing, for the first time, a materialization of common ground. For this purpose, the new tool aims to measure and provide a real time visualization of the team’s common ground.

4.2 A new instantiation of Clark’s theory (Coopilot App)

In collaboration with a Swiss firm, we have developed a mobile application (called Coopilot App) running an instance of Coopilot through a web browser accessible on smartphones and other devices. The aim of such new instantiation is to improve Clark’s adaptation to IS project management and proposes premises for assessing the relevance of the notion of common ground as a new foundation to improve the understanding of the becoming of an IS project in real time.

As mentioned previously, the Coopilot Cards were used by project managers only to assess the team members’ perceptions regarding the four values displayed on the cards. It evaluated the level of common ground of the team members as perceived by the project manager. On the contrary, the Coopilot App allows every participant to directly assess their own perception regarding the four same variables. Indeed, for the same reasons as for the Coopilot Cards, the project team uses the application to assess their level of common ground towards the end of a meeting. The process of voting starts with each participant entering a link in the internet browser in their device which directs them to the homepage of the software. They select the appropriate project from the list of all projects rolled out in the company. The browser then directs them to the page on which they can vote on the four variables.

In this new instantiation, all Coopilot variables are presented as cursors on which each project participant can position her/his own perception of the ongoing activity (see Figure 1). For instance, the project participant assesses that: joint objectives are clear or unclear to him/her, joint commitments are implicit or explicit to him/her, if resources are available or unavailable to play his/her part, and if joint risks are perceived as high or low in terms of risk exposure. After participants position their cursor and submit their votes, the application displays the votes of the other participants that have already voted and updates automatically as soon as a new vote is submitted (note: this can be a matter of seconds as all participants vote at the same time and the process of voting does not take long). Once everyone has voted, the software displays all participants’ votes on everyone’s screens anonymously as illustrated on Figure 2. If there is a beamer in the room, it is possible to show all the participant’s votes so that all participants have the same visualization of the votes. The fully filled points indicate the vote of the participant him/herself, and the other points show the votes of the other team members. As the votes are anonymous, there is not visual differentiation between the votes of the other team members. Once the votes are aggregated, participants are asked whether they are surprised by the scattering of the votes.

The display of the scattering of the votes (see Figure 2) allows the project manager and the participants to visualize the discrepancies between everyone’s perceptions on each variable. The more scattered the votes are, the greater the perception gaps. Note that the project manager can also deduct each member’s perceptions using the Coopilot Cards and scatter them manually. However, this way of proceeding is less precise than using the application as it is based on perceptions of perceptions, adding an additional level of potential deviations from reality, thus inaccuracy. Immediately after each vote, data about when and what each participant voted and the position of all group members is collected and stocked anonymously on our server.
From this common visualization, participants can start a discussion about the perception gaps they visualize. The application also incorporates a conversational guide with an enhanced set of questions the project manager or any participant can use to raise the need for discussing the variables that require further discussion or explanation. Similar to the Coopilot Cards, the aim of the conversational guide is to help the team discuss the relevant elements so that their common ground related to the project increases, in turn reducing the number of coordination surprises.

Moreover, one major difference between the application and the cards is the means by which common ground is evaluated. While the Coopilot Cards underlined the relevance of the four variables we defined in our previous study and helped managers evaluate their team’s common ground on project-related knowledge, to our knowledge Coopilot App is the first tool to measure and provide a real time visualization of a team’s common ground as defined by the team itself. When using the Coopilot Cards, common ground is measured when asking participants whether they are surprised by the scattering of the votes. We assume that such a question reflects the fourth requirement of Clark’s theory on joint projects, i.e. mutual belief. For example, if the votes of one person are close to maximum values for all four variables and those of another are rather low but both participants state that they are not surprised by the scattering of their votes, we consider that this situation is in both participants’ common ground. It can be said that the first member knows that the other has a low understanding of the joint objectives. It is thus in their common ground that one has a good understanding while the other does not. Common ground no longer is evaluated based on one person’s perceptions (the project manager) but is the reflection of the aggregation of every member’s perceptions. This improvement proves particularly important and relevant as individuals perform actions based on information from their perceptions (Clark, 1996, p.92).

Finally, Coopilot App will allow us to perform quantitative analysis as data on the votes of every participant for each project will be collected, otherwise cumbersome with the Coopilot Cards.
quantitative analysis will be combined with qualitative analysis through semi-structured interviews. The application will allow us to use a mixed-method approach to test whether theoretical and statistical generalizability of the findings of our previous study can be strengthened.

5 Discussion

From the developments of our previous study, the aim of this current paper was to strengthen the adaptation of Clark’s theory to IS project management by presenting a new instantiation to design a tool in the form of a mobile application (called Coopilot App). Based on the overarching goal to assess the relevance of the notion of common ground as a new foundation to improve the understanding of the becoming of a project in real time, this new instantiation aims to materialize and provide project participants a relevant visualization of the common ground. Such an instantiation in the form of a mobile application has three main implications.

First, this new instantiation reinforces the adaptation of Clark’s views to IS project management in that it is the first tool to materialize common ground and allows teams to visualize their perception gaps on their devices. Indeed, the participants’ perception gaps then become part of the team’s common ground. With the display of the votes on everyone’s devices, common ground on the perception gaps has a high quality of evidence. Clark (1996, p.93) states that when people share a same situation of which both are aware and have a mutual believe of that very situation, this situation is a shared basis for their common ground. Nevertheless, shared bases can lead to difference in quality of evidence of common ground, i.e. the level of evidence that an information is part of the common ground (ranges from low to high) (Clark, 1996, p. 98). Some situations may lead to clear evidence that a piece of information is part of a team’s common ground while some others show poor evidence. For example, let us assume that a team has great perception gaps, i.e. their votes are highly scattered. For the scattering of the perception gaps to become common ground for the team when using the Coopilot Cards, the project manager needs to mention verbally each participant’s position for each of the four variables during the meeting by saying sentences such as “regarding objectives, you Ann have a low quality of evidence. Bob you too, but George seems to grasp them clearly”, and so on for the other three variables. With the multiplatform mobile application, establishing common ground on the perception gaps is straightforward as they are displayed on a tangible medium and everyone shares the same visualization at the same moment. It is much easier to visualize a scattering of votes on a screen than to imagine the Coopilot Cards and picture each participant’s perception on the scale of each variable based on the project manager’s discourse. The quality of evidence is thus greater when using the application. The team’s awareness of its common ground is consequently improved. Instead of founding the need for discussion on a feeling of a team’s confusion, project managers (or any participant) will see the need for further discussion or more thorough explanations. The display of the votes also makes it easier to identify the elements that need further investigation. Consequently, this new instantiation provides a shared basis with a strong quality of evidence and thus can reinforce the becoming of the project.

Second, this application can provide justification on a project’s state with regards to organizational matters. Without such a display of the team’s perception gaps, project managers who believed their team’s perceptions were too different to complete the project successfully (e.g. the team is not clear on the objectives or too many participants don’t know what is expected from them and what they can expect from others) could only base their recommendation for cancellation to stakeholders or requests for the organization of workshops on feelings. In such cases, the application legitimates a project manager’s suggestions. She could show the votes to the stakeholders and found her arguments on facts rather than feelings or intuitions.

Third, the application acts as a group (or community) mirror when displaying the participants’ votes. It informs the group on the state of its knowledge and is the basis for reflection on that state and action.
towards a desired state. For example, if a participant perfectly grasps the objectives of the project while another has a low understanding of them, the project manager or any project participant deduct from the scattering of the votes on the first variable that a member of the group is confused regarding the objectives. From this conclusion, the project manager or the team members can decide to solve for this discrepancy with different types of actions such as immediately triggering a discussion on the related variable, scheduling a workshop with the whole team to ensure that everyone is aligned on the objectives, or formulating the objectives of the project on a memorandum that will be distributed in the following meeting.

Of course such contributions and implications need to be empirically investigated. We discuss it in the following section. Nevertheless, it is important to note that we are currently performing empirical investigations. The first interviews with team members of one project reveal that the mobile application has helped them identify strong perception gaps between them. Thanks to this detection and the visualization of common ground discrepancy, they have decided to postpone the end of the project by one year. The respondents mentioned that they would not have detected these discrepancies and take the decision to postpone without using the application.

6 Limits and further research

Such adaptation and instantiations from Clark’s theory might remain challenging for some time. Clark’s coordination model is purely descriptive and by no means prescriptive. It takes almost no account for example of concepts such as effectiveness or efficiency, which are in the end the ultimate goal in our discipline. Another difficulty lies in picking the relevant variables and processes among the dozens of linguistic variables and processes underlined by Clark. Moreover, to date, we know little about the materialization of common ground and the way it can be measured. Consequently, further research is needed to investigate the relationship between common ground and the becoming of a project.

More precisely, based on a design science research (Holmström et al., 2009), we first need to investigate empirically the materialization part of the common ground and its measurement, and the device we have designed (Coopilot App). Indeed, this tool is still a prototype. Since prototypes require testing, we will test the perceived ease of use and usefulness to the users (Davis, 1989; Venkatesh et al., 2003) through usage frequency. The version presented here is the second one. We had built a first version in collaboration with a polytechnic school in Switzerland but the application very soon proved that it needed improvements in terms of data collection and usability, hence our resorting to professionals in solutions development.

In addition, we need to assess aspects that are not tangibly linked to the application. In fact, we will assess the relevance of the conceptual model and its usefulness for project members. For this purpose, we have begun to implement Coopilot App in five projects, (two projects are lead in a firm from the watchmaking sector, another project in the luxury sector, and a project in a public administration) in order to collect during four months (1) quantitative data from the use of Coopilot App informing the frequency of using the tool and (2) qualitative data from semi-structured interviews with all team members of each project to assess the usefulness of the application. Also, because time is essential in a project and can have an impactful role in the use of Coopilot, we have selected projects at different project phases. We will use a Chi-squared test to assess the dependency between the number of votes and the tool’s usefulness. This further research would first allow us to identify if the software version (Coopilot App) of our model is easy to use and useful for project actors or conversely, if such a device negatively impacts the usability of the conceptual model. Second, we would also be able to assess whether our model - a its four variables - are appropriate and sufficiently relevant and efficient to provide a clear understanding and measure of the common ground. Consequently, we will assess
criteria for the improvement of our conceptual model and thus the materialization of common ground and a list of requirements to improve the device’s usability.

In parallel, by means of semi-structured interviews and blinded questionnaires, we will investigate in a detail manner how project participants used the application and formulated their votes. This analysis will help us assess the effect of a possible social desirability bias. Moreover, as we will conduct a longitudinal analysis in that we will follow different projects over a period of several months, we will assess a posteriori if participants ever experienced wrong perceptions. For example, one might think that they have a good understanding of the objective and come to notice after some time that the objective they had in mind was not totally in line with the actual goal of the project.

Also, after improving our model and its instantiation on mobile devices, we will deeper investigate the relationship between common ground and the becoming of a project and thus provide current IS literature with a deeper understanding of the role of common ground in the becoming of a project. We have already demonstrated that a sufficient level of common ground is necessary to avoid coordination surprises and that a reduction of the latter positively affects a project’s success potential. A more thorough analysis should be conducted to explore and identify in which ways the level of common ground can have an impact on the becoming of a project. Furthermore, the analysis should also aim at defining what level of common ground would be considered as sufficient in order to improve the becoming of the project and find out how this level can be improved. To this end, we have identified two interrelated research questions.

First, does the awareness of common ground play a significant role in the becoming of a project? In answering this question, we will seek to observe and understand the role of the awareness of common ground in the becoming of a project. Taking a different perspective than prior literature, we want to understand what happens throughout a project concerning common ground.

Second, does the level of common ground have an impact on the becoming of the project and how does one act on this level? In answering this question, we aim to identify whether there is any type of correlation between the level of common ground and the becoming of a project and how this level could be improved.

7 References


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