Conceptualizing Unexpected Events in IT Projects

Research-in-Progress

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Abstract

Unexpected events occur during many IT projects and need to be adequately addressed so that their potentially negative impacts can be mitigated. While various tools and methodologies are available to help IT project teams better manage projects, our knowledge of unexpected events remains limited. To better understand such events, their impacts, and how project teams can respond to them, it is important to first comprehend their nature. As a preliminary step in that direction, the present study conceptualizes unexpected events in IT projects based on a case survey of 50 unexpected events described in 38 published case studies. Our analyses suggest three complementary categorizations of unexpected events based on their source, scope and genesis. Further, based on the premise that different unexpected events are likely to lead to different project team responses and outcomes, we suggest several propositions for future research.

Keywords: Unexpected events, Project Management, Case Survey, IT Project Dynamics

Introduction

According to the Project Management Institute (PMI), an IT project is defined as "a temporary endeavor undertaken to create a unique product, service or result" (PMI 2009, p.442), where the product is an information system. Despite the significant advances in project management tools and methodologies that have been made over the years, managing IT projects continues to be an important and challenging topic for both researchers and practitioners alike. This is likely due to the inherent difficulties in managing such projects, their increasingly complex nature, as well as the delays, cost overruns and other problems that often afflict many of them (Nelson 2007, Standish Group 2009). An important aspect of this complexity stems from the fact that, over their life cycle, most IT projects face unexpected events (Hällgren 2007), defined as events that had not been anticipated by the project team (Tukiainen et al. 2010). Here, we propose to further specify this perspective by defining them as *unanticipated events that occur suddenly and that have significant impacts on a project*. When such events occur, project managers and team members need to react in an appropriate manner so that their potentially negative impacts can be addressed or mitigated. Given that our current knowledge and understanding of unexpected events in IT projects remains limited, we intend to conduct an empirical study that will examine these events in depth, as well as the reactions of project teams to such events, and project outcomes. In this paper we explore the kinds of unexpected events that have been observed in IT projects in order to develop a categorization as a first step.

Categorizing the different kinds of unexpected events faced by project teams is fundamental to understanding their impacts and the team's response. Figure 1 shows our research agenda on this topic and its key proposition that unexpected events influence project outcomes and the team's responses determine whether their impacts are mitigated or amplified. Thus, in the longer term, our research intends to answer the following questions: (1) What kinds of unexpected events occur in IT projects? (2) How do unexpected events impact IT project processes and dynamics? (3) How do project leaders and team members respond to unexpected events? and (4) How do project teams' responses influence project outcomes? Our main research proposition is one of contingency, with the premise that different kinds of unexpected events need to be handled differently.

Figure 1.   General Research Framework
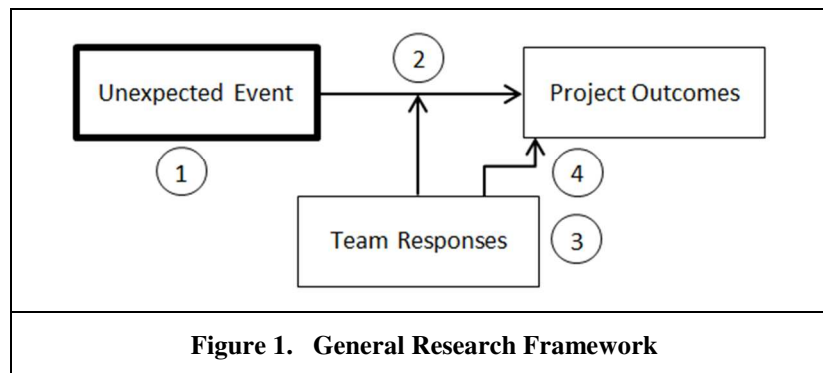
In this article, we first summarize the literature on unexpected events and show how this notion differs from the concepts of IT project risk and uncertainty. Then, we describe our inductive approach and the categorization it suggests. Based on these categories, we then discuss the outcomes of unexpected events and possible team responses to suggest an agenda for future research.

Background

IT projects are seen as complex multi-dimensional phenomena that involve multiple stakeholders (Sabherwal and Robey 1993). This complexity often leads to uncertainties that arise both from the internal or external environment of projects. Uncertainty reflects a lack of knowledge about events and their outcomes (Perminova et al. 2008), thus leading to project risks, which in turn are thought to be associated with potential losses (Barki et al. 1993). To control the uncertainties of projects, it is suggested that managers develop risk management practices by assigning probabilities to the potential outcomes of different events, as well as values to the potential losses they may cause (Barki et al. 1993). Project

managers are then supposed to prepare strategies to deal with such events, in case they occur. However, uncertainty also means that managers do not know all the "rules of the game" (Perminova et al. 2008, p.75) and that they are not able to assess every possible event along with its potential consequences (Söderholm 2008). Unexpected events, i.e., events that have not been anticipated, do occur during IT projects (Paré 2002, Söderholm 2008). While planning and controlling may play an important role in ensuring project success, we posit that IT project managers and team members also need to be prepared to react to different types of unexpected events.

In the project management domain, past research has not focused on categorizing and classifying unexpected events in IT projects, and has mostly reported how project teams have interpreted and dealt with such events (e.g., Tukiainen et al. 2010; Hällgren 2007; Hällgren and Maaninen-Olsson 2009; Söderholm 2008; Floricel and Miller 2001), and factors that lead to successful responses (e.g., Geraldi et al. 2010). Focusing on the nature of unexpected events, some researchers have proposed two dimensions to distinguish between them: their locus of generation and level of predictability (Piperca and Floricel 2012). While these dimensions are useful for clarifying the concept of unexpected events, they need to be further developed in order to provide a more complete picture of what happens in these events, thereby enabling better theorizations that incorporate the project team's responses and the resulting project outcomes. For example, it is reasonable to think that different types of unexpected events are likely to impact a given project with different degrees of severity, which in turn suggests that addressing them is likely to require different responses, depending on project characteristics.

Methodology

To develop a generalizable and accurate categorization of unexpected events in IT projects, a large variety of cases is needed. As such, a case survey methodology appears appropriate given that many case studies on IT projects are published every year. An important advantage of a case survey is to pool "*relevant case studies into data sets sufficiently large for statistical testing*", enabling generalization (Larsson 1993, p.1517).

To identify cases, we used the keywords '*Project', 'Case Study(ies)', 'Information System', 'Information Technology'* and searched for peer-reviewed articles, book chapters, proceedings, theses and working papers in the following sources: Web of science, ABI/INFORM (complete and Dissertations & Theses), ScienceDirect, EBSCO and Emerald. A case was added to our sample when it (1) reported at least one unexpected event that occurred in the project, and (2) provided sufficiently detailed information to allow us to understand the event's antecedents and impacts. Based on our definition that an unexpected event is likely to have a significant impact on the project management process and occurs suddenly, we excluded the cases where the event had either a non-significant impact or where the team had seen the event coming. In this paper, we report the preliminary analysis of 50 unexpected events described in the 38 IT case studies, from 1990 to 2012, that were retained and that form our study sample (the list of references is available from the first author).

Preliminary Results

For each of the 50 unexpected events, a synopsis was written. Using an inductive approach, we first developed a set of dimensions to reflect how project leaders and team members might perceive an unexpected event that happens during a project by asking how and why the unexpected events reported in the case studies were different from each other. Then, we coded each unexpected event based on these dimensions to ensure that all the events in our sample could be classified (completeness). We then grouped related dimensions, which yielded three complementary ways of classifying unexpected events in IT projects. Thus, we assigned three labels to each unexpected event in our study sample. Finally, data analysis was performed to assess patterns between our categorizations.

Categorization 1: Source of the Event

Unexpected events can be differentiated according to their source and five categories of sources emerged from our analysis. An unexpected event may originate from the technical aspects (*Information Technology),* such as glitches, stability issues, and high response time issues that can arise in a project.

The *Project team* can also be a source of unexpected events, such as unexpected conflicts that may occur between project team members, vendors, consultants, and users. Unexpected reactions of *Users* could also catch a project team off-guard when such reactions are not expected. An unexpected event could also emerge from *External stakeholders*, such as when a vendor decides to discontinue a system or suddenly goes bankrupt. Finally, a project is usually mandated by an *Organization* to pursue a specific goal or sets of goals. As such, this dimension reflects the unexpected changes that might occur at the organizational level, such as a change in the structure or strategy of the company or the departure of the sponsor, which can also affect a project. Table 1 shows the frequency of occurrence of each source in our sample, along with an illustration.

Table 1. Sources of Unexpected Events		
Source	Frequency (n = 50 events)	Illustration
Information Technology	44 %	Even though the pretest of an IT system was successfully undertaken, the system was "brought to its knees" as soon as it went live. Response time problems occur in real operating conditions (from Klepper and Hoffman 2000).
Project Team	12 %	A company that owns production and sales sites around the world, decided to implement an ERP system. The first phase ended with the definition of the project objectives. Then, several business units (BUs) in different countries participated to the analysis and conceptual design phase. However, by the end of this second phase, the project team realized that the deliverables of each BU varied significantly according to their understanding of the project. The project team acknowledged that the objectives had to be retranslated to avoid such confusion and re-launched the first phase of the project. (from Elbanna 2006)
Users	18 %	A few weeks after the go-live of a Patient Care documentation system, while the nurses were initially enthusiastic about the system, the IT team faced "a revolt" from them, who complained that the system was not appropriate for their tasks (from Spetz and Keane 2009).
External Stakeholders	8 %	In the middle of the implementation stage, the vendor of the IS became bankrupt. The team had no other solution than to stop the current implementation and decide whether they should continue with another vendor or return to the legacy system. (from Pramatari et al. 2009)
Organization	18 %	The implementation process of an ERP was without trouble until the organization changed its structure from a State-Owned Enterprise to a subsidiary company. The chosen ERP was not flexible enough to adapt to such a change and was almost useless. (from Xue et al. 2005)

Categorization 2: Genesis of the Event

A different approach to distinguishing between unexpected events can be to examine two dimensions related to the project team and the event's genesis. First, team members might feel that they could have predicted the event easily, or not. Second, a team can have some control over the event's occurrence, i.e., team members could have done something to prevent it, or they could feel that they were helpless. Thus, *Ease of predicting the event* and *Locus of control of the occurrence of the event* can be viewed as two dimensions that help identify four categories of unexpected events and their frequency of occurrence in our sample, as shown in Figure 2.

	Ease of Predicting the Event		
		High	**Low**
Locus of Control of the Occurrence of the Event	**High**	**Misjudgment 54%**	**Oversight 12%**
	Low	**Sword of Damocles 12%**	**Act of God 22%**

Figure 2. Genesis of the Event

Some unexpected events we identified in our sample were virtually unpredictable and outside the team's control, which we labeled *Acts of God*. In contrast, some unexpected events might have been quite easily predicted, and were to a large extent under the control of the team. We labeled these events as *Misjudgments*. In other situations, team members might perceive that they could have anticipated the event (easy to predict) but could not do much about it (low locus of control). We labeled such events as *Swords of Damocles*. Finally, team members might perceive that the event was difficult to predict, but if they could have predicted it, they could have done something to avoid it. We labeled these events as *Oversights*, following Piperca and Floricel (2012). Table 2 provides illustrations from our case studies.

Table 2. Examples of Unexpected Events according to their Genesis	
	Examples
Act of God	The day after the project go-live, the team was informed that, due to a problem in the server at the contractor's site, all data from the system had been lost. (from Bartis and Mitev 2008)
Misjudgment	A European firm decided to implement an ERP system in its Chinese subsidiary. During the implementation stage, the team realized that the system could not support the Unicode system and therefore Chinese characters. Many users did not speak English very well and some customers required documents in Chinese only. (from Avison and Malaurent 2007)
Sword of Damocles	Although the project team had carefully involved end users during the design phase to grasp their requirements, they received 28 major new requirements shortly after the go-live. Some of these requests were too complicated to be included at this stage, which led to user dissatisfaction. (from Sillince and Mouakket 1997)
Oversight	The project team performed a pilot test without any problems. However, stability issues quickly arose after the go-live. The team needed 10 weeks of « firefighting » to find a solution to this problem. (from Denyer et al. 2011)

Categorization 3: Scope of the Event

Finally, two additional dimensions related to the impacts of unexpected events emerged from the case studies. The first dimension, which we named *Impact immediacy of the event*, captures the need for a quick response to an unexpected event (e.g., as otherwise the event might paralyze the project). In such a situation, the team needs to address the event immediately so that the project can continue. At other times, an unexpected event may not require an immediate response from the team, but must ultimately be dealt with sometime during the project. The second dimension, labeled *Impact severity of the event,* reflects the magnitude of the impact an unexpected event can have on an IT project. Combining these two dimensions helps further characterize unexpected events along four categories (see Figure 3).

	Impact Immediacy of the Event	
	High	**Low**
Impact Severity of the Event **High**	Crisis 30%	Threat 36%
Impact Severity of the Event **Low**	Obstacle 8%	Problem 26%

Figure 3. Scope of the Event

The most prejudicial event is the one that hits strongly and paralyzes the project, labeled *Crisis*. In such cases, IT project teams face a potentially dangerous wall and have to quickly find a solution to address the situation. IT projects can also be affected by unexpected events that have a moderate direct impact, but that need to be addressed quickly if the project is to continue, which we categorized as *Obstacles*. The third category reflects unexpected events that have a large impact on the project's dynamics but the team has time to address it. In such events we labeled *Threats*, there is no urgency, but if the event is not addressed at some point, the resulting impacts can threaten the project's outcomes. Finally, when the impact of the event is moderate and there is no urgency, the team is facing a *Minor Challenge*. Table 3 provides illustrations from the 38 case studies included in our sample.

Table 3. Examples of Unexpected Events according to their Scope	
	Examples
Crisis	Quickly after the go-live and soon after the system produced its initial reports, the team realized that the stock balances in the system differed from physical quantities. While the team tried to correct existing errors, the causes were not clearly understood and the users refused to use the system any longer. (from Joshi 1990)
Threat	In the post-implementation stage, while the new system was operational, the team leader was informed that the vendor of the solution had decided to discontinue the software package. This event was frustrating considering the amount of money already spent, and put the team in an uncomfortable position. Should they look for a new system or try to maintain the current package by themselves? (from Paré 2002)
Obstacle	During the implementation of an EMR (Electronic Medical Record) system, the team planned that the system would retrieve data from a computer hard drive. However, when they tried, it seemed that the module could not access the hard drive. The only solution was to reprogram the software, which delayed the project. (from Spetz and Keane 2009)
Minor Challenge	When the users of an IT system began using it, the project team observed « a rush of interest » and received an unexpected number of requests to improve it. The team had to filter unfeasible requests and used « tactics of political incorporation to manage user groups » that took time and effort. (from Fincham 2002)

Links between the Three Categorizations

To analyze the linkages between the above three ways of categorizing unexpected events (i.e., source, genesis and scope), we first assessed the overlap between their scope and nature. No clear patterns emerged which suggests that the three categorizations are likely to be independent. For example, a Crisis can also be an Act of God or a Misjudgment. This finding provides support to the idea that unexpected events in IT projects can be classified according to different and complementary ways. Similarly, no clear patterns could be observed between the scope and the source of unexpected events (not shown here), e.g., an unexpected event that stems from the technical aspects of a project can also be a Crisis or an Obstacle. However, the source and the nature of the event appear to be related (see Table 4).

Table 4. Distribution of Unexpected Events from the Case Studies				
	Act of God	Sword of Damocles	Misjudgment	Oversight
Information Technology	0	0	18	4
Users	0	2	6	1
Project Team	0	3	3	0
Organization	7	1	0	1
External Stakeholders	4	0	0	0

While Categorizations 1 and 2 capture the antecedents of the event, Categorization 3 reflects the team's perception of how an unexpected event affects or impacts the project. In fact, we found that unexpected events related to technical aspects were predominantly Misjudgments. This finding is not surprising since project teams usually have high levels of control on this aspect of projects. It is also not surprising to find that unexpected events that stem from the project team or the users were categorized as Sword of Damocles and Misjudgments, indicating that both were relatively easy to predict. Finally, unexpected events that originated from the organization and the external stakeholders, which are less visible and harder to control by the team, were mostly associated with Acts of God. Thus, our analysis shows that different entities related to the project appear to lead to different patterns of unexpected events, suggesting that our categorizations are complementary.

Discussion and Research Agenda

Our objective in this paper was to conceptualize the notion of unexpected events in IT projects. As can be seen from our preliminary results summarized in Table 1, 44% of unexpected events in our sample stemmed from the information technology itself, underscoring the importance of the IT artefact in these projects. As noted above, the present study is a first step towards the development of a process theory that aims to link unexpected events to the responses of project teams and, ultimately, to project outcomes (see Figure 1). Based on the premise that different unexpected events are likely to lead to different responses and outcomes, our three categorizations also suggest several preliminary propositions, as discussed next.

Project Team Responses to an Unexpected Event

In the next phase of our research program, we will focus on project teams' responses to unexpected events. To do so, we intend to develop a coping model of team adaptation to unexpected events. Coping theory posits that an individual first appraises an event and its potential consequences, and then acts to deal with the situation (Lazarus and Folkman 1984, Beaudry and Pinsonneault 2005). Hence, our objective is to theorize how project teams make sense (Weick 1988; 1995) of different kinds of events, based on the three categorizations discussed above, and how they respond. In project management we also need to consider the sequential nature of unexpected events, that is when one unexpected event leads to or causes another unexpected event (Sicotte and Paré 2010, El-Masri and Rivard 2012). In the cases we analyzed, sometimes events and the resulting team responses led to further unexpected events that were actually more significant or severe than the initial event. This suggests that an unexpected event that is perceived to be of average importance by a team, e.g., a "Minor Challenge", can sometimes lead to an inadequate response, paving the way to further, and potentially more important unexpected events.

In addition, depending on the stage of a project when the unexpected event occurs, different types of responses or tactics might be more suitable for dealing with the situation in the most effective and efficient manner and, hence, need to be examined in future research.

Outcomes

As noted above, we also intend to develop a preliminary set of research propositions that link unexpected events and team responses to outcomes. In this section, we differentiate between three types of outcomes, i.e., outcomes related to the project, the team and the users.

Project Outcomes

Unexpected events may impact IT projects in different ways, such as resulting in longer delivery times and greater project costs. A promising research avenue would be to investigate the relationship between unexpected event categories and perceptions of project success. For example, in the case of an Act of God, even though the direct impacts of the event (such as cost and time) may be severe, the project could be perceived as a success from the point of view of many stakeholders, who might consider that things are not bad after all given the extraordinary nature of the event. On the other hand, when the unexpected event is a Misjudgment, the perception of success might be much lower given that the team can be perceived, in a way, to have been responsible for the situation and its negative impacts.

Another promising research avenue would be to examine the impacts of unexpected events on project momentum. This concept is defined as "the level of energy associated with a collective's pursuit of a goal-directed initiative" (Nelson and Jansen 2009, p.141). This level of energy can fluctuate during the course of a project and different kinds of unexpected events can lead to a drop in the project's momentum, or even to an increase when overcoming the consequences of the event becomes a collective priority.

Finally, one could also investigate the impact of unexpected events on IT projects depending on the stage of a project. For instance, the impact of an unexpected event that occurs early on might be different from one that occurs towards the end of IT projects.

Team Outcomes

We also hope to gain a better understanding of how unexpected events can affect project team dynamics. A recent literature review on project team effectiveness found that different behavioral, cognitive and affective team processes enable team members to combine their resources in order to effectively perform their tasks (Kozlowski and Ilgen 2006). It is thus plausible to think that different kinds of unexpected events can impact team processes differently. For example, we argue that the reaction of a project team could vary depending on whether an event is an Act of God or a Misjudgment. In the former case, a team could easily be galvanized and rally together to face the challenge, resulting in stronger team commitment, cohesion and motivation. In contrast, in a Misjudgment case, the team might feel completely discouraged, and their motivation might be considerably lowered. Team climate could also become unhealthy, while conflicts related to the responsibility of the event could emerge between team members. Finally, team efficacy, i.e., the shared belief in a group's collective capability to organize and execute courses of action required to produce given levels of goal attainment (Kozlowski and Ilgen 2006), might be negatively affected when team members believe the unexpected event was to a large extent under their control. It is important to note that project and team outcomes are often intertwined. For example, project momentum could fluctuate according to a change in team processes, such as team morale and involvement.

User Outcomes

Finally, unexpected events might also affect users in several ways. In the final phase of our work we will analyze the impacts of unexpected events on IT adoption based on user reactions. In fact, our sample has several cases where user expectations towards the new system were quite high, but an unexpected event during the implementation phase lowered their enthusiasm and negatively affected the project's atmosphere. That is, while the users were focusing on the best aspects of the system before the unexpected event, following the event's occurrence they saw only its negative aspects.

Table 5. Summary of Preliminary Research Propositions	
Team Responses	1.a. The sense a project team makes of an unexpected event influences its response to that event.
	1.b. When the response of a project team to an unexpected event is inadequate, further unexpected events are likely to occur.
	1.c. Depending on what project stage an unexpected event occurs, different tactics will be more suitable for dealing with the situation.
Project Outcomes	2.a. Perceptions of a project's success will vary according to the category of unexpected events that occur during the project.
	2.b. The momentum of a project will vary according to the frequency and nature of unexpected events that occur throughout the project.
	2.c. Depending on what project stage an unexpected event occurs, its impact on the project might vary.
Team Outcomes	3. Different categories of unexpected events are likely to impact project team dynamics differently (e.g., team efficacy, motivation, climate, commitment, conflicts).
User Outcomes	4. Unexpected events that occur during IT projects influence user perceptions and their eventual acceptance of systems.

Conclusion

In this paper, we highlighted the idea that project leaders and team members face different types of unexpected events during IT projects. Our taxonomy helps clarify these differences and deepen our understanding of what happens in IT projects when unexpected events occur. Moreover, our conceptualization will enable the development of formal propositions for future research so that how different unexpected events can lead to different team responses and project outcomes can be examined in greater depth.

In the next phase of our research program, we will ask two independent researchers to code a subsample of the unexpected events we identified in order to validate our classification scheme. Subsequently, we intend to collect qualitative data by conducting interviews with project managers in order to more crisply define our propositions about team responses and outcomes. We believe that this will allow us to suggest practical recommendations regarding how IT project managers could address unexpected events.

We believe that exploring the topic of unexpected events in IT projects offers fresh promise and hope that future studies on this subject will yield a deeper understanding of how project teams can adequately and appropriately manage unexpected events in IT project contexts and help mitigate their potentially negative outcomes.

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