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# Risk Management in Agile Methods: A Study of DSDM in Practice

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**Abstract.** Businesses are increasingly operating in extremely turbulent environments necessitating the need to respond and adapt to change more quickly and improve overall time to market. From an Information Systems Development perspective this has triggered a new wave of development, the most notable of these being agile methods. A principle objective of agile methods is to reduce well-known risks associated with common ISD project failures. While there is extensive academic literature on risk management and its growing importance in ISD, literature in relation to risk management in agile ISD projects is still in infancy. The purpose of this research was to ascertain the extent to which risk management practices are incorporated into agile development projects. The methodology deployed for this research involved a case study of a change management consultancy firm dedicated to the use of the Dynamic Systems Development Method (DSDM).

**Keywords:** Risk Management, Agile Methods, DSDM (Dynamic Systems Development Method)

## 1 Introduction

In ISD, the rapidly growing use of agile methods shows the urgency of organizations to adapt to change at a more speedy and efficient pace. Agile methods are known for their use of iterative development, active user involvement and their acknowledgement of the need to incorporate changing system requirements and “focus on generating early releases of working products using mostly collaborative techniques” [1]. This is a stark contrast to the traditional model for systems development which promotes “elicitation and freezing of requirements in advance” [2] with no overlap between project phases of analysis, design and implementation [3].

A principal objective of agile methods is to reduce well-known risks associated with common ISD project failures by for example, accepting that requirements will change. The Dynamic Systems Development Method is considered to be the first “truly agile method” where “it is preferred to fix time and resources and then adjust the amount of functionality accordingly” [4]. This highlights the element of flexibility

in DSDM with regard to adjusting system functionality where system requirements are open to change. However, no matter what the nature of change, there will always be associated risks involved.

### **1.1 Motivation for Research**

While there is extensive literature on risk management, research of risk management in agile ISD projects is non-existent. This is surprising considering how quickly agile methods are being adopted in ISD where a survey conducted by Vijayasathy and Turk [5], having a total of 98 respondents indicated that sixty percent use agile approaches in seventy five percent or more of their projects. Many books on agile methods “have remarkably little to say about how a development team determines the risks it faces, prioritises them or takes action to negate their effects” [6]. Essentially agile approaches must tailor traditional risk management techniques meant for “years-long projects into a risk driven agile iteration lasting only seven to thirty days” [6]. How agile projects go about doing this remains unknown.

The primary objective of this research was thus to develop a better understanding of risk management practices in agile ISD projects and the level of formality with which these practices are executed. Specifically, this research focuses on three main elements of risk management, namely risk identification, estimation and evaluation.

## **2 Theoretical Foundations**

In an ISD context, Barry Boehm highlighted the concept of managing risks and giving them priority as far back as 1988. Ten years later, Hall [7] described Boehm as being “the father of software risk management.” Boehm proposed a move away from the ‘staged’ SDLC to a more iterative or incremental process and this proposed concept in software development was an attempt to lower project risks [8]. Boehm’s aim was to eliminate any software difficulties or risks mainly by deriving “risk-driven documents” and “incorporating prototyping as a risk-reduction option” [9]. It resulted in what was called the Spiral Model that essentially created “a risk-driven approach to the software process rather than a primarily document-driven or code-driven process” [9].

Many associations can be made between Boehm’s proposals above and that which has developed in the approaches deployed by agile methods. While many authors highlight distinct approaches and frameworks for dealing with risk management (ranging from formal to informal), its basic fundamentals remain the same and are consistent across disciplines. The literature shows similar emphasis on the most important activities in risk management namely, those identified by Rowe [10] and Charette [11] – the early practitioners of risk management – who outline the three main elements of risk assessment as (i) Risk Identification, (ii) Risk Estimation and (iii) Risk Evaluation.

## 2.1 Risk Identification

Risk identification is the reduction of descriptive uncertainty [10] which involves “surveying the range of potential threats” [11]. This element of risk assessment involves detecting issues which could jeopardize or threaten the success of a project [12, 13]. Chapman [14] states that “the risk identification and assessment stages have the largest impact on the accuracy of any risk assessment.” It is therefore the most important stage of risk management. Of particular importance to ISD is the early identification of risks where “identifying and dealing with risks early in the development lessens long-term costs and helps prevent software disasters” [15]. Furthermore, it is important that risk identification carries on throughout the project’s lifecycle [13]. Therefore, risk identification is an ongoing, continuous process that requires regular screening and monitoring.

An important aspect of risk identification is categorizing the risks organizations encounter. According to Coppendale [16], “depending on the size and the complexity of the project there might be between five and fifteen” categories of risk. Categories attempt to group certain types of risk under a particular heading and in doing so “can help you find global risks that can be solved together” [17]. There are many sources of risk, some of which include senior management, the client or customer, the project team, organization of the project itself and even laws and standards which directly impact the project [18]. Such sources can be placed into their respective categories as being either internal or external risk as follows:

**Table 1.** Categories and Sources of Project Risk

|                                |                             | <b>Risk Category</b> |                    |
|--------------------------------|-----------------------------|----------------------|--------------------|
|                                |                             | <b>Internal</b>      | <b>External</b>    |
| <b>Sources of Project Risk</b> | Senior Management           |                      | Acts of Nature     |
|                                | Project Team & Management   |                      | The Client         |
|                                | Organisation of the Project |                      | Laws and Standards |

The two most dominant sources of internal risk identified across the literature are Senior/Project Management and Project Team. The dominating external source of risk is the client. All of these were collectively identified by Mantel, Meredith et al. [18] and are represented in the above table. Every source of risk can have numerous risk factors. A risk factor is “a condition that forms a serious threat to the completion of an IT project” [19]. Some internal risk factors include project conflict and resource boundaries, which can be linked to sources of project team and senior management risk respectively. The following table shows some of the most dominant risk factors identified by Wieggers [20], who categorizes these factors by sector:

**Table 2.** Most common risk factors for various project types

| <b>Project Sector</b> | <b>Risk Factor</b>               | <b>% of Projects at Risk</b>  |
|-----------------------|----------------------------------|-------------------------------|
| <b>MIS</b>            | Creeping User Requirements       | 80                            |
|                       | Excessive Schedule Pressure      | 65                            |
|                       | Low Quality                      | 60                            |
|                       | Cost Overruns                    | 55                            |
|                       | Inadequate Configuration Control | 50                            |
|                       | <b>Commercial</b>                | Inadequate User Documentation |
|                       | Low User Satisfaction            | 55                            |
|                       | Excessive time to market         | 50                            |
|                       | Harmful competitive actions      | 45                            |
|                       | Litigation expense               | 30                            |

On analysing the table, some direct link between sources and risk factors is evident. For example, the sources of ‘management’ risk or ‘organisation of the project itself’ could be linked to the risk factor of ‘inadequate configuration control’ due to a flaw in the project’s arrangement and organisation. However, the most interesting correlation is that of the ten risk factors listed in Table 2, at least six of these can be linked to the client as a source of project risk.

Finally, a dominating feature in recent literature deserves recognition where there is strong support among authors that an actual ‘source of risk’ can provide a ‘source of opportunity.’ Chapman and Ward [21] state “it is only once risk is seen as a good thing people begin to look for opportunities.” Very few people would acknowledge ‘opportunity’ as being a facet of risk as naturally there are negative connotations associated with risk. Hillson [22] however, states “the decision to encompass both opportunities and threats within a single definition of risk is a clear statement of intent, recognising that both are equally important influences over project success, and both need managing proactively.” In a general sense the above ideas represent something we all know and understand about risk and the nature of taking gambles – people and organisations usually undertake risks with the aim of benefiting from potential opportunities [23]. Taking on any form of risk can be a daunting task but as DeMarco & Lister [24, 25] state, “if a project has no risks, don’t do it.”

## **2.2 Risk Estimation**

At this stage it is hoped that the project team have identified all potential risks and they can now move on to estimating those risks. Risk estimation is the reduction of measurement uncertainty [10] where “the values of the variables describing the system are determined, the various consequences of an event occurring are identified”

and finally, “the magnitude of the risk is determined” [11]. In ISD environments there are many generic risk factors (such as creeping user requirements) but very few instances of projects operating under similar circumstances. Therefore, allocating future estimates is undoubtedly different to those allocated for past events as there are so few exact comparable projects conducted in the past [26].

Risk estimation attempts to estimate “the chance (or probability) of potential loss” as well as “the exposure to potential loss i.e. the consequences or magnitude of the identified risks” [26]. The chance of potential loss is essentially the process of attaching a probability of occurrence to any identified risk. As Hall [7] states “estimation is the appraisal of risk probability and consequence.” Probability is categorized as being greater than zero and less than one hundred while consequence is decided relative to cost, schedule and technical goals [7]. If an event is certain to occur it has a probability of exactly one [27] or one hundred percent. According to McManus [27], probability data should be used to compute the risk. When no actual data on probabilities exist, estimates by individuals most familiar with the project, its risk factors and overall problems are a good substitute [18].

Headings should be capitalized (i.e., nouns, verbs, and all other words except articles, prepositions, and conjunctions should be set with an initial capital) and should, with the exception of the title, be aligned to the left. Words joined by a hyphen are subject to a special rule. If the first word can stand alone, the second word should be capitalized. The font sizes are given in Table 1.

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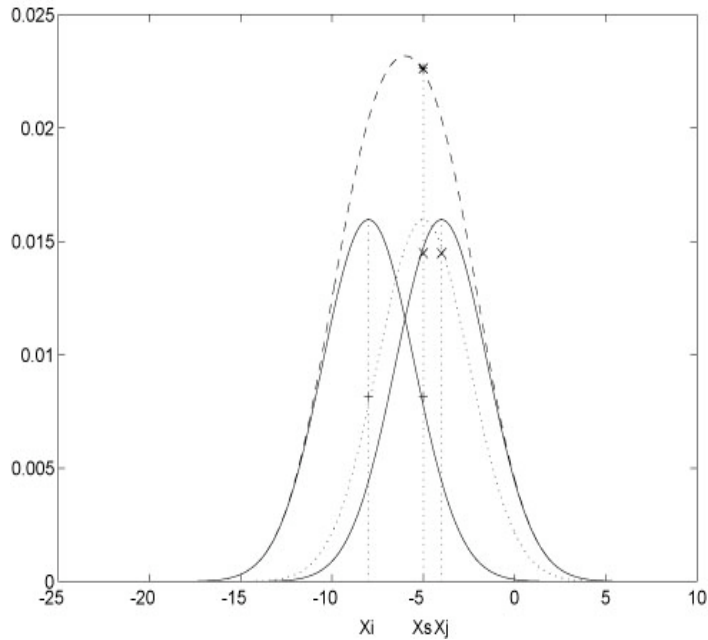
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**Fig. 1.** One kernel at  $x_s$  (*dotted kernel*) or two kernels at  $x_i$  and  $x_j$  (*left and right*) lead to the same summed estimate at  $x_s$ . This shows a figure consisting of different types of lines. Elements of the figure described in the caption should be set in italics, in parentheses, as shown in this sample caption.

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Displayed equations or formulas are centered and set on a separate line (with an extra line or halfline space above and below). Displayed expressions should be numbered for reference. The numbers should be consecutive within each section or within the contribution, with numbers enclosed in parentheses and set on the right margin.

$$x + y = z . \tag{1}$$

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Program listings or program commands in the text are normally set in typewriter font, e.g., CMTT10 or Courier.

Example of a Computer Program from Jensen K., Wirth N. (1991) Pascal user manual and report. Springer, New York

```
program Inflation (Output)
  {Assuming annual inflation rates of 7%, 8%, and
  10%,...  years};
  const MaxYears = 10;
  var   Year: 0..MaxYears;
        Factor1, Factor2, Factor3: Real;
begin
  Year := 0;
  Factor1 := 1.0; Factor2 := 1.0; Factor3 := 1.0;
  WriteLn('Year 7% 8% 10%'); WriteLn;
  repeat
    Year := Year + 1;
    Factor1 := Factor1 * 1.07;
    Factor2 := Factor2 * 1.08;
    Factor3 := Factor3 * 1.10;
    WriteLn(Year:5,Factor1:7:3,Factor2:7:3,
            Factor3:7:3)
  until Year = MaxYears
end.
```

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