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<th>Data presentation for agile information systems project decision making</th>
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DATA PRESENTATION FOR AGILE INFORMATION SYSTEMS
PROJECT DECISION MAKING

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Abstract
Awareness and use of agile methods has grown rapidly amongst the information systems development (ISD) community in recent years, and have been largely well received. While there are a number of purported benefits, many highlight the difficulties that the dynamic, turbulent nature of agile development environments may present. Specifically, project management and decision-making processes are significantly more challenging than when traditional development approaches are used. This paper focuses on decision-making in agile projects, and aims to develop a better understanding of current approaches and processes. We investigate how best to present dynamic data to decision makers who may act “on the fly” and to develop a model for effective, high quality decision-making in agile environments.

Key Words: Agile IS project, decision making, decision presentation

* Corresponding author
1. Introduction

The last 10 years or so has seen the emergence of a number of information systems development (ISD) methods, which have collectively been labelled as agile. Some of the most popular include eXtreme Programming (XP) [1], the Dynamic Systems Development Method (DSDM) [2], Scrum [3], Crystal [4], Agile modelling [5], Feature Driven Design (FDD) [6], and Lean Software Development (LSD) [7], along with variants of each e.g. XP-Lite [8]. These methods have been well received by those in ISD and there is strong anecdotal evidence to suggest that awareness and indeed use of these methods is highly prevalent across the community. However, use of these methods has a significant impact on the project’s decision-making processes. In an agile development environment, the project manager’s role as a decision-maker is greatly reduced, and is more akin to that of a facilitator or coordinator [9-11]. Further, the development team makes most of the decisions, creating a “pluralist decision-making environment” [9] due to the diverse backgrounds, attitudes, goals, and cognitive dispositions of the team members [12-14]; the organization or team structure is “organic and flexible”, as opposed to traditional structures which are “mechanistic, bureaucratic and formalized” [9]; the project is completed through a series of iterations, each often as short as a few working days [15, 16], resulting in more frequent, short-term decision-making; software is valued over documentation [15] which was traditionally used as a vital decision aid; and the customer plays a more continuous and embedded role, and thus is intrinsically involved in most decisions [17-20]. Moreover, developers are not confined to a specific specialised role and are encouraged to self-organise, interchanging and blending roles [9] thus involved in decisions that may fall outside their traditional skill areas.

2. Research objectives and questions

As is often the case with new and emerging phenomena in ISD, agile method practice has led research, with the creation, promotion and dissemination of these methods almost completely due to the efforts of practitioners and consultants. Agile method research has gained momentum in more recent years, but has been argued that the current body of agile method knowledge suffers from a number of conceptual problems such as a lack of clarity, parsimony, cumulative tradition, and theoretical ‘glue’.

One key weakness of agile method research is a lack of focus on how best to present data for decision-making in such an environment. Decision-making in this context is much different to that associated with traditional systems development, with many additional complexities, uncertainties and hurdles to overcome. There is a need to capture and represent metrics on the progress of the project, for example, estimates and bounds for stage delivery, dependencies and required resources for iterative development, timeline information on next stages, personnel information such as planned vacations, and external factors such as customer availability for development across iterations. Typically these are dynamic data, and are best represented either in tabulated formats with columns and column attributes, or in other aggregate representations such as appropriate graphs and charts. Indeed the latter has been shown to be particularly valuable
in decision-making instances and scenarios involving key performance indicators. It follows that the format of presented data can be influential in decision-making scenarios.

To address this, we seek in this study to investigate decision-making efficacy in agile projects by exploring how best to present dynamic data to decision makers. The primary focus is on the decision-making process in agile project management, with secondary focus on supporting high quality decision-making through data presentation. The study will examine the decision processes involved by project managers in ensuring the success of agile projects, and investigate the appropriateness and value of various data presentation techniques to project managers to best support quality decision-making in dynamic environments. In so doing, the study aims to develop a data presentation model for quality decision-making in agile projects involving the composition, structuration and presentation of relevant data. Our research objective is thus: To investigate and develop appropriate and effective methods of data presentation to support high quality decision-making in agile information systems project management.

To realize the objective we will investigate the effects of various data presentation formats on decision processes: considering that there is substantial evidence in the literature that decision processes and strategies can directly impact decision quality, we strive to investigate decision making in agile development projects from a decision process perspective, with the aim of that identifying optimal decision processes and the presentation formats underpinning them, so that decision quality can be maximized.

3. Theoretical foundation

Decision making is the performance of a task, that of making a particular decision [21]. Project managers are faced with decision tasks on a daily and more frequent basis, with the occurrence of such tasks increased in agile development projects as a consequence of rapidly changing requirements, expectations, and their underlying data. Typically these tasks involve choice, with the decision maker presented with large amounts of data, and categories of data describable by various attributes that may influence the value of those data for decision-making. Decision makers in dynamic contexts need to assess various courses of action, various potentially good avenues of resource, or investigate the relativity of one potential decision over others, and make a choice. Such activities are multifaceted, and the process of quality decision-making includes aspects such as decision maker behaviours and strategies, as well as data-related aspects such as data representation.

A decision strategy can be considered as a sequence of operations for searching through a problem space to effect a decision. Benbasat and Todd [22] argue that the determination and application of a particular decision strategy is contingent upon the capabilities of the decision maker as well as the characteristics of the problem (that is, the decision-making task) and the availability of decision aids as tools to support particular strategies. Further, in choice-based decision-making scenarios, with the decision maker choosing from alternatives, the use of particular decision strategies is dynamic, and decision makers are highly adaptive
in strategy selection [23-25]. The cognitive ability of the decision maker in conjunction with behavioural characteristics and decision styles can influence strategy selection and can impact decision making. Further, the nature of the decision-making task can lend itself to the employment of particular strategies: the use of accurate but more effortful strategies can arise in tasks where there is an importance attached to the decision outcome, and where decision-making time may be secondary to decision outcome. Also, data presentation formats may influence strategy selection, with particular display formats commensurate moreso with higher quality strategies.

Modes of presentation of information to decision makers can be extremely influential on decision making. There is evidence that individuals employ different decision-making and problem-solving processes and strategies for different types of task. Vessey and Galletta’s [26] study involving the comparison of alternatives across a number of attributes found that individuals prefer tabulated information to other representative forms. Indeed Speier and Morris [27] found that informational display format was influential in affecting decision performance. Further, Jarvenpaa [28] found that display formats used in a multiattribute choice task were central in influencing decision strategies when the format was matched to the task, and that strategies which minimised the cognitive effort were preferred.

In this study we aim to examine the most appropriate data presentation formats to best support quality decision-making. In examining the usage, employment and selection of particular decision-making strategies, we aim to support decision making in agile projects by mapping presentation format to decision strategies, so as to promote the use of high quality strategies in the decision-making process, and thus positively impact decision quality. The study will examine a number of cases exploring how data are presented; investigate the decision strategies in use; map presentation format to decision process and strategies used; and produce a model for data presentation formats most likely to support and lead to high quality strategies in agile situations, and therefore superior decision making.

4. Research methodology and current project status

Through an examination of the impact of data presentation on decision strategies used in the decision-making process the study will provide a best-fit model of data presentation formats best suited to quality decision making in agile project management. The study will involve a number of case studies. The framework for the study is structured in Figure 1

![Data presentation for agile IS project decision making](image)
Figure 1. Framework for quality decision/making in agile projects.

Commensurate with the IS literature in this regard, we assume that decision makers will employ an effort-accuracy tradeoff in the decision-making process, and seek to reach an optimal decision with least effort. We also assume that the format of the data used in the decision-making process can support particular decision-making strategies: it remains to be seen whether such presentation formats can encourage quality decision-making by promoting superior strategies, but in so doing reduce the effort required for their use, and therefore provide a mechanism whereby decision makers are likely to employ such strategies.

**Background to the Cases**

The primary operation of Pennysoft, a large, privately owned U.S. company, (employing 40000) involves the provision of financial services and investment resources. The company has been developing software at its site in Ireland since 1995, and currently employs around 300 people at this Irish site. The software products developed are supplied mainly to internal customers in the U.S. Many projects involve co-ordinating with several teams in the U.S. and India. In many cases, the requirements are generated in the U.S. with software development then taking place in both the U.S. and Ireland. In this study we analyse three systems development project cases within Pennysoft (Table 1).

Data will be collected over a 6 month period from November 2008 to April 2009. Data collection will involve personal face-to-face interviews, a technique well suited to case study data collection, and particularly for exploratory research such as this because it allows expansive discussions which illuminate factors of importance [29, 30]. The information gathered is likely to be more accurate than information collected by other methods since the interviewer can avoid inaccurate or incomplete answers by explaining the questions to the interviewee [30]. The interviews are expected to last between 50 and 120 minutes. The questions will be largely open-ended, allowing respondents freedom to convey their experiences and views, and expression of the socially complex contexts that underpin ISD [29, 30]. The interviews will be conducted in a responsive [31, 32], or reflexive [33] manner, allowing the researcher to follow up on insights uncovered mid-interview, and adjust the content and schedule of the interview accordingly. In order to aid analysis of the data after the interviews, all will be recorded with each interviewee’s consent, and subsequently transcribed, proof-read and annotated by the researcher. In any cases of ambiguity, clarification will be sought from the corresponding interviewee, either via telephone or e-mail. Supplementary documentation will also be collected, including project management plans, budgets and budget reports, meeting minutes and relevant e-mail communications.

<table>
<thead>
<tr>
<th></th>
<th>Project A</th>
<th>Project B</th>
<th>Project C</th>
</tr>
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<tbody>
<tr>
<td><strong>Team size</strong></td>
<td>8 Ireland, 5 U.S.</td>
<td>24 people (sub-group of 5 using agile)</td>
<td>7 Ireland, 6 U.S.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ireland</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 U.S.</td>
<td></td>
</tr>
<tr>
<td><strong>Team composition</strong></td>
<td>1 SVP, 1 VP, 1 director, 1</td>
<td>1 SVP, 1 VP, 1 director, 2 principal</td>
<td>1 VP, 1 project manager, 1 principal engineer, 1 tester, 3 engineers</td>
</tr>
<tr>
<td></td>
<td>principal engineer, 1 tester</td>
<td>engineers</td>
<td></td>
</tr>
</tbody>
</table>

Data presentation for agile IS project decision making
1 directors, 1 project manager, 1 principal engineer, 5 engineers
2 directors, 2 project managers, 2 architects, 15 principal engineers, 4 testers
1 project manager, 1 principal engineer, 1 tester, 3 engineers

<table>
<thead>
<tr>
<th>Project Duration</th>
<th>1.5 years</th>
<th>7 years (2 years agile sub-group)</th>
<th>1 year</th>
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<tbody>
<tr>
<td>Type of system developed</td>
<td>Exploring new strategic opportunities of cutting edge Web 2.0 technologies</td>
<td>Security system for provision of enterprise wide access control</td>
<td>Suit of tools to monitor SLA adherence across Fidelity’s core application service providers (response times etc) Application for monitoring/ tracking system issue resolution</td>
</tr>
<tr>
<td>Customer</td>
<td>Internal</td>
<td>Internal</td>
<td>Internal</td>
</tr>
<tr>
<td>End Users</td>
<td>General population</td>
<td>Pennysoft staff</td>
<td>Pennysoft staff</td>
</tr>
</tbody>
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Table 1. The profiles of the three cases.

Data analysis will use Strauss & Corbin’s [34] open coding and axial coding techniques. Open coding is “the process of breaking down, examining, comparing, conceptualizing, and categorizing data” [34]. Glaser [35] argues that codes and categories should emerge from the data, while with Strauss & Corbin’s approach [34] these are selected prior to analysis. The approach adopted in this study is more akin to the latter, where the interview questions and subsequent analysis will be based on Payne’s [36] decision-making model. This will provide a list of “intellectual bins” or “seed categories” [37] to structure the data collection and the open coding stage of data analysis.

The second phase of analysis will use axial coding. Axial coding is defined by Strauss and Corbin [34] as a set of procedures whereby data are put back together in new ways after open coding; whereas open coding fractures the data into categories, axial coding puts the data back together by making connections between the categories and sub-categories. As the data is coded, theoretical questions, hypotheses and code summaries will arise. These will be documented in analytic memos [37] to aid understanding of the concepts being studied and to refine further data collection. Miles and Huberman [37 p. 72-74] offer advice on effective analytic memos, and these practices will be followed where possible.

As categories emerge, follow-up interviews will be arranged to elicit further, richer, more focused information. This will be done to confirm, extend, and sharpen the evolving list of categories. As categories become integrated, further data collection will not tend to cause any additional categories to emerge, but rather reinforce those already in existence. At this point, the categories will be deemed to be “theoretically saturated” [34], and data collection ended.

Once the decision-making process is documented and analyzed, the focus will shift to constructing decision-making scenarios involving underlying data presented in various formats to decision-makers. Revisiting the cases using a think aloud protocol, the study will investigate the impact of data presentation.
format on the decision-making process, in terms of the decision strategies used to reach decision finality. Using decision strategies as indicators of decision-making quality from a process perspective, the study will construct a model illustrating the relationship between data presentation format and decision-making processes in agile project management.

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