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Project Management in Information Systems Development

Investigating the performance management of agile software development teams using the Beyond Budgeting model.

(WORKING PAPER)

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Abstract: *Although there is a growing body of literature concerned with the adoption of agile software development within a large organization, there is still very little in terms of empirical research of practice. This research uses principles from the Beyond Budgeting model to investigate the budgeting practices of large organizations using an agile method. Budgeting is taken in this context to mean the performance management process that executes the organizations financial plan (Hope and Fraser 2003). Using this model, the research will seek to establish a framework for "agile project budgeting" which can be used as a tool to help with the alignment of the Finance and IT functions of a large organization. The main research questions identified thus far are; How are Beyond Budgeting principles used in agile software development? What are the advantages and disadvantages with combining the Beyond Budgeting principles with agile software development? How might organizations optimize their budget process to facilitate agile development? Using case study research methods including open-ended interviews the researcher will conduct two in depth case studies to develop the agile project budgeting framework.*

Keywords: Beyond Budgeting, Agile Methods, Information Systems Development, Performance Management, Finance, Information Technology.

1 Introduction

The focus of this research is the budgeting practices of firms using an agile method to develop software, it is therefore important to discuss in detail the context within which the research is set. Two streams of research relevant to this project are identified and discussed. The first is the literature from the field of information systems (IS), which will discuss the evolution of information systems development (ISD) and elaborate on the importance and relevance of its evolution to this research. The second stream is the existing literature from the field of accountancy and finance, which will discuss budgeting and the budgeting process in ISD. These two streams lead on to the final section of the literature review, which will elaborate on the Beyond Budgeting model and its application to agile ISD. The Beyond Budgeting model will be used to establish a framework for "agile project budgeting" which can be used as a tool to help with the alignment of the IT and Finance functions of organizations developing software using an agile method.

2 Information Systems Development

Information systems (IS) that are designed and developed efficiently, accurately, reliably and meet the intended needs and expectations of the stakeholders are important goals of organisations today (Fruhling and de Vreede 2006). However, cost, quality and schedule issues have been widely reported in IS development. Project failure in the IS field is a costly problem and troubled projects are not uncommon[1]. It is difficult to estimate correctly the costs involved in developing an IS and despite the introduction of new estimation tools (SLIM, CoCoMo, FPA, SEER, etc.) there has been little improvement in

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[1] See Appendix 1 for a list of papers which reported on project failures. This list covers from 1998 until September 2008 and was drawn up from the AIS recommended top six basket of IS journals.

software cost estimation accuracy over the past 20 years (Grimstad, Jørgensen et al. 2006).

2.1 Traditional Information Systems Development

The traditional Information Systems Development Life Cycle (ISDLC or SDLC) is an established concept and widely used for systems development. It is a rigid process that assures control over the development process by following a series of phases where the completion of each is a prerequisite to the commencement of the next and where each phase consists of a predetermined list of steps. It has always been a troublesome, costly and time consuming process and the call for a more flexible development approach has been around since the early eighties (Ahituv, Hadass et al. 1984).

2.2 Agile Methodologies

In recent years, agile software development approaches have received a great deal of attention. It was the continued dissatisfaction with the available development methods that led to the introduction of the various agile approaches. The agile approach seeks to help address the key problems in software development, such as quality, time and cost (Fitzgerald, Hartnett et al. 2006). While having conceptual roots dating from the early twentieth century it was the formation of the Agile Alliance in 2001 and the publication of the Agile Manifesto (Fowler and Highsmith 2001) that formally introduced the term agility to the field of software development (Conboy and Fitzgerald 2004). The emergence of agile methods as a formalised concept has had a huge impact on the way software is developed worldwide (Dybå and Dingsøyr 2008). Although relatively new

and still under researched[2], there are a number of success stories regarding the use of one or other of the methods. Case studies have shown that agile methods can result in increased productivity, cost savings and improved cost control (Lindvall, Muthig et al. 2004; Karlstrom and Runeson 2005; Dybå and Dingsøyr 2008). There has been some concern raised about its applicability to larger organisations and how these new practices can be integrated with existing processes and systems (Lindvall, Muthig et al. 2004).

2.3 Agile Concerns

Not all organisations can or will use all the techniques of a particular method. It may be inappropriate for them to be fully agile in all aspects of development, perhaps retaining well-known and trusted elements of a more traditional approach within an overall agile project (Qumer and Henderson-Sellers 2008). Managers and developers become frustrated with the difficulty of integrating agile processes into traditional, top-down development organisations (Boehm and Turner 2005). In a report published in 2008 by the Software Engineering Institute [3] called "CMMI or Agile: Why Not Embrace Both!" the authors call more research and reporting on what works and in which context. This research aims to add to the body of knowledge by establishing the kinds of contacts, cooperation and synergies existing between the Finance, and IT functions of a large organization employing an agile method as its software development process.

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[2] Tore and Dingsoyr (2008) identified 1196 studies (up to and including 2005) of agile software development of which only 36 were concluded to be empirical studies conducted with rigour, having credible findings and being of relevance. Their assessment criteria were informed by those proposed for the Critical Appraisal Skills Programme (CASP) www. Phru.nhs.uk/Pages/PHD/CASP.htm See also Chow and Cao (2008)

[3] http://www.sei.cmu.edu/pub/documents/08.reports/08tn003.pdf

3 Budgeting

Budgeting is regarded as the cornerstone of the management control process in most organisations (Hansen, Otley et al. 2003) and is one of the most extensively researched topics in management accounting. Budgeting is related to cost accounting, responsibility accounting, performance measurement, and compensation. It is used for many purposes, including planning and coordinating an organisation's activities and allocating resources(Covaleski, Evans Iii et al. 2003). Traditional budgeting methods include, incremental budgeting, activity-based budgeting, zero-based budgeting, rolling budgeting and priority based budgeting. There has been extensive research carried out on the traditional budget process including, reasons to budget (Hansen, Otley et al. 2003), measuring tight budgetary control (Van der Stede 2001) and performance management (Otley 1999). Although relatively few organizations are planning to abandon the annual budget, it is, however widely accepted that the traditional budgeting model is cumbersome and ineffective (Ekholm and Wallin 2000). Criticisms of traditional budgeting have attracted much publicity in recent years (Drury 2008).

3.1 Budgeting in ISD

Budget performance in ISD is generally the primary concern of the project manager, rather than the business investment appraisal team (project sponsor) (Yetton, martin et al. 2000) and the completion of a business-critical project is likely to be supported by senior management whether or not budget goals are being met. That said however, in a modern turbulent and competitive business environment the money being spent on IS projects[4] is still a serious cause for concern. Software development projects are continuously running over budget.

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[4] See Appendix 1

3.2   Budgeting in agile software development

Agile methods address the issue of cost overrun by allowing a scope change rather than a cost overrun for the project. This allows a project to be completed within a specified budget by reducing the functionality if needed. However, as certain project will need to be completed with full functionality regardless of the budget (Yetton, martin et al. 2000), the value of the budget process is questionable. To date there has been little or no research into the budgeting process in agile method software development.

4   Beyond Budgeting

The problems with budgeting in practice (Hansen, Otley et al. 2003) led to a series of articles and a book by Hope and Fraser (2003; 2003a; 2003b; 2003c) arguing that organizations should abandon traditional budgeting. They introduced the Beyond Budgeting model, an accounting innovation (Davila, Foster et al. 2009) which advocates that budgeting should be replaced with rolling forecasts that embrace key performance indicators and incorporate exception-based monitoring and benchmarking (Drury 2008). The emergence of this new concept coincided with the emergence of agile methods and both concepts share many similarities. In keeping with complementarity management principles (Milgrom and Roberts 1995), the researcher views the Beyond Budgeting model as offering the best potential for the alignment of processes and systems for organizations using agile methods. Research on the theory of complementary management choices shows that a failure to consider complementarity when making strategic decisions can lead to negative impacts on firm outcomes (Milgrom and Roberts 1995). Complementary management theory covers a wide spectrum: from operating in different market economies (Hall and Soskice 2001), the relationship between

organizational culture and systems development methodologies (Iivari and Huisman 2007), aligning software processes with strategy (Slaughter, Levine et al. 2006) to cross-unit synergies (Tanriverdi 2005). The goals of the Beyond Budgeting model are to sustain superior competitive performance while agile project management is about rapidly delivering business value. The Beyond Budgeting model has been shown to benefit organizations through faster response, innovative strategies, lower costs and more loyal customer. Beyond Budgeting aims to promote a set of principles that lead to more dynamic processes and front-line accountability. In some cases, this is a big change from the command and control model traditionally used. According to the authors, "it is the process that drives the behavior change". The model includes six process principles and six leadership principles. Together, these form a coherent model. Here are the twelve principles.

	Principles	Beyond Budgeting Model	Budgetary control model
Process Principles	Goals	Set relative goals for continuous improvement	Negotiate fixed performance contracts
	Rewards	Reward shared success based on relative performance	Meet fixed targets
	Planning	Make planning a continuous and inclusive process	A top down annual event
	Controls	Base controls on relative indicators and trends	Variances against a plan
	Resources	Make resources available as needed	Annual budget allocations
	Coordination	Coordinate actions dynamically	Annual planning cycles
Leadership Principles	Customers	Focus everyone on improving customer outcomes	Achieve vertically negotiated targets
	Organization	Create a network of lean, accountable teams	Centralized hierarchies
	Responsibility	Enable everyone to act and think like a leader	Follow the plan
	Autonomy	Give teams the freedom and capability to act	Micro-management
	Values	Govern through a few clear values, goals and boundaries	Detailed rules and budgets
	Transparency	Promote open information for self-management	Restrict information hierarchically

Fig. 1 The Beyond Budgeting Model v The Traditional Model

The six process principles and six leadership principles support each other in an holistic model. Some of these principles are inherent in an agile team while others are not so visible. The relative importance of each principle might vary depending on the business in question (Bogsnes 2009). Beyond Budgeting is a philosophy supported by these guiding principles. It is a journey that may have varying solutions depending on the

business. The journey must address both the leadership and process side, although the timing and order may vary.

5   Research Method

As the objective of this research is to gain an insight into the performance management techniques used in agile software development a qualitative approach will be used. The researcher will be conducting case studies within two large organisations who have adopted an agile method. Case research is particularly appropriate for problems in which research and theory are at their early, formative stage. It is well suited to capturing knowledge from practitioners and developing theories from it. It is possible to study the research phenomena in a natural setting, learn about state of the art and generate theories from practice. Case studies allow the researcher to answer "why "and "how" questions and understand the nature and complexity of the processes taking place. It is also suited to an appropriate way to study an area in which few previous studies have been carried out (Benbasat, Goldstein et al. 1987).

The research design is currently being developed from the Beyond Budgeting model principles. A set of constructs under each principle being completed and these will provide a basis for the interview guide.

Yin (2003) suggests single-case studies are appropriate if it is a revelatory case. As there has been little or no research to date in budgeting techniques used in agile software development, this research is exploratory in nature. Two case studies are included in this research to 1) provide more descriptive data 2) yield more general research results and 3) provide triangulation of results.

6 Challenges and Contributions

The relative lack of research into the area of budgeting for agile software development makes this research both difficult and exciting. The nature of software development and in particular agile software development means that a generic set of guidelines will be difficult to develop. Factors such as project type, size, complexity, criticality and organizational culture issues will add importance to the contextualizing of the research.

The main contribution from this research will be a rigorously researched account of the interactions that occur between the IT and Finance functions during the agile software development process. The benefit to practice will be a set of guidelines that organizations can adapt to their own organizational/project specific needs. The research will add to the growing literature on agile software development and fill a gap in the area of agile project budgeting where there has been little research carried out to date. The Beyond Budgeting model is increasingly recognized as having a distinctly agile feel but there has been no research carried out which links the two concepts. This research will address this shortcoming by using the Beyond Budgeting model as a lens to examine the operational relationships existing between the Finance and IT functions of a large organization. Although there is an increasing number of organisations employing the Beyond Budgeting model, the traditional model is still the most widely used. The same can be said for larger software development projects. The traditional models offered, at a glance, the progress of a project versus a predefined plan. Actions could be taken when deemed necessary. There has been a significant amount of research into traditional models in both software development and strategic management/budgeting but relatively little on the newer models of Beyond Budgeting and Agile development. To date there has been little published research into how agile methods are adapted for or integrated into an

organisations management model whether traditional or not. Is there a seamless integration into existing processes? How is progress and performance monitored? Does the management model need to change to cater for dynamic customer requirements? Is the budget process appropriate? Are opportunities being missed? This research hopes to address these issues and more, and will propose a framework for agile project budgeting which can be used by both the accounts department and the software development department to deliver better performance. The framework will have at its core, and be influenced by, the values and principles laid out by the BBRT and the agile manifesto while also recognising the value, and continued use of traditional management models. It will do this by examining the extent to which current practices employed by organizations using agile methods are consistent with the Beyond Budgeting principles. It will investigate why certain practices are used and suggest areas where improvements may be made.

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Appendix 1

Author	Comment	Note
Au et al. 2008	Project failure due to end user satisfaction.	
Dibbern et al. 2008	Outsourcing: 50% of the cases of offshore projects fail to achieve cost savings or that costs actually increase (Hatch 2004; Schaaf 2004).	
Bartis & Mitev 2008	(Fitzgerald & Russo 2005) 16% of IS projects are completed on time and within budget (Standish Group)	
Park et al. 2008	Project failure is a serious problem in the information field	
Iivari & Huisman 2007	Problems regarding the cost, timeliness, and quality of S/W products still exist	Also quotes CHAOS report of $255B spending on ISD in the United States in 2004
Huigang et al. 2007	..many ERP projects have failed and led companies to financial difficulties (Miller 2000; Xue et al.2005)	ERP implementation failures range from 40% to 60% (Langenwalter 2000)
Espinosa et al. 2007	Many SW projects are behind schedule and over budget (Mann 2002).	Team coordination
Xu & Ramesh 2007	A significant proportion of SW projects…. and run over budget (Standish 2004)	Lack of a disiplined approach to managing projects
Keil et al. 2007	More than half S/W projects experience severe difficulty and/or failure (Standish 2004)	
Napier et al. 2007	53% of ISD projects are late and/or over budget and 18% fail outright. (Standish 2004)	
Mitchell 2006	2001 Standish Group: 49% exceeded time and cost estimates.	She also quotes several instances of project completion rates regardless of time and cost overruns.
Slaughter & Kirsch 2006	Firma often fail in their attempts to build and deploy software (Gaudin 2003)	Software Process Improvements
Pan et al. 2006	43% of projects were over budget (Standish 2003)	
Porra et al. 2005	Texaco IT failed because top management consistently misinterpreted its performance as poor	Recent accounting procedural changes help firms capitalise on internal ISD costs, providing alternatives for the overhead rationale. (AICPA 1998)
Weidong & Lee 2005	Standish 1994: 16.2% Successful projects. Standish 2001: 28% Successful projects. ISD project failures occur regularly (Ewusi-Mensah 1997; Field 1997; Johnson 1995; Standish 2001)	
Lee & Xia 2005	Success rate is historically low, (Standish Group 1994, 2001)	
Chiang & Mookerjee 2004	Standish Group 2001: close to 50% suffered cost and schedule escalation and another 23% were outright failures. Van Genuchten (1991) notes that more than 70% surveyed suffered cost overruns	
Kautz & Nielson 2004	Devlopment of software frequntly results in project overruns	
Baskerville & Pries-Heje 2004	A quarter-century has elapsed since the field first realised budget overruns are typical	
Goulielmos 2004	Continues to be significant failure rate in ISD	
Smith & Keil 2003	26% of projects delivered on time (Standish 1999)	
Keil at al. 2002	$75B cost of failed projects in US in 1998 (Johnson 2000).	
Schmidt et al. 2001	Too many projects end in failure: 25% cancelled outright (Gibbs 1994). 80% run over budget (Walkerden & Jeffrey 1997). The average project exceeds its budget by 50% Gibbs 1994; Johnson 1995).	Over budget delivery is management related therefore the concept of SW project risk management has gained prominence.
Barki et al. 2001	Project failures are still common (Gibbs 1994; Hoffman 1998)	

Author	Comment	Note
Smith et al. 2001	Marriot, Hilton and Budget Rent-a car CONFIRM project failure 1992 $125M. Standish 1999 CHAOS reports 26% completed on time and within budget.	
Doherty & King 2001	Quotes other authors figures, failure rates of 50%, 89%, 70%, 90%	
Jiang et al. 2001	Alarming lack of success of IS projects in industry	
Irani & Love 2000	A case study highlighting a vendor supplied MRPII system that failed after implementation due to lack of human and organisational factors being considered during cost/benefit analysis. The intangible benefits were taken on faith therefore rendering the evaluation process ad hoc.	Vendor supplied system
Lyytinen 2000	Large IS projects continue to fail at an alarming rate	Executive overview
Montealegre & Keil 2000	Project failure … is a costly problem and troubled projects are not uncommon	
Lyytinen 2000	A truism that large projects escalate. These have a higher probability of achieving poorer performance in terms of budgets and schedules	Executive overview
Ravichandran & Rai 2000	Recurrent problems such as … high costs. Denver Airport $1.1M per day operatng costs increase (Gibbs 1994).	
Yetton et al. 2000	Projects continue to fail at an alarming rate	
Ravichandran & Rai 1999	In most organisations. Systems development is characterised by recurrent problems, such as … high costs	Problems are also: poor quality, long development lead time, user dissatisfaction.
Zmud 1999	Failure to deliver S/W systems on budget	Executive overview
Keil & Robey 1999	Project failure … is a costly problem and troubled projects are not uncommon. Quotes the standish report from (Johnson 1995). 1995: American companies spent $59B on cost overruns, and $81B on canceled projects. Tauras project abandoned £80M over 3 years (Drummond 1996). Payroll for NZ Education Dept. abandoned (Myers1994)	
Kanellis et al. 1999	Most systems disappoint. The cost of project disappointment in monetary terms for public sector projects is over £5B over past 12 years	
Lyytinen & Robey 1999	$59B spent on cost overruns in the US 1995. (Johnson 1995)	
Marakas & Elam 1998	One study (Jenkins et al. 1984) found that over 50% of the systems reviewed had problems necessitating a return to the requirements analysis phase.	
Guinan et al. 1998	Projects continue to come in over budget. Denver Airport baggage handling system $1M per day delayed for over 1 year. Confirm travel reservation cancelled with sunk costs exceeding $125M. Federal Aviation Administration currently $1B over budget for traffic control system (Gibbs 1994)	
Lyytinen et al. 1998	Sales support system CONFIG cancelled with costs of $1m (Keil 1995) IS field is plagued by various system failures (Lyytinen & Hirschheim 1987) such as .. budget overruns…	risk management solution: Failures are also delays, failure to deliver a system and organisational rejection.
Ocker et al. 1998	Software is still developed behind schedule and over budget	Focuses on user requirements
Qing et al. 1998	Significant problems plague software projects. Worst of these problems is cost overruns and schedule slippages. 1984 study (Jenkins et al. 1984) showed average of 67% cost	Inaccurate estimation of development cost and schedule is often considered one of the top contributors.
Lind & Sulek 1998	Most S/W development projects have completion time overruns.	success 75% of the time at estimating project duration within 25% of actual project time