The Best Value IT Industry

Dean Kashiwagi (PhD, Fulbright Scholar, PE), Isaac Kashiwagi (Researcher)
Performance Based Studies Research Group, Arizona State University
Tempe, AZ, USA

The IT industry has struggled with performance in the last 10 years. Tools, processes, and techniques have been developed in attempts to improve performance. Three of the most recent proposed solutions which have shown previous results of success include decreasing the size of projects, using agile project management, and using the best value approach. This paper will focus on differentiating between the three approaches and introduces the latest solution, the best value approach. After analyzing the three approaches, the paper proposes that the best value approach is the only one that requires the utilization of expertise. Using a case study of Schuberg Philis, the paper proposes that the Schuberg Philis model uses the agile approach but has most of the characteristics of the best value approach. In the course of the study and analysis, the Schuberg Philis company has moved from the agile approach to the Best Value approach.

Keywords: ICT industry failure, agile approach, best value approach

Introduction

The IT industry has struggled with performance since its origins. In 1968 NATO sponsored one of the first major software engineering conferences which addressed what was termed as the "software crisis". The crisis was due to the number of software projects failing to come in on time, on budget, and which met the correct specifications. Proposed causes of failure included (NATO Science Committee, 1969):

1. Complexity of systems.
2. Vendors may lack expertise due to a lack of experience.
3. Rushed projects due to pressure of meeting the owner's deadlines.

The only consensus to these problems at the time was that the solution was unknown. Guidance was given to continue to improve on current techniques and not to work outside the present state of technology (NATO Science Committee, 1969). However studies dating from 1995 have identified project failure rate still as high as 70-84% (De Marco, 1982; Dorsey, 2000; Grossman, 2003; IT-Cortex, 2014; Sauer & Cuthbertson, 2003; Standish Group, 1995). Recent reports have shown little signs of improvement with continuing high failure rate among IT projects (Budzier & Flyvbergj, 2011; European Services Strategy Unit [ESSU], 2007; Geneca, 2011; Government Accountability Office, 2008; McKinsey & Company, 2012; Standish Group, 2013; The Bully Survey, 1998; Venugopal and Suryaprakasa, 2011).

The reports identified the following "failure" or lack of performance statistics:

1. US Accountability office identified 413 IT projects--totaling at least $25.2 billion in expenditures for the fiscal year of 2008--as being poorly planned, poorly performing, or both. With just under half being rebaselined at least once (2008).
2. European Services Strategy Unity reported 105 outsourced public sector ICT projects with 57% of contracts which experienced cost overruns with an average cost overrun of 30.5% and 30% of contracts which were terminated (2007).
3. The Bull Survey performed 203 telephone interviews with IT project managers who took the lead in integrating large systems within organizations in the Times Top 100 and reported that with the IT projects 75% Missed deadlines, 55% exceeded budget and 37% were unable to meet project requirements (IT-Cortex, 2014).
4. Genenca Survey included 600 U.S. businesses IT executives and practitioners and reported that 75% of respondents admit that their projects are either always or usually doomed right from the start, of which 27% always felt this way (2011).
5. McKinsey & Company analyzed over 5400 projects and reported 50% of IT projects on average are 45% over budget, 7% over time, 56% less value than predicted and 17% of projects end so badly they can threaten the life of the company (2012).
6. Flyvbjerg and Budzier's entry for the Business Harvard Review did an analysis of 1,471 IT projects and reported an average cost overrun of 27%, of which 17% had a failure high enough to threaten the company's existence, with an average cost overrun of 200% and schedule overrun of 70% (2011).
7. Venugopal and Suryparakasa's survey of ERP systems reported that 51% of ERP implementations were viewed as unsuccessful, 46% of the participants noted that while their organization had an ERP system in place, or was implementing a system, they did not feel their organization understood how to use the system to improve the way they conduct business (2011).
8. Other findings reported 5–15% of all large-scale software projects are cancelled in the USA (Ahonena & Savolainen, 2010), there is a 50-80% failure rate of large projects (Dulcian inc) and 15% of all software development never delivers anything, and has overruns of 100-200% (DeMarco,1982).

Recently in the Netherlands a parliamentary inquiry was held to address the poor performance of IT projects in the Public space. During the enquiry it was reported that 1-5 billion Euros are wasted with ICT projects annually. Recent and notable projects by the media and government inquiry include (Eye4management, 2014; Plazilla, 2013; Ringelestijn, 2014; Tweede Kamer, n.d., 2014; Viergever, 2014):

1. Defense Department project (SPEER) cancelled after spending € 418 million.
2. Belastingdienst ETPM project cancelled after spending € 203 million.
3. Police Investigation Suite (PSO) Cancelled in 2005 after spending € 430 million.
4. C2000 emergency police and others Implementation costs € 72 million due to delays.
5. P-direct failed tender costs € 200 million with a potential € 700 million more.
6. EPD Electronic Patient File cancelled, after spending € 300 million.

Even more recently, a reported collusion among ICT vendors in the Netherlands has raised concerns about the industry (Zembla, 2014). Kashiwagi had previously identified that the reason

for collusion of the construction industry in the early 2000s in the Netherlands, is caused by the following (Kashiwagi D., Kashiwagi, J. and Sullivan, 2013; Rijt and Santema 2013):

1. A nontransparent environment where the client was using management, direction and control [MDC] rather than utilizing expertise.
2. Leveling of the playing field resulting in lower profits, minimized value of vendor expertise, reactive behavior of vendors and minimum standards/expectations being turned to maximum standards by the vendors.
3. Getting work is more important for vendors than doing high performance work.
4. Relationships are used to minimize risk instead of high performance, motivating collusion.

The United States has also experienced a high failure rate with IT projects, reportedly spending billions of dollars on projects which are incomplete, cancelled, or nonfunctional. Recent and notable projects include:

1. USAF attempt to automate and streamline their logistics operations by consolidating and replacing over 200 separate legacy systems. Project cancelled after spending $1.1 billion, project incomplete and non-functional (Institute for Defense Analysis, 2011; Kanaracus, 2012; United States Senate Permanent Subcommittee on Investigations, 2014).
2. State of California attempt to merge 13 separate payroll systems into a single system that served 243,000 employees. Cancelled after spending $254 million, project nonfunctional (Chiang, 2013; Kanaracus, 2013).
3. The Census Bureau attempt to convert to handheld computers for 2010 census. Cancelled after spending up to $798 million, project non-functional (Nagesh, 2008; US Department of Commerce, 2011).
4. The IRS continual attempts to update their system from legacy software. Projects cancelled with over $4 billion spent (Hershey, 1996; Moseley, 2013; Thompson, 2012).
5. The US Government online healthcare website, “Obamacare” was originally budgeted for $93 million. Official statements of costs have not been calculated but estimations calculated it to be as high as $634 million (Costello & Mcclaim, 2013; Dinan & Howell, 2014; Vlahos, 2013).
6. The Federal Aviation Association attempt to consolidate terminal automation system for an initial $438 million; cost increase has been estimated to be $270 million. The project is still ongoing and is currently nonfunctional (Levin, 2013; Perera, 2013).

Why Projects Fail and What Are the Potential Solutions

Among various sources the following are key reasons why projects fail (Al-ahmad et al., 2009; Dorsey, 2000; ESSU, 2007; Gardner, 2000; Geneca, 2011; Glaser, 2004; IT-Cortex, 2014; Kappelman, McKeeman & Zhang, 2009; Mckinsey & Company, 2012; Nato Science Committee 1969; OASIG Survey, 1995; Sauer & Cuthbertson, 2003; Savolainen & Ahonen, 2010; Schmidt, Lyytinen, Keil & Cule, 2001; Standish Group, 1995):

1. Lack of top management / executive commitment and support.
2. Incomplete User Requirements.
3. Misunderstanding of scope/objectives/requirements.
4. Lack of client/end-user commitment/involvement.

5. Changing scope/objectives.
6. Poor planning/estimation.
7. Inadequate project management.
8. Failure to manage end-user expectations.
9. Conflict among stakeholders.
10. "Lack of a clear link between the project and the organization's key strategic priorities, including agreed measures of success.
11. Inadequate resources and skills to deliver the total delivery portfolio.
12. Lack of quality control.
13. Poor / insufficient communication between relevant parties.
14. Confusion around roles and accountabilities.
15. Project complexity.
16. Making an unrealistic tender or agreement due to lack of understanding of the real needs of the customer.
17. Lack of methodology or structure.
18. Introduction of new technology.
19. Change in ownership or senior management.
20. Number of organizational units involved.

The reason for failed ICT projects seems to have the following similarities:

1. Project Complexity.
2. Misunderstanding of scope/objectives/requirements.
3. Inadequate resources and skills to deliver the total delivery portfolio.
4. Changing scope/objectives.
5. Poor planning/estimation.

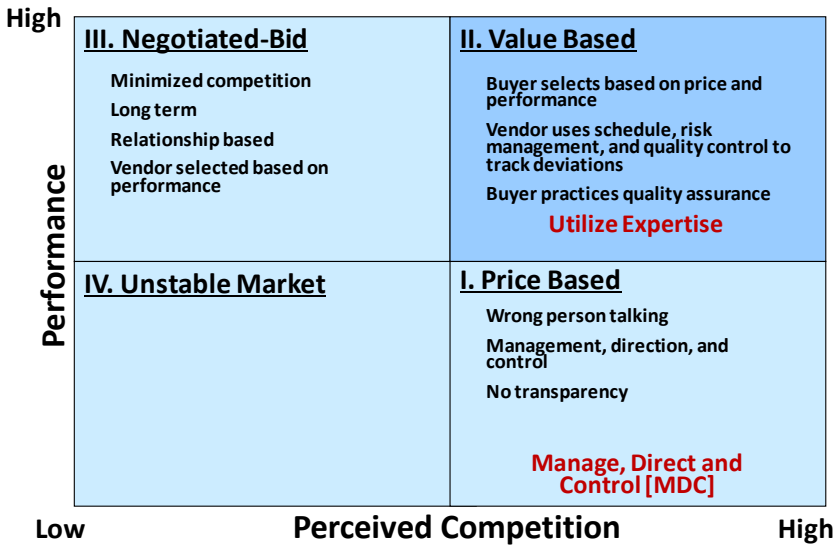
All five of the reasons seemed to be related to project complexity. On the dual side, project complexity occurs when there is a lack of project expertise. Possible solutions for the ICT project performance should address either project complexity or the lack of expertise. Three solutions that have been proposed to solve the problem of ICT industry nonperformance include:

1. Make projects smaller (Netherlands house of representatives, 2014; Standish Group, 2013).
2. Use agile project management to break project up into smaller milestones/projects to get to the final project deliverable (Cutter Consortium, 2008; PMI, 2014; QSM Associates, 2013; Scrum Alliance, 2013; Serena, 2012; Shine Technologies, 2002; Standish Group, 2011; VersionOne, 2007; VersionOne, 2013).
3. Use the best value approach to deliver the project (Duren & Doree, 2008; Kashiwagi, 2013; Rijt & Santema, 2012).

This paper will address and analyze these proposed solutions.

ICT Industry Structure

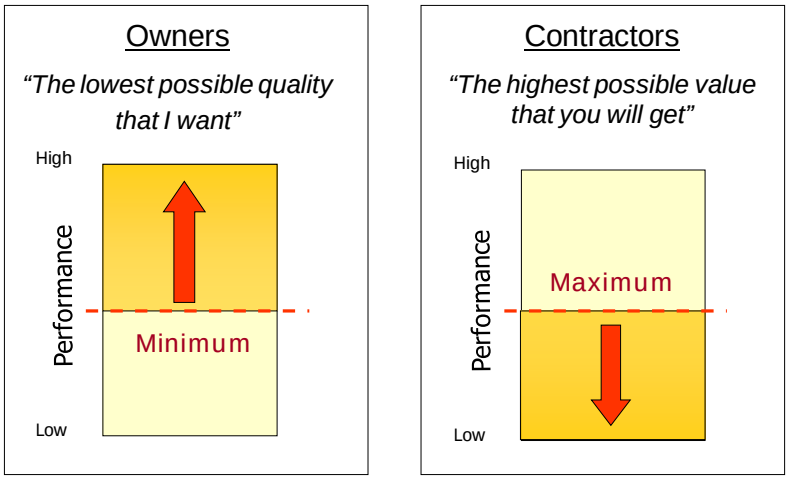
The industry structure [IS] diagram (Figure 1) was proposed in 1991 and modified in 2013 to explain the difference between high performance and low performance. The IS diagram was first used in reference to the construction industry. Later research performed in the Netherlands and the States of Oklahoma and Idaho identified that it applied to all industries.



Source: Information Measurement Theory by Dean Kashiwagi, 2014a, Tempe: Kashiwagi Solution Model-inc [KSM-inc.].

Figure 1. Industry Structure

In the low performance environment, the owner/buyer utilizes management, direction and control [MDC] to minimize project risk and ensure performance. In the high performance environment, the owner/buyer utilizes the expert vendor's expertise to minimize project non-performance. If the owner/buyer is using MDC, they are the experts and are hiring vendors that need to be managed, directed and controlled. The communication/direction is in the form of minimum requirements (Figure 2). There is no incentive for vendors to be proactive and increase performance. It forces the client to want higher performance and the vendors to minimize performance. This ensures that all parties protect their own interests, the owners want something better for a lower cost, and the vendors deliver less using the minimum as a maximum.



Source: Information Measurement Theory by Dean Kashiwagi, 2014a, Tempe: Ksm-inc.

Figure 2. Minimum Requirements

The owner/buyer MDC environment has the following characteristics:

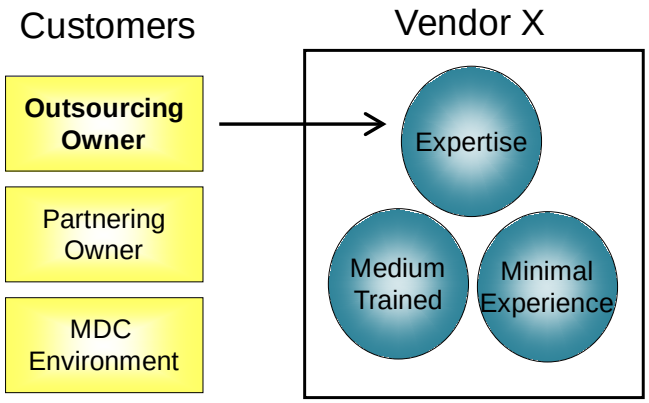
1. Owner management, direction and control (MDC).
2. Owner representatives behave as if they are experts [they give the directives and define the scope].
3. Owner MDC environment makes it possible for "less expert" vendors to participate lowering the quality and value.
4. The value of the expert vendors is minimized, and the vendors naturally become reactive, not wanting to "rock the boat" [relationship] and have fear to inform the owner that they are not really the expert or are proposing inaccurate concepts or expectations.
5. All vendors [regardless of capability] are viewed as having the capability to meet the owner driven requirements.
6. Selection is based solely on price and not a vendor's level of expertise [the owner is the expert] or the scope of the delivered service.
7. Because the owner is in control, no performance metrics are tracked. Performance metrics would show the inefficiency of the owner in managing the vendor.
8. If the performance is poor, the owner blames the contractor.
9. Transparency is minimized due to the lack of performance metrics and relationships become more important than being able to perform the work.
10. Price becomes more important than having trained and experienced workers because the owner is the expert and will MDC the vendor labor.
11. Value of vendor's expertise is minimized leading to a degradation of industry capability.

It is important to note that the major problem in the price based environment is the assumption that the owner/buyer is the expert and has the most expertise on the installation and implementation of ICT systems. This is not accurate. The expert is the party who is responsible if there is a technical mistake. The expert is the party doing the quality control. When the party doing the MDC is not doing the actual work, quality control by the expert vendor is replaced by the more inefficient owner's MDC and inspection. This is identified clearly by Deming (1986) as a source of inefficiency and nonperformance.

This owner's MDC environment results in:

1. A price based environment that assumes the ICT service is a commodity, with no difference in performance and no risk.
2. No accountability of the vendors due to the owner/buyer making the decisions and the MDC of work.
3. No vendor technical risk.
4. Reactive behaviors of vendors who are acting in their own best interests, treating the owner's minimum requirements as maximums and driving the minimum requirements lower (Figure 2).
5. Increased transactions and flow of information due to owner MDC (meetings, emails, technical discussions, directions and number of people involved).
6. Inefficiency.
7. Lower profit margins for the vendors, making it difficult to afford experts.

These characteristics match the characteristics of the current IT industry and are a possible explanation of the "complexity" of the industry. The MDC environment also hampers experts, who are more experienced and deliver the client scope at a fixed price [which is not what their competitors are delivering, leading to the perception that they are more expensive]. The expert's competitive advantage is to use their expertise to preplan and do work successfully [on time, on budget, and high value]. In the MDC environment their production and value decreases due to the expert's higher salaries and confusing environment [which increases transactions and down time]; when production goes down, highly expert vendors' costs increases more than vendors using non-expert personnel. This does not motivate the less experienced to become more expert. Instead this results in more reactive behavior by non-expert vendors. The only method to increase the use of expertise is the identification of experts and the utilization of their expertise [the Best Value Environment] (Figure 3).



Source: Information Measurement Theory by Dean Kashiwagi, 2014a, Tempe: Ksm-inc.

Figure 3. Utilization of Expertise

Improvement of Performance by Utilizing Expertise

The industry structure analysis proposes that the method of improving industry performance is to minimize MDC and utilize expertise. This differs from the premises of the other proposed solutions which do not address the MDC issue directly [make projects smaller and less complex and utilizing agile project management]. The authors propose that the agile project management may be the middle ground between the make projects smaller and the best value approach solutions.

Proposal

Identify the differences between the three different proposed solutions, identify the pros and cons and identify statistics or case studies which may support the different proposals.

Methodology

The methodology of this paper will be to:

1. Define the three approaches with assumptions and solution.
2. Identify the difference between the three solutions and the traditional approach.
3. Identify any justifications of the three approaches.
4. Identify case studies that support the justifications.
5. Present conclusion and recommendations.

The paper will analyze the three approaches to improve ICT performance by using the Industry Structure concept of identifying the difference between high performance and low performance by whether expertise is being utilized or if the owner is using management, direction and control [MDC].

Proposed Solution #1: Make Projects Smaller

The simplist solution proposed is to make projects smaller. This is a deductive approach that would minimize project scope in terms of number of stakeholders, time and complexity. The proposal is that smaller projects would be by definition less complex and would result in better results (Standish Group, 2013). The Standish group reports a high level of success with smaller projects compared to large projects with a 66% difference in success rate (Table 1).

Table 1

Large vs. Small Projects

	*Small Projects	Large Projects
Success	76%	10%
Fail	4%	38%

*Small project are considered <$1 million in labor cost, Large project >$10 million
Source: Adapted from the CHAOS Report 1995. Boston, MA: The Standish Group International, Inc.

Additionally when comparing the impact of the two different approaches [traditional waterfall or agile] to project management results (Table 2), a decrease in project size and complexity results in a decrease in the importance of the project management approach or project management expertise (Standish Group, 2011 & 2013). Therefore, with smaller projects, the need for project management expertise is reduced.

Table 2

Large vs. Small Projects Methodology

	All Projects (2011)		Small Projects (2013)	
	Waterfall	**Agile**	**Waterfall**	**Agile**
Success	14%	42%	49%	46%
Fail	29%	9%	8%	6%

Source: Adapted from the CHAOS Report 2011 and 2013. Boston, MA: The Standish Group International, Inc.

This approach assumes that the only source of non-performance is complexity and does not address the problems caused by owner management, direction and control [MDC], low level of vendor expertise and the lack of motivation to provide higher levels of quality and value. By definition, this approach assumes that the IT industry may have an insufficient level of expertise to handle complex projects. This approach also minimizes the competitive advantage of ICT firms that may have expertise and who can perform on complex projects.
Results of another performance study that is done annually to ICT clients/buyers in the Netherlands, gives evidence that the "complexity" proposal that larger and more complex projects have higher non-performance, may not be accurate.

The third party performance measurement firm Giarte, did a recent analysis with the performance rating information they had collected for their 2012, 2013 and 2014 annual reports. Giarte compared the client's satisfaction on large and small projects in the infrastructure management domain from both midsize and large providers (Giarte, 2014).

Table 3

Percentage Satisfied Respondents Infrastructure Management

	Midsize Providers	**Large Providers**	
	****Small Deals**	****Small Deals**	***Large Deals**
2012	88%	59%	70%
2013	89%	76%	85%
2014	90%	85%	79%

** Deals considered large are >5 million EUR / year*
***Deals considered midsize are < million EUR / year*
Source: Adapted from the Outsourcing Performance 2014 Report by Giarte.

From the results the following can be observed (Table 3):

1. Midsize providers in all three years received higher customer satisfaction in their small projects than the large providers for both small and large projects.
2. Large providers for 2012 and 2013 received higher customer satisfaction on their large projects than their smaller projects.
3. In 2013 larger providers received higher customer satisfaction on their smaller projects. However, the only obvious trend is that the performance on smaller projects has been getting better. There are no obvious trends on the performance on larger projects.

From the rating group's analysis it can be proposed that if any conclusion can be drawn, it is that the larger projects have a greater likelihood to have higher performance rather than small projects, and that vendor non-performance may be due to vendors' size [large providers have lower performance on smaller projects] and lack of expertise [most large projects are successful] and not the complexity of the project. These results are supported by a later case study reference of Schuberg Philis, who is the top rated ICT vendor in the infrastructure and application integration business. Schuberg Philis project documentation proposes that:

1. Complexity is caused by a lack of expertise and planning.

2. Size of projects does not affect project performance although larger projects may need more attention.
3. This is supported with their performance on ICT projects.

The information and discussion on the proposal to make ICT projects smaller to increase their performance has the following conclusions:

1. Making projects smaller results in minimizing the importance and need of ICT vendor expertise.
2. It gives the competitive advantage to vendors with minimal expertise.
3. It makes price a more important factor.
4. It uses relationships and working together as the methodology for successful performance.
5. It does not identify a potential source of non-performance as the owner using MDC to minimize risk.
6. It does not help the industry to improve their level of expertise.

Solution #2: The Utilization of the Agile Project Management Approach

In 2001, 17 software developers with a wide range of expertise in software development created the guidelines to what is known as the agile software development manifesto. The manifesto gave 12 principles of agile that focused on three main points (Beedle, et al., 1999):

1. Teamwork and collaboration: This has a focus on daily interaction and face to face communication.
2. Continuous, steady, and an iterative pace: Involves welcoming changing requirements, adaptive team behavior and frequent piece by piece delivery of working software until project completion is reached.
3. A high level of quality: Technical excellence achieved by self-organizing teams, with motivated individuals and utilization of simplicity.

The approach of agile is now applied to various different methodologies such as Dynamic Systems Development Method (DSDM), Extreme Programming, Lean Software development, Kanban, and SCRUM. All methodologies differ in application details but remain consistent with the general agile principles. SCRUM, reported to be used by over 70% of the IT industry (Scrum Alliance, 2013; VersionOne, 2013), and has been defined by the Scrum Alliance to be:

"founded on an empirical process control theory, or empiricism. Empiricism asserts that knowledge comes from experience and making decisions based on what is known. Scrum employs an iterative, incremental approach to optimize predictability and control risk."

Agile has become mainstream in the IT sector with as high as 84% of IT companies practicing agile methodologies and over 5,000 PMI certified practicioners, making it the fastest growing PMI certification (Project Management Institute, 2014; Scrum Alliance, 2013; Serena, 2012; VersionOne, 2013). The greatest concerns of those adopting agile include (VersionOne, 2013):

1. Lack of upfront planning.

2. Loss of management control.
3. Management opposition.
4. Lack of documentation.
5. Lack of predictability.
6. Lack of engineering discipline.

Agile is used as an alternative to traditional methodologies such as the waterfall approach. The difference between the waterfall approach and the agile approach is that the the waterfall approach is linear and a single iteration for the entire project (Figure 4). Each waterfall step can be treated as an entire project in the Agile approach. A complex system can be broken up into simpler segments or components, and each component becomes its own project. This allows the testing of a component to be successfully accomplished before moving on to other components. It allows components to be done simultaneously. Agile simplifies by allowing ICT experts to focus on one component at a time, instead of attempting to factor in many components and their interfaces at the same time. To simplify is intelligent. To simplify by treating a component is similar to proposal #1: Make the Project Smaller. The Agile approach minimizes the need of expertise. If an expert vendor did a project, they could be doing the agile approach in their mind as they did the waterfall approach. An expert in the ICT industry is using both the waterfall and the agile approaches.

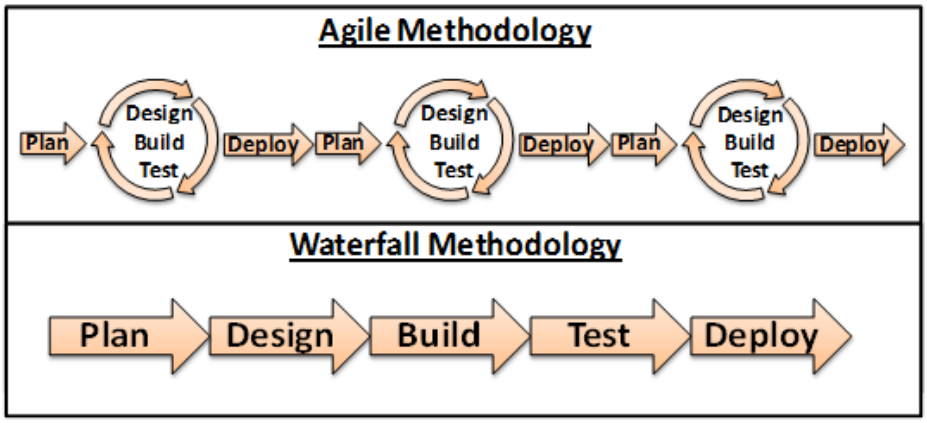


Figure 4. Agile vs. Waterfall

In comparing methodologies the Standish group found that Agile had a success rate 28% higher than the traditional waterfall approach (Standish Group, 2011). Various other reports and surveys support the Standish group with claims of improvement in cost, time to market, risk, defects and productivity when switching from traditional methodologies to agile (Cutter Consortium, 2008; QSM Associates, 2013; Scrum Alliance, 2013; Shine Technologies, 2002; VersionOne, 2007).

Solution #3: the Best Value Approach

The best value approach was first conceived by Dean Kashiwagi, at Arizona State University (ASU) in 1991 as part of a PhD dissertation (1991). The best value (BV) Performance Information Procurement System (PIPS) was originally, limited to a selection/procurement process, then matured into a project management and risk management approach. The BV PIPS was first tested

in 1994 by the Performance Based Studies Research Group (PBSRG) at ASU (Kashiwagi & Savicky 2002) and was used to select roofing systems and contractors for private organizations in the Phoenix, Arizona and Chicago, IL area (including: Intel, IBM, and McDonald Douglas). Due to the simplicity of the system and drastic improvements made on performance and value, the system quickly spread to other construction and facility areas.

The BV PIPS approach has been heavily documented. Facts of the BV PIPS system research include (PBSRG, 2014):

1. Researched and developed (1992-present) at the Performance Based Studies Research Group (PBSRG) at Arizona State University (ASU).
2. PBSRG has received a total of $15.9 million in funding with 313 grants.
3. Most licensed university developed technology at Arizona State University with 38 licenses issued by the innovation group AZTech at Arizona State University. PIPS tests have been conducted in 31 states in the U.S. and five different countries besides the U.S. [Finland, Botswana, Netherlands, Canada, and Malaysia].
4. Documented performance of over 1,700 projects delivering $6 billion (1629 projects, $4B in construction and 89 projects, $2B in non-construction), customer satisfaction of 9.8 (out of 10), 93.5% of projects on time and 96.7% on budget.
5. Research's most dominant results include: Arizona State University business services and procurement department testing the PIPS system and generating $100M of revenue based on the method in the first three tests, and currently observing $110M a year from using the method (Kashiwagi 2014).
6. Research tests show that in procuring of services outside of construction, the observed value is 33% or an increase of revenue or decrease in cost of 33% (Kashiwagi, J., 2013).
7. Minimization of up to 90% of the client's professional representative's risk management efforts and transactions due to reduced risk levels and the transfer of risk management and accountability to the vendors. This is the only documented reduction in management in the construction management industry.
8. The results of PIPS testing has won the 2012 Dutch Sourcing Award, the Construction Owners of America Association (COAA) Gold Award, the 2005 CoreNet H. Bruce Russell Global Innovators of the Year Award, the 2001 Tech Pono Award for Innovation in the State of Hawaii, along with numerous other awards.

The former Associated Vice-President of Arizona State University Business Services, Ray Jensen (Kashiwagi, 2013), who led ASU to deliver $1.7B of services at ASU, commented on PIPS:

"I have been successful in the business of procurement and services delivery for the past 30 years. I saw in PIPS, improved solutions of performance/contract administration issues that are so dominant, that I am willing to change my approach to the business after 30 years."

The BV PIPS system has been analyzed by outside groups multiple times in the last 17 years. However, there were two investigations that performed a thorough study on the impact and effectiveness of the PIPS system:

1. The State of Hawaii Audit (Kashiwagi et al. 2002; State of Hawaii Report 2002 (DIS)).

2. Two Dutch Studies on the Impact of PIPS (Duren & Doree, 2008; Rijt & Santema, 2012).

These studies all confirmed that the performance claims of the PIPS system were accurate. Duren and Doree's study found the following for PIPS projects performed in the United States:

1. 93.5% of clients who worked with PIPS identified that their projects were delivered on time.
2. 96.7% of clients who worked with PIPS identified that their projects were delivered within budget.
3. 91% of the clients stated that there were no charges for extra work.
4. 93.9% of the clients awarded the supplier's performance with greater than an 8 rating (on a scale from 1-10, 10 being the highest performance rating).
5. 94% of clients would hire the same supplier again.

Best Value Concepts

The BV approach has a selection phase [selects the expert vendor], a clarification phase [expert vendor clarifies their plan in detail] and an execution phase where the expert vendor manages their project. The BV approach uses the following concepts (Kashiwagi, 2014):

1. Requires the owner to hire an expert vendor.
2. Identifies the buyer/owner as the major source of project cost and time deviations.
3. Identifies owners' management, direction and control [MDC] as a source of project risk.
4. Identifies that decision making should be minimized and done by the expert vendor.
5. Replaces owner/client MDC with the utilization of expertise.
6. Proposes that the language of communication between client/owner and expert vendor should be a language of metrics.
7. Defines experts as not having technical risk. The only risk they have is risk that they do not control (source is the other stakeholders).
8. Expert vendors use transparency and not control to identify and mitigate the risk that they do not control. This risk is always non-technical risk.
9. Transparency is when all stakeholders can see future risk even if they do not understand its cause.
10. Experts identify the project deliverable in terms of non-technical requirements and metrics, and work the solution from the end to the beginning.
11. Experts also identify the risk that they do not control and the required risk mitigation and use their expertise to create information that is insufficient or unknown to complete their plan.
12. Experts are hired for their plan or scope. They are not financially responsible for deviations to their plan caused by unforeseen conditions or risk that the expert vendor does not control.

The BV approach differs from the traditional "waterfall" process in the following ways:

1. The expert vendor is responsible for determining the final scope.
2. Owner decision making and MDC is minimized. Owner participation is led by the expert vendor.
3. The expert vendor does risk management of risk [which they do not control] during the execution phase.

4. Owner should not hire vendors with technical risk.
5. Experts are required to have a complete plan which meets the requirements of the owner in detail including a milestone schedule, risk and risk mitigation, and assumptions where there is insufficient information.

The biggest difference between the BV and the Agile approach is that the BV approach requires an expert vendor with expertise who can see the entire project from beginning to end before the project is started. The BV approach maximizes pre-planning and planning utilizing the expertise of the expert vendor. The expert vendor must also manage the entire project and create transparency that minimizes the need for the owner to understand the technical requirements of

the project. The BV approach also has a structure that enforces that an expert is selected. The structure includes a selection phase and a clarification phase that forces the following actions for the expert vendor:

1. The expert uses metrics to first identify the project deliverable and get consensus from all stakeholders.
2. The expert has a complete plan [includes a detailed schedule, cost and a milestone schedule].
3. The expert must identify, mitigate and track risk [that they do not control] including unforeseen conditions.
4. The expert works backwards from the deliverable, to identify all other requirements in their project plan.
5. The expert tracks all project deviations from their project plan.
6. The expert creates transparency that allows the owner/client to see clearly into the future to the end of the project, minimizing the need for the owner to get involved in the management of the project.

The best value process was utilized in two six year longitudinal studies [Users in the state of Minnesota and the U.S. Army Medical Command (Table 4 and 5). The two studies resulted in the following conclusions (Sullivan et al 2005; Kashiwagi 2014; Kashiwagi et al. 2009):

1. The owner and their representatives were the biggest source of project deviations.
2. The BV structure minimized the cost and time deviations.
3. The vendor performance was outstanding.
4. Cost was minimized and within the budgets.

Table 4

U.S. Army Medical Command Best Value Performance

Completed Projects	NTP 2007	NTP 2008	NTP 2009	NTP 2010	NTP 2011
# of Projects	110.00	129.00	122.00	92.00	27.00
Original Awarded Cost ($M)	$181.9	$177.3	$184.0	$107.1	$16.3
Final Awarded Cost ($M)	$193.9	$187.8	$192.6	$111.0	$16.4
Total Over Budget ($M)	$11.9	$10.6	$8.6	$3.9	$0.74
Total % Over Budget	**6.56%**	**5.96%**	**4.68%**	**3.61%**	**0.46%**
% due to owner	4.58%	5.59%	3.61%	2.36%	0.46%
% due to Designer	0.00%	0.14%	0.00%	0.21%	0.00%
% due to contractor	0.11%	-0.17%	-0.01%	0.08%	0.00%
% due to unforeseen	1.88%	0.40%	1.09%	0.96%	0.00%
Total % Delayed	**51.56%**	**48.43%**	**36.77%**	**28.53%**	**3.31%**
% due to owner	41.38%	39.96%	28.51%	16.53%	9.20%
% due to Designer	0.00%	0.49%	0.00%	1.32%	0.00%
% due to contractor	1.86%	-0.02%	1.29%	0.12%	-6.40%
% due to unforeseen	8.32%	8.01%	6.97%	10.56%	0.51%

Source: Best Value Standard by Dean Kashiwagi, 2014, Tempe: Ksm-inc.

Table 5

State of Minnesota Best Value Performance

General Overview	Overall	Group A	Group B	Group C	Group D	Group E	Group F	Group G
Total Number of Projects	399	1	8	21	10	3	355	1
Total Awarded Cost ($M)	$434.9	$0.19	$37.8	$17.2	$5.1	$29.5	$332.7	$12.4
% where BV was lowest cost	54%	0%	83%	42%	33%	33%	55%	0%
Overall $ Change Order Rate	**8.83%**	**-**	**3.73%**	**4.04%**	**1.27%**	**2.54%**	**10.16%**	**4.53%**
Client	7.61%	-	2.15%	1.08%	0.33%	0.34%	8.83%	1.16%
Designer	0.69%	-	1.68%	2.07%	0.63%	1.57%	0.33%	2.55%
Contractor	0.01%	-	-0.21%	-0.17%	0.00%	0.00%	0.01%	0.21%
Unforeseen	0.52%	-	0.12%	1.06%	0.31%	0.63%	0.51%	0.62%
Overall Schedule Delay Rate	**47.17%**	**-**	**35.31%**	**1.59%**	**16.38%**	**7.44%**	**51.68%**	**12.73%**
Client	21.92%	-	15.26%	0.00%	7.41%	3.93%	24.13%	5.45%
Designer	4.47%	-	5.69%	1.59%	8.97%	0.00%	4.48%	7.27%
Contractor	2.65%	-	10.93%	0.00%	0.00%	3.51%	2.42%	0.00%
Unforeseen	4.54%	-	3.42%	0.00%	0.00%	0.00%	5.04%	0.00%
Number of Satisfaction Surveys	**233**	**0**	**2**	**18**	**0**	**0**	**212**	**1**
Vendor	9.5	-	9.0	9.9	-	-	9.5	8.8
Selection Process	9.7	-	8.5	10.0	-	-	9.6	10.0

Source: Best Value Standard by Dean Kashiwagi, 2014, Tempe: Ksm-inc.

These results were reconfirmed in the first large Dutch test by the Rijkswaterstaat on the $1B fast track projects in 2008. The projects minimized procurement time, cost and transactions by 50%

reduced construction time by 25%, and identified that the major source of project cost and time deviations were caused by owner decision making and management, direction and control (Kashiwagi et al. 2013; D. Kashiwagi and J. Kashiwagi 2013).

State of Oklahoma History with Best Value Approach

In the four years the State of Oklahoma has been using the PIPS and changing their buying paradigm, they have achieved the following (Kashiwagi, 2014):

1. Convinced the State Legislature to pass law allowing them to run BV PIPS on construction projects.
2. Convinced major government organizations to use PIPS in the purchasing of service (department of health care services, tax commission, department of commerce, department of corrections).
3. Created a weekly risk reporting system and best value industry group.
4. Ran over 19 best value projects on 13 different types of services.
5. Users were happy with results (Table 6).

The following is a list of different services the State of Oklahoma has implemented PIPS/PIRMS:

1. Commercial Off the Shelf (COTS) Tax Software.
2. Enhancement of Workforce Job Website.
3. Electronic Document Management for Construction Documents.
4. Computer to Plate Printer.
5. State wide light bulb and lighting fixture contract.
6. Emergency hazardous Waste Removal contract.
7. State Mental Health Services.
8. Performance Measurement of Federal Grants.
9. Juvenile Center and Services (cancelled).
10. New construction and renovation projects.
11. Design Services.
12. Construction Management Services.
13. Commissioning Services.

The following Table 6 shows a summary of the results of the PIPS/PIRMS implementations.

Table 6

State of Oklahoma Best Value Performance

State of Oklahoma Central Purchasing Best Value Project Results	
Total # of Best-Value Procurements	30
# of projects in process	7
# of completed projects	23
# of different services procured	12
% Where identified Best-Value was lowest cost	92%
Estimated $ of BV projects procured	$ 141.1M
Estimated $ cost avoidance	$ 71.8M
Average customer satisfaction	9.4

Source: State of Oklahoma Central Purchasing. (2014). Director's Report [Data file], retrieved from S. Hagar November 11, 2014.

The State of Oklahoma procurement group minimized 34% of the cost of the projects by using the BV PIPS approach. The clients are satisfied [9.4/10.0 satisfaction rating].

COTS-ITS Tax Software

After implementing the PIPS/PIRMS on a wide variety of services, the State of Oklahoma agreed to implement PIPS on a large ICT project. The Oklahoma Tax Commission identified a need to update their outdated tax software and processes. The Agency estimated the cost of this project at $40M. The decision to implement PIPS/PIRMS on the project was made in the Spring of 2010 (Kashiwagi, 2014).

The agency's expectations were as followed:

1. To consolidate their different processes into one system.
2. To automate as many manual processes as they could.
3. The Supplier would be able to implement changes despite multiple technology constraints.
4. Minimal customizations and adjustments of the future software.
5. The software was to be upgradeable in the future.

The project would task the supplier with implementing a developed and commercially offered Commerical off the Shelf Integrated Tax Software (COTS-ITS) as the primary technology tool to manage all taxpayer data and account information, to include (Kashiwagi, 2014):

1. Taxpayer Registration.
2. Account Management.
3. Returns & Payments.
4. Credits & Refunds.
5. Transaction Posting.
6. Correspondence & Case Management Inquiries.
7. Info Mngmt & Reporting, Accounts & Periods.
8. Retrieval, Streamline Sales Tax (SST).
9. Web-based Functionalities.
10. IRS Modernized eFile (Mef) Auditing.
11. Apportionment and Compliance Functions.

The supplier would also need to have a proven product that would include the ability to successfully implement the following tax types:

1. Individual Income.
2. Corporate Income.
3. Sales, Use, Franchise.
4. Mixed Beverage.
5. Withholding.
6. Waste Tire.
7. Telephone Surcharge.
8. Vehicle Rental.
9. Coin Device.
10. Cigarette/Tobacco/Alcohol.

In the BV approach, the owner must determine what they “think they want”, but not being the expert, the Best Value expert supplier is required to create the scope of the project. The expert’s proposed scope must be acceptable to the owner. The RFP went from over 15 pages down to 1 page. The Tax Commission realized that if they minimized their MDC, the expert vendor had more flexibility to utilize their expertise.

The Awarded Supplier was Fast Enterprises LLC (Firm A). The supplier had ranked #1 in every category in the selection phase (see Table 7). The awarded amount would end up being $24,989,400 [budget of $40M]. The supplier was given an additional $8M from their original bidding price due to value added options.

Table 7

Selection Phase Criteria

#	Criteria	Firm A	Firm B	Firm C	Firm D
1	Cost Proposal ($M)	$16.98	$34.39	$28.60	$66.76
2	Interview Rating	180	105	106	45
3	Technical Risk Plan	65	28	40	35
4	Risk Assessment	70	32	36	40
5	Value Added	60	28	45	40
6	Measurement Plan	60	36	32	32
7	Schedule	45	32	40	40
8	Average PPI Score (Vendor)	9.6	8.9	9.4	8.8
9	Average PPI Score (PM)	9.5	9.1	9.34	8.46
10	Average PPI Score (Regional VP)	10	9.4	7.95	8.76

Source: Best Value Standard by Dean Kashiwagi, 2014, Tempe: KSM-inc.

The selected best value supplier was able to successfully develop the clarification period documents and was awarded the contract in less than 2 months. The project finished on time and on budget with no change orders. The expert vendor cut the government's cost by 40%. The Tax software project and the work done at the State of Oklahoma reinforced the concepts of the best value approach:

1. Owner is not the expert.
2. Best Value vendor will determine the appropriate scope of the project.
3. The client is the biggest source of project cost and time deviation.
4. The expert utilizing their expertise can increase the performance of projects.
5. The cost of the owner's MDC is dominant and could be reduced significantly with the best value approach.

Arizona State University History with Best Value and the IT Networking Contract

The second case study of an ICT project delivered by the BV approach, is the ASU IT network outsourcing at one of the largest university networks in the United States, consisting of:

1. 4 different campuses, 83,000 Students and 12,000 Faculty.
2. Estimated Cost: $12.9 Million.
3. Number of UTO/IT employees: 18 Full-time employees, 8 Students, 3 Contract technicians.

Arizona State University (ASU) decided to utilize the best value PIPS in 2008 to procure IT Networking maintenance services (Kashiwagi 2014). ASU decided to use the best value approach after using it to procure food services and sports marketing services. In both procurements, ASU received outstanding value. The food services contract delivered $32M from the high performance

vendor to work in the new environment shaped by the best value approach (Michael, Sullivan and Kashiwagi 2008).

The ASU IT Networking outsourcing was a unique case study for the following reasons:

1. Complexity was high. The requirements or state of their networking system were not known by the client/user.
2. The management was changed during the 3.5 years of the best value vendor's tenure.
3. The new management accused the vendor of nonperformance and high prices.
4. The vendor used their metrics to create transparency and mitigate the client dissatisfaction. Instead of the client recompeting the contract, the client decided to renew the contract for another five years.
5. The vendor understood that if they provided transparency through metrics, the complexity and confusion which often happens between the client and the vendor is simplified.

The head of ASU University Technology Office (UTO) had a difficult time getting information from his own staff. The following was transpiring (Kashiwagi, 2014):

1. He had been trying for two years to define what the IT networking services included in terms of requirements and resources, and had not been successful.
2. He requested from his staff a vision of what it would take to transform the antiquated system to a system deserving of a Level 1 research institution.
3. He received no proposals. Answers he received included, "No one has all the information." "No one can control the system." "No one has enough control over the network." "The problem is too complex."

He asked the Director of PBSRG the following questions and received the answers (answers are in parenthesis) (Kashiwagi, 2014):

1. When applying the best value PIPS approach, does the user/buyer have to know what they need?
   (Answer: no.)
2. Will the best value approach find the optimal answer? (Answer: yes.)
3. Will the best value approach answer have metrics that can be easily understood? (Answer: yes.)
4. Will the best value vendor identify how they will modernize ASU's system? (Answer: yes.)
5. What if no vendor proposes a better solution than the current performance? (Answer: then what the university is currently doing is the best value option.)

The UTO Director immediately agreed to use the BV Approach. The process would utilize expertise to identify the current state of the ASU IT systems with metrics, identify what to improve and provide a strategic plan to get it accomplished.

After the ASU/UTO decided to use the BV approach, they invited all potential suppliers of the service for an education briefing of the approach and the process. At the end of the briefing the

vendors were asked to fill out a survey evaluating the new BV process compared to the traditional selection process. The average vendor responses are shown in Table 8.

Table 8

Traditional Procurement Process vs. Best Value PIPS Process

#	CRITERIA	UNIT	BV PIPS Process	Traditional Process	Difference
1	The process is able to identify the vendor that can deliver the best performing IT service.	(1-10)	7.6	4.9	2.7
2	The process focuses selection on a vendor's proven ability to perform	(1-10)	8.1	5.0	3.1
3	The procurement process requires minimal amounts of resources for qualified vendors to bid.	(1-10)	6.5	4.1	2.4
4	The process is fair and allows all vendors equal opportunity to be selected	(1-10)	7.0	5.2	1.8
5	Relationships and marketing is the main factor in selection	(1-10)	4.0	7.5	-3.5
6	The process allows the vendors to differentiate themselves by their ability to perform	(1-10)	8.2	5.3	2.9
7	The process forces the vendors to make a proposal that is easy for the client to understand.	(1-10)	7.9	4.0	3.9
8	The process allows the vendor to submit a proposal that is in both the best interest of the client and the vendor.	(1-10)	7.5	4.7	2.8
9	The process allows the vendors to regulate the performance level needed to be selected for the service.	(1-10)	7.7	4.9	2.8
10	The process allows a vendor to submit a proposal that is accurate to the expectations of the client.	(1-10)	7.3	5.1	2.2
11	The process allows the vendor to be more creative and inventive with their proposals, allowing them to give clients more options for their service.	(1-10)	7.5	5.2	2.3
12	The process is simple and easy to understand	(1-10)	7.9	4.6	3.3
13	The process increases competitiveness of high performing vendors.	(1-10)	7.1	5.4	1.7
14	The process favors the vendors that have an understanding of how to accurately measure their performance.	(1-10)	8.1	3.9	4.2
15	Your overall satisfaction of the process	(1-10)	7.9	3.7	4.2
16	Total Number of Surveys	#	11.0	11.0	0.0

Source: Best Value Standard by Dean Kashiwagi, 2014, Tempe: KSM-inc.

The IT vendor's perception of the BV approach was that:

1. PIPS showed a 27% improvement to find a qualified vendor.
2. Vendor's proven ability is 21% more important with the BV approach.
3. PIPS system decreased the value of marketing and relationships by 35%.
4. The PIPS process is 33% more simple.
5. The BV process increases the competitive advantage of performers by 42%.
6. The IT vendors were 42% more satisfied with the BV PIPS process.

The ASU IT networking system was fragmented, antiquated and had poor performance. Due to the restricted budget [$12.4M], outages were occurring, however there was no documentation on the outages or the bureaucracy of the ASU UTO environment. Only one vendor submitted a proposal.

Due to the transparency of the process the procurement agent and client were totally satisfied. The bidding vendor did not realize they were the only bidder. The other major vendors identified that they could not be cost competitive. A survey was performed to identify why the other vendors did not bid on the project. Three of the other major vendors responded with the following explanation for not bidding:

1. Risk is too high for the vendor.
2. ASU bureaucracy is a formidable risk to overcome.
3. Projected profit in the project to offset the risk is not sufficient.

The BV vendor was then asked to write their own detailed level of service, measurement of the service, risk management plan, and weekly risk report. This was compared to the Universities in-house cost and plan.

The best value vendor's cost was $2M below the cost of the university in-house operations (Table 9). The vendor minimized the labor cost, minimized the management cost, but still provided an increase in service. The greatest value-add was improving the procurement ratio of amount spent on new equipment instead of maintenance costs from the university's spend rate of 6%/94% to their proposed rate of 19%/81%.

The UTO Director had been trying to make the transformation to a more efficient, measured, value added structure for the past two years, but was not successful within the bureaucracy of the university. Now the entire system was measured. The vendor was not only providing every critical measurement that was requested, but also measuring against other major universities to ensure cutting edge IT Networking services. The UTO Director's statements, three months after the vendor took over the ASU IT network, were (Kashiwagi, 2014):

1. "Am I dreaming? Am I missing something? When do all the problems begin?"
2. "Am I missing something, or have we just made one of the biggest changes with no problems?"
3. "This is an unqualified success.....!"

Less than a year later, the senior manager of ASU/UTO moved to a different position at ASU. The new management was more MDC oriented. As time moved on, the vendor was directed to stop the constant use of metrics and to stop measuring the performance at other universities. However, PBSRG, the Best Value experts instructed the vendor to continue to keep and post their metrics internally. At the same time, the ASU Director of Procurement was promoted to the Senior Business Manager position, and ASU hired a new director of Procurement.

By 2013 both the new ASU procurement office and the new UTO group were questioning the performance of the BV IT vendor. They proposed that the contract would not be renewed in 2014, and the contract should be recompeted. The following reasons for non-performance were given (Kashiwagi, 2014):

1. There were too many outages and the vendor was the reason for the outages.
2. The BV vendor was overcharging for services.

3. The BV vendor was not billing accurately.
4. The ASU users of the IT networking were dissatisfied.
5. The UTO office had to use MDC [2012-2013] to keep the service acceptable.
6. The BV vendor was not acting like an expert vendor in keeping ASU in the forefront of technology. They were viewed as reactive and not moving ASU to the latest technology.

The level of the degree of disagreement on the performance of the vendor was so high that the differences seemed irreconcilable. PBSRG recommended that the contract should be competed again. PBSRG proposed that this was not only in the best interest of ASU/UTO [who felt they were being cheated] but in the best interest of the vendor who thought they were delivering high performance services. PBSRG proposed to the ASU Procurement Office and the ASU UTO office that the performance metrics should be reviewed before any action was taken. Everyone agreed and the vendor presented their performance metrics in the fall of 2013 (see tables 9 and 10) (Century Link, 2013). The performance metrics were so dominant; it changed ASU/UTO's position. They dropped their request to re-compete the service, and renewed the contract with the BV vendor for another five years.

Table 9

Century Link Best Value Performance

	Before CL	**CL (2010) Contract Agreement**	**CL (2013) 3rd year Performance**
Business Costs			
MSA Baseline	$12.29M	$10.81M	$11.96M
Growth – Out of Scope	N/A	N/A	$1.15M
Value Add	N/A	$0.43M/yr	$0.98M/yr
Net MSA	$12.29M	$10.38M	$9.83M
Reliability and Satisfaction			
# of Major Outages	N/K	37	11
% Uptime	99.802	99.989	99.998
Customer Satisfaction (max 4.0)	3.6	3.71	3.81
% of Tickets within SLA	0.94	0.97	0.97
Technology			
% Network supported (Not at end-of-maintenance)	0.89	0.99	0.99
% 1Gb- Wired Connections	0.57	0.715	0.96
% Wireless(n)	0.09	0.087	0.926
IT Spending Ratio (New vs. Maintenance)	6/94	26/74	56/44

Source: ASU MSA Annual Review. Meeting Minutes. Retrieved September 17, 2013 from Arizona State University Annual Review.

Table 10

Vendor Upgrades to Network Management Processes and Security

Before CL	**CL 3rd year results**
Manual KPI tracking	On-line KPI tracking
Informal Change Management	Formal Change Management Process
Manual Project Tracking	Sharepoint
Single level of Engineering Review	Multiple levels of Engineering Review
No Redundancy Testing	Bi-annual testing
Minimal Security Setup	NG - Firewalls, Segmentation, Malware Protection, Logging

Source: ASU MSA Annual Review. Meeting Minutes. Retrieved September 17, 2013 from Arizona State University Annual Review.

The presentation of the metrics confirmed the following:

1. Metrics assists the best value vendor clearly identify their performance.
2. Metrics allow a vendor to plan ahead.
3. Metrics creates transparency, and stops win/lose behavior.
4. Performance metrics protect the vendor, as well as the owner/user from themselves.
5. MDC creates confusion, non-transparency and an inaccurate picture of reality.
6. Documentation utilizing metrics of the vendors protects the vendors against abuse.
7. Selecting a BV vendor, allowing the BV vendor to use metrics to identify their performance and minimizing deviations, validated the BV approach.

The BV vendor's presentation utilizing the performance metrics along with accompanying documentation at the time of award, and during the lifetime of the contract, made the following very clear:

1. The BV vendor was a very high performance vendor, who provided services to the highest level, while reducing the costs.
2. The vendor took over the antiquated ASU IT networking system "as is."
3. The vendor made drastic improvements to the ASU network system.
4. The client wanted even higher performance during the contract years.
5. The BV vendor reduced the cost by 25% ($2.8M/year).
6. The BV vendor upgraded all points to 1MB connects, and transformed the campus into a wireless environment.
7. The vendor increased the supportability of all networking to 99% even though most components were no longer being manufactured.
8. The vendor changed the spend ratio (maintenance/new equipment) from 6%/94% to 56%/44%.
9. Outages decreased by 67% and ASU/UTO was responsible for all outages.
10. Customer satisfaction increased.
11. The BV vendor raised security levels, and made it possible for any UTO personnel to get access to the metrics information on the internet.
12. The requirement created by ASU/UTO (that was not in the contract) that the BV vendor was responsible for upgrading the technology and systems every year was not a valid requirement.

The ASU IT Networking Services delivered by the Best Value approach was unique in the following ways (Kashiwagi, 2014):

1. The best value approach was fully utilized to deliver ITC services.
2. The owner did not know the state of their IT Networking system [they were not the expert].
3. The results of the BV delivery were identified as successful by all parties.
4. The ASU/UTO leadership delivering the best value results was separated, and a new group that was more comfortable with the traditional MDC took over, causing confusion, nontransparency, and questioning the success of the BV vendor.
5. The BV expert vendor used their metrics to create transparency. Even the MDC owner agreed that the vendor was a high performer.

Even though the client in the execution phase attempted to return to the traditional MDC approach, the BV vendor unilaterally ran the BV approach, and their metrics and documentation and understanding of the BV approach allowed them to utilize their expertise, increase performance and deliver the best value at the lowest cost. When they could not control the owner, they documented the actions of the owner which clearly showed the owner made decisions, overrode the expertise of the vendor, and therefore were liable for the poor performance and risk that the vendor could not control.
This case study showed the following (Kashiwagi, 2014):

1. The ICT vendor was an expert.
2. The owner utilized the expertise of the expert ICT vendor.
3. The ICT vendor lowered the cost and raised the level of performance of the client's IT networking system.
4. When the owner and vendor disagreed on the level of performance, the expert vendor utilized metrics to show performance.
5. The metrics created transparency and allowed everyone to understand the performance of the IT vendor was spectacular.
6. The owner rehired the BV expert IT vendor.

Even in a confusing state, where the owner and the vendor disagreed on performance, the metrics created transparency and both parties agreed that the vendor was a high performance BV vendor. All the BV concepts were documented in this case study.

Schuberg Philis Case Study

In 2013, Schuberg Philis [SBP] was introduced to the BV approach. They immediately gravitated to the BV concepts due to a high similarity to the SBP approach to delivering ICT services. The authors had interest in SBP as a case study for the following reasons:

1. Their philosophy was very similar to the BV concepts.
2. They had performance metrics.

The authors had the following objectives in studying SBP:

1. Was SBP an expert in the ICT infrastructure and application integration industry in the Netherlands?
2. What are similarities between SBP and the BV approach?
3. Can SBP make improvements using BV concepts?

The BV approach requires an expert vendor. SBP has the following performance metrics that identify them as an expert vendor (See table 11 and 12, figure 5, 6 and 7):

1. They are the top rated ICT vendor in the ICT infrastructure area [in every category measured].
2. They have a project performance of 89.36% on time, 95.74% on budget, and 93.62% customers satisfied on 47 large projects in the last six years.
3. Their performance on large [larger than 150K Euro] projects showed the same performance as smaller projects.
4. Of the six most critical ICT providers that support financial vital infrastructures as stated by DNB (same function as Federal Reserve Bank); they are the only vendor with 100% customer recommendation for outsourcing. (Figure 6).
5. In the last four years, their business process uptime performance is 99.994.
6. Their customer satisfaction rating was 8.9 in 2013 – highest in the IT market for 7 years in a row, 2 full points above the market average [6.9].
7. SBP has 30 expert project managers within the company. Nine out 30 project managers' performance lines are made available for this paper. The average project manager of these 9 have done 5 projects of 150K, with customer satisfaction of 100%, scope of 404K Euros, largest project of 1,402K Euros, a percent cost and time deviation of .68% and 1.33% respectively, and 7.8 years at SBP.
8. Case studies show that although they are perceived as having very high cost, the exact opposite is true. They minimize cost and time for the clients.

Table 11

Schuberg Philis Overall Performance Line

#	Criteria	Metrics
1	Total # of projects in last 10 years	991
2	# of large projects (€150K- € 3.3 Million)	47 (72)**
3	% of large projects on time	89.36%
4	% of large projects on budget	95.74%
5	% of large projects customers satisfied	93.62%
6	Highest customer satisfaction 7 years in a row (Market Average)*	8.9 (6.9)*
7	Recommended by customers by year	100% 5 years in a row
8	Business Process Availability past 4 years	99.994%

* Market average was taken from 2014 Giarte Report

**72 projects existed however; documentation older than 6 years was discarded and not available.

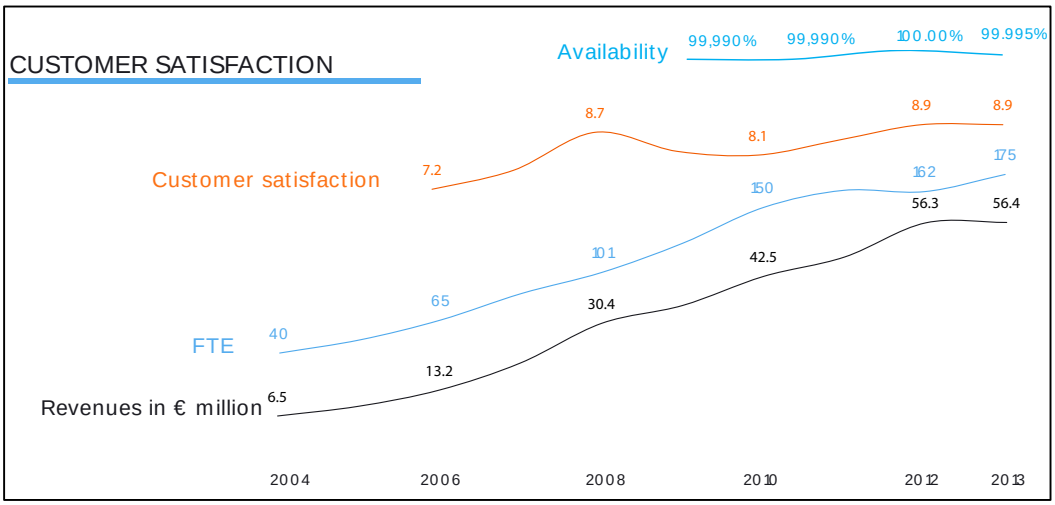
Source: Schuberg Philis Audit on Project Metrics 2009-2014 by Sandeep Gangaram Panday, 2014: Schuberg Philis.

Table 12

Project Manager Performance

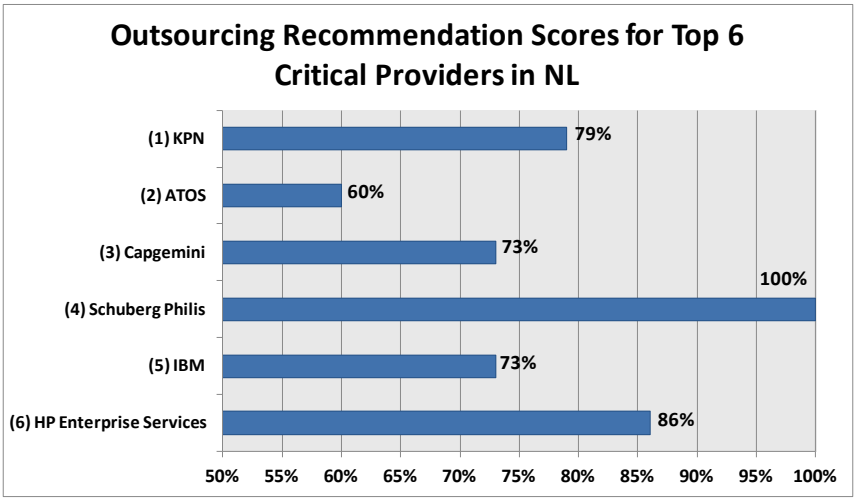
	Average of 9 PMs	PM 1	PM 2	PM 3	PM 4
Average size of projects	€ 404,000	€ 264,000	€ 329,000	€ 475,000	€ 328,000
Largest project	€ 1,042,000	€ 764,000	€ 501,000	€ 1,250,000	€ 700,000
# of projects > 150k	5	6	2	5	4
# of years working for SBP	7.8	10	13	7	2
Customer satisfaction	100%	100%	100%	100%	100%
Project cost deviation	0.68%	0%	0%	0%	0%
Project time deviation	1.33%	0%	0%	0%	0%
	PM 5	**PM 6**	**PM 7**	**PM 8**	**PM 9**
Average size of projects	€ 568,000	€ 323,000	€ 350,000	€ 586,000	€ 413,000
Largest project	€ 935,000	€ 556,000	€ 603,000	€ 3,289,000	€ 780,000
# of projects > 150k	3	11	4	7	4
# of years working for SBP	9	8	6	4	12
Customer satisfaction	100%	100%	100%	100%	100%
Project cost deviation	0%	0%	6.1%	0%	0%
Project time deviation	5%	0%	0%	7%	0%

Source: Data retrieved by personal interview by J. van Wegen & A.van Schendel, personal communication, September 17, 2014.



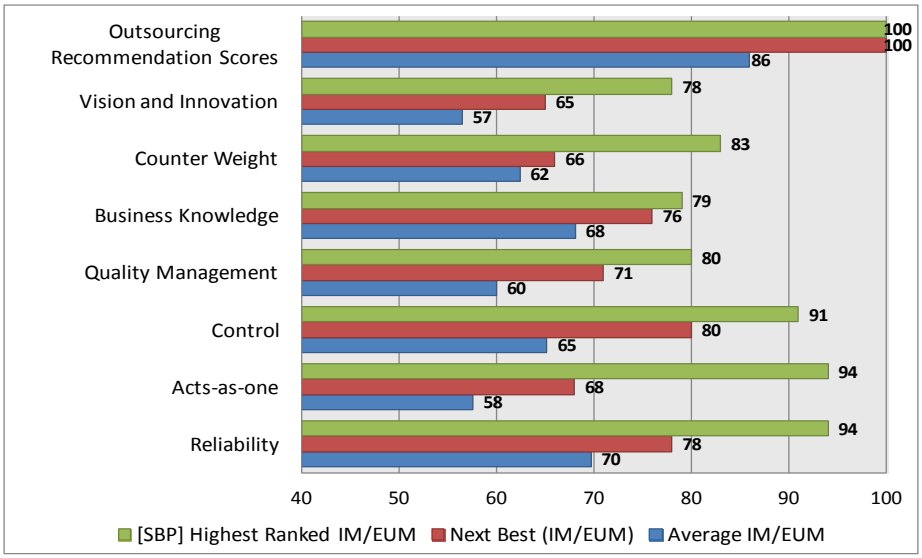
Source: Schuberg Philis Customer Satisfaction [PowerPoint slides] by Schuberg Philis:

Figure 5. Schuberg Philis Growth and Performance



Source: The outsourcing recommendations were taken from the Outsourcing Performance 2014 Report by Giarte and the Critical Providers were identified in the 2012 Symposium Uitbesteding & Cloud computing by the De Nederlandsche Bank.

Figure 6. De Nederlandsche Bank Report



Source: Adjusted from the Outsourcing Performance 2014 Report by Giarte.

Figure 7. 2014 Giarte Report Results

SBP has a tremendous amount of case studies which shows their ability to minimize the client/owner's ICT implementation time and cost. It is important to note that the SBP project performance metrics have been certified by a certified professional auditor using the audit standards as defined by Norea, the Dutch Branche organization for IT-Auditors (http://www.norea.nl/). Information on customer satisfaction is acquired from the independent Giarte Report. The following are examples from customer references of SBP:

1. Banking Industry [names and references of banks are available upon request from SBP]: SBP completed 14 bank projects with 0% cost and time overrun, 9.0 customer satisfaction and a

delivery time of 6-14 months where the normal delivery time of the market is 24 months or more with a 50% success rate (Table 13).

2. Dutch Federal Government Department [Undisclosed Department]: SBP took over a failed client project which was cancelled after spending 2 years and €15M. SBP proved how the project could be successful in 7 weeks for 200,000 Euros by a Proof of Concept and would be able to reuse 65% of the investments spent on the previously failed project (Table 14).
3. Online Retail Company [name available upon request]: SBP increased their uptime from 96.5% to 99.998%, increased the number of product groups completed each year from 0.5 to 3, and assisted in the CIO receiving the CIO of the year award in 2008 (Table 15).
4. Insurance company [Undisclosed but reference is verified by certified accountant]: SBP increased availability from 98.0% to 99.98% and decreased the client's contingency budget from €800K to €0 (Table 16).
5. Energy Company [name available upon request]: SBP decreased downtime per month from 2.880 minutes to less than 1 minute, improved project on time performance from 50% to 99.6% for the past 450+ projects, and improved the client's TCO from an identical project costing €480,000 in 2006 to earning a profit of €24,000 in 2013 (Table 17).
6. Port Authority Service [name available upon request]: SBP implementation minimized cost per functionality change by 75%,
7. minimized the application deployment cycle life cycle from 26 to 3 weeks, reduced the downtime in a year from 24 hours to 0 hours, and eliminated a backlog of application related business reuirements by 3 years (Table 18).

Table 13

Banking Industry

Performance Criteria	**Metrics**
Total # of banks	14
*Delivery time (months)	6-14
Cost and time overrun	0%
Customer satisfaction (1-10)	9.0

*Normal delivery time in marketplace is > 2 years or 24 months with a 50% success rate

Table 14

Department (ICT Improvement Project)

Performance Criteria	**Before SBP**	***SBP**
Duration of project	2 years	7 weeks
Cost	€ 15.00 Million	€ 0.20 Million
Project results	Failed	100% Success
Customer satisfaction	4	Very high

*SBP was able to reuse 65% of spent investments on previously failed client project

Table 15

Online retail

Performance Criteria	Before SBP	SBP
Availability	< 96.5%	99.998%
# of new product groups a year	0.5	3
Compliancy statements (PCI DSS)	NA	Yes
CIO named CIO of the year	No	Yes

Table 16

Insurance Company

Performance Criteria	Before SBP	SBP
Availability	< 98%	99.98%
Compliancy statements (SAS 70/ISAE3402)	N/A	Yearly
# of compliancy findings	Undisclosed	0
Contingency budget for claims	€ 1 Million	€ 0.00

Table 17

Energy Company

Performance Criteria	Before SBP	*SBP
Downtime per month	2.880 minutes	< 1 minute
Cost	Increasing cost	- In 2006: € 480,000 (cost) - In 2011: € 240,000 (cost) - In 2013: € 24,000 (profit)
Project results	50% not on time	450+ projects 99.6% on time
Customer satisfaction	Very low	9.0

*The reason Company outsourced to SBP was due to a single deal that lost the company € 1.5 million due to a slow system

Table 18

Port Authority Service

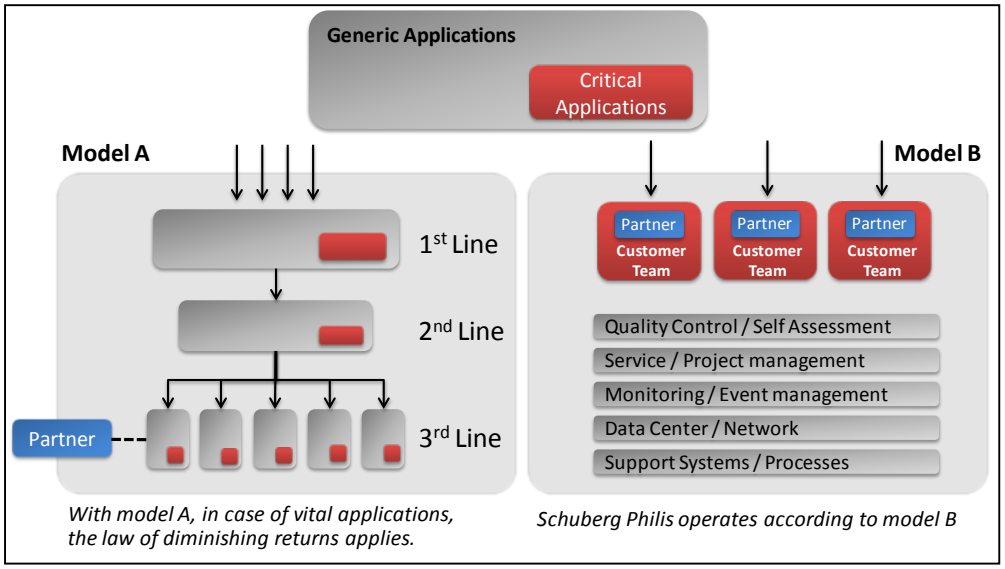
Performance Criteria	Before SBP	SBP
Downtime in a year (hours)	≥24	0
Longest downtime due to IT failure (hours)	4	0
Application deployment life cycle (weeks)	26	3
Cost per functionality change	-	-75%
Business time required related to mediating downtime and incidents	1 full FTE	0
Backlog of application related business requirements	3 years	0
Problems with legal issues / liability claims / reputational damage	Yes	No

The SBP case studies show some characteristics about the ICT industry in the Netherlands:

1. SBP documentation identifies their expertise by minimizing the time and cost required to implement ICT infrastructure. They show by comparison with other ICT services that SBP expertise delivers services for a dominant lower cost, faster time and adding value to business. This is counter to some perceptions that they are high cost or expensive service providers.
2. Their expertise is defined by dominant differences in metrics of project cost and time.
3. Expertise and the utilization of expertise may be the reason SBP has the high customer satisfaction.
4. SBP expertise has been sustainable [10 years, 991 projects, 97% success] and their Best Value approach [discussed later] to business increases their level of expertise.
5. There high performance on both large and small projects shows that the utilization of expertise is a solution to ICT industry complexity issues. It also identifies that the solution of making projects smaller is an indication that the ICT industry may lack expertise. It also identifies the possibility that ICT project complexity is also caused by a lack of expertise.
6. Case studies coupled with high performance over a sustained time period identifies that SBP must have a continuous improvement program in place to be able to produce dominant value over a number of years. High sustained performance has not been identified in many companies in the ICT industry.

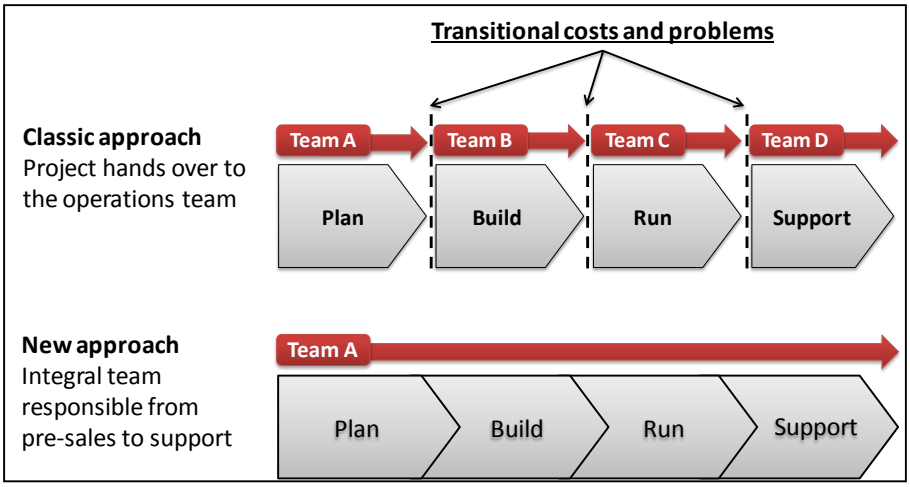
SBP is the only company that the authors have confirmed with performance documentation that has multiple major characteristics of a BV operation. The only other company worldwide that has been documented is SEMCO, a pump manufacturer company in South America, whose visionary owner has become famous for the radical approach of observation, alignment and transparency (Stockport 2010). SBP has the following unique BV operational characteristics:

1. They utilize lead experts who are the interface with the prospective clients from the beginning to the end. The traditional approach is to have marketing and sales personnel to interface with prospective clients (See figure 8).
2. They utilize a risk management system that identifies the cost of risk that they cannot control before the project begins to ensure that impact of changes by a client will be understood by the client.
3. Lead project managers volunteer for all potential projects. They must be able to internally within SBP show capability and a successful plan to deliver the potential project before they propose to a prospective client.
4. Lead project managers form teams with voluntary team members.
5. SBP has no function silos. The expert led team takes the project from the design, planning and execution phases to the end of the project (See figure 9).
6. There are no management, direction and control personnel positions at SBP. There is no management layer that manages the project leads. All positions are volunteer positions and team membership must also be voluntary. Any policies must be accepted by the project teams. There are no MDC policies that come from a management group.
7. All personal compensation is based on peer review of the individual.
8. SBP provides total transparency of their costs to the clients.
9. SBP also has internal transparency in their company that is due to the voluntary nature of participation and peer review.



Source: Schuberg Philis 2013 Company Introduction [PowerPoint slides] by Schuberg Philis.

Figure 8. Expert Front Line Client Interface



Source: Schuberg Philis 2013 Company Introduction [PowerPoint slides] by Schuberg Philis.

Figure 9. Integrated Project Teams

SBP Continuous Improvement and Movement to the Best Value Approach

SBP uses the BV approach to their service. They utilize the following BV concepts:

1. Utilize expertise to minimize transactions.
2. Do not use MDC in their operations.
3. Do not use silo based behavior.
4. Create cost transparency for client.
5. Do risk mitigation.
6. Keep performance metrics to provide transparency.

SBP is a BV organized and high performing expert ICT infrastructure vendor in the Dutch marketplace. Their project performance and customer satisfaction performance numbers show that they are one of the highest performing vendors in the Netherlands. When approached with the BV approach, SBP analyzed their high performance operations and realized that they could become even better by making slight changes in their approach to their operations.

SBP identified that they were currently using an agile project management approach, and as a result the project managers did not always have a detailed project schedule and representative milestone schedule. The project cost and time deviation could not be easily tracked [that would increase the level of internal and external transparency] by both the clients and SBP leaders. SBP leaders also realized that client caused unforeseen cost and time deviations that were being absorbed by SBP to continue to deliver on time and on budget [SBP goals]. They identified that the transparency SBP was providing the clients often led to more client stakeholder participation and requests for more detailed information instead of giving the clients the confidence that SBP was performing on the project and minimizing client/expert transactions. Despite their industry leading performance, the SBP leaders understood the potential value of the subtle paradigm shift from the agile approach to the BV approach.

For the first time in the 22 year history of PBSRG research and development of the BV environment, the authors identified the following:

1. An already highly successful organization was ready to make a subtle but monumental change to go from an expert with a more industry acceptable approach [agile project management] to a futuristic BV approach that no one had previously harnessed.
2. A successful organization's leadership understood the difference between a "price based" transparency that increases MDC transactions and a BV transparency that allows the minimization of MDC and the utilization of expertise.
3. An organization with such a low level of risk [nonperformance] had motivation to change their successful model to become even more successful.
4. SBP had enough Type A or visionary employees that a companywide change/movement could be made to create the level of transparency that performance metrics can provide. This has not been achieved by any vendor in PBSRG's 20 year research of BV environment and supply chain development. Previously, PBSRG advice would be against such a move due to the lower percentage of visionary employees.

The SBP leaders identified that having a BV periodic risk management report (RMR) would create a metric based BV transparency which would allow the clients to have more confidence that their project was on track. The passing of non-technical metrics would allow "non-experts" to understand without getting into the technical details of the project. This would also minimize the client's requests for more detailed project information and minimize the risk of MDC. They also agreed that the metrics could be used internally to quality control the projects using transparency rather than MDC. They have put the RMR system on their company cloud (Schuberg Philis, 2014a). This action will increase the transparency inside and outside of SBP. This action will also create a competitive advantage that will be difficult to challenge and emphasize the importance of expertise and the utilization of expertise.

Having a BV RMR would also motivate the SBP project team leaders and teams to do the following:

1. Identify the project requirement in terms of non-technical metrics at the very beginning of the project.
2. Work the detailed schedule from the end back to the beginning.
3. Use a milestone schedule with time and cost implications to create transparency with the clients.
4. Identify up-front, the potential impact of SBP installed ICT system to the client's business goals.

The biggest change that SBP agreed to do is to document their deliverable from the end to the beginning, identify risk that they do not control, mitigate risk, identify the cost and time deviation caused by risk and simplify their explanation to their clients using non-technical metrics that the client can easily understand. With this information, SBP is also able to create a transparent structure within their company to give potential and current clients access to performance information on Schuberg Philis that was previously not available in the industry on any vendor. SBP has shown the Dutch ICT industry performance can be significantly improved.

They are showing the difference between utilizing the agile project management approach with the vendors who may not be utilizing expertise. SBP has committed to move from an agile PM approach, to a full blown best value (BV) approach. All future SBP projects will be done with the BV approach.

Lessons Learned from SBP Case Study Investigation

The following are preliminary lessons learned from the SBP case study investigation:

1. The ICT industry is price based [relationship based and non-transparent]. Despite SBP high performance, they must still spend significant resources on forming relationships to increase their business.
2. The level of expertise in the industry is low, thus prompting industry personnel to identify the complexity of the projects as the reason for project failure. However, when an expert is identified and expertise is utilized, it is easily identified that the performance on the project is not related to project size or complexity.
3. The ICT industry has not recognized the replacement of MDC with the utilization of expertise as a major solution for solving the industry's performance issues. SBP is a dominant example of the potential of utilizing expertise to resolve industry issues.
4. SBP shows the potential of the BV approach in solving the ICT industry problem of low performance.
5. The level of expertise of ICT vendors may be more dominant than realized by the ICT owner/client industry.
6. The operations of SBP show a potential of using a language of metrics to minimize the owner/client need to MDC expert vendors.

7. MDC based approaches may be the source of problems in the ICT industry. Complexity may be caused by non-experts, by MDC practices and by the bureaucratic organizations and their operational practices.

Further Research

The authors will approach the SBP organization to further document the changes and challenges of the movement from their current operations and environment to a fully transparent and metric based BV environment. The authors see the SBP model as a representation of the potential of the ICT industry and potential changes that the Netherlands is already embracing in other industries.

Analysis of BV Case Study Results

The Arizona State University IT Networking case study, the State of Oklahoma BV history and the State of Oklahoma Tax Software case study, and the SBP case study show the potential of the BV approach [utilizing expertise] to improving ICT industry performance. Each case study shows a dominant improvement in performance. The case studies support the following concepts of the BV approach:

1. The replacement of MDC with the utilization of expertise may be the most needed change required to improve industry performance.
2. The utilization of expertise leads to lower costs, higher performance and value. This is despite some industry perception that expertise is too costly. Then, when faced with massive failure due to the utilization of vendors without adequate expertise, they blame the complexity of the projects.
3. If the expert must be managed, directed and controlled, they are defined as a non-expert and are being hired by a non-expert client.
4. Transparency minimizes the level of complexity and increases the value of experts and their expertise.
5. The price based environment is a MDC environment that increases cost and risk.
6. The relationship based environment of the ICT industry is a price based MDC environment that is non-transparent, complex and increases project cost and risk.
7. The utilization of expertise may increase the success of the traditional waterfall approach, doing smaller projects and utilizing the agile approach to project management.

Comparison of the Three Approaches to the ICT Industry Performance

The waterfall approach is the traditional approach. It utilizes MDC, lacks flexibility, and oftentimes results in poor performance in ICT systems delivery. Simplifying the complexity of an ICT project by making projects smaller, allow the less expert vendors to be more successful. Logic and common sense tells us that this is an accurate concept. The agile approach increases flexibility, simplifies by breaking the project up into manageable components, and increases the teamwork of the client/owner and the vendor. Agile project management should also increase the performance and this is borne out by the results of agile PM by Standish Group and the Schuberg Philis results.

The BV approach stresses utilizing expert vendors [ensuring that an expert vendor is selected], minimizing owner/client MDC, and forcing the expert to use transparency, metrics, and non-technical language to increase the accountability of the expert vendor and motivating the owners to minimize interference in the project. The BV approach has the following advantages:

1. Minimizes the need to MDC expert vendors.
2. Increases the accountability of the expert vendors.
3. Increases the accountability of the client/owners to know their business and how the ICT applications will add to their business goals.
4. Increases the value of the experts and their expertise.
5. Creates transparency which allows everyone to understand the project with minimized information and communications.
6. Increases the strength and performance of the industry to deliver high performance.

Conclusions

The ICT industry [owners/clients and vendors] are struggling with increasing the performance of their industry. Although new solutions have been suggested and implemented, the overall performance and customer satisfaction could be improved. The current environment is one where the owner/client/buyer of ICT services hires a consultant and manages, directs and controls [MDC] the vendor through a contract. The two major methods of award are low price and a negotiated contract [based on a relationship]. The project is designed and implemented in a "waterfall" approach.
Three potential solutions have been proposed. The first is to make projects smaller, and thus simpler, and the smaller projects would have greater performing results. The assumption is that the projects are too complex. This is logical and simple. It assumes that projects are too large and complex. It also assumes that the industry does not have the expertise to resolve the complexity of large projects.

The Schuberg Philis [SBP] case study results, identifies SBP as an expert vendor who does not agree with the proposal that smaller projects would minimize risk and increase performance. They have done large and small projects, are the #4 critical ICT provider in the Netherlands that support vital IT infrastructures, and the size of their projects has not had impact on the performance of the projects. The third party, performance rating system, which gets feedback of industry clients on all projects in the Netherlands, also disagrees with this assumption. The Giarte reports show that larger projects have received higher satisfaction ratings more often than smaller projects. And smaller vendors show higher performance on smaller projects than larger vendors.

The downside to this concept of making projects smaller and requiring less expertise is that it would become a price based commodity. Owners/clients would have a low price mentality, and the vendors who have less expertise would be encouraged to bid low to get the work. It would penalize those with expertise, and increase our current industry problem of poor performance.

The second solution, the agile project management approach, is a logical solution. The approach breaks up the project into smaller components, utilizes partnering between all stakeholders, and lessons learned can be quickly implemented into the project's other components. The Schuberg

Philis case study shows that the agile project management can lead to outstanding performance. The Standish group claims that the agile approach increases performance by 33%. The downside of this approach is that it does not minimize the owner's management, direction and control [MDC] which is a source of project cost and time deviation.

The third solution is the best value [BV] approach. The approach has been tested, modified, and implemented for the past 20 years. It proposes to replace the owner MDC with the utilization of expertise. The best value is the best value for the lowest price. It uses the following concepts:

1. Expert vendors are used to lower costs and improve value.
2. Experts use nontechnical metrics to form transparency.
3. Transparency is used to mitigate risk.
4. Communication between stakeholders is done with a language of metrics.

The difference between the first two approaches and the third approach is that the BV approach utilizes expertise to resolve the complexity, while the other two approaches attack the complexity by reducing the scope by making the project smaller or by breaking a project up into smaller components and working on a component at a time. Experts in the BV approach work backwards from the well-defined deliverable to the initial conditions, while the other two approaches work from the beginning to the end.

The Schuberg Philis case study is a key to potentially solving the ICT industry performance issue. SBP is an ICT industry expert who has documented their performance. They are very successful using the Agile project management approach. Their case studies and performance metrics confirm their high level of expertise. They show that utilizing expertise resolves the nonperformance issues. Their leadership is interested in becoming even higher performing by adopting the BV structure. Their approach is significant in confirming that vendors with expertise and high performance, also have a drive to continuously improve. Their movement from the agile approach to the BV approach shows the potential of the BV approach in the ICT industry. Their expertise and utilization of expertise to perform, shows the importance and potential of expertise and the best value process in raising the level of performance in the ICT industry.

Recommendation

Recommend that further work be done documenting the performance of the SBP company and the increase of performance in moving from the agile project management approach to the BV approach. Recommend also working with the large ITC companies in the Netherlands to study the difficulties they may have in changing from a traditional to a BV organization. Also recommend publishing parts of this paper in other journals concentrating on specific ICT issues. Incorporating the information in this paper in educational programs to users of ICT would also assist the Dutch outsourcing industry.

References

Al-ahmad, W., Al-Fagih, K. Khanfar, K., Alsmara, K., Abuleil, S., Abu-Salem, H. (2009) A taxonomy of an IT project failure: root causes. International Management Review, 5 (1), 93-106.

Beedle, M., Bennekum, A. V., Cockburn, A., Cunningham, W., Fowler, M., Highsmith, J., et al. (2001). Principles behind the Agile Manifesto. http:// agilemanifesto.org/principles.html.

Budzier, A. & Flyvbergj B. (2011). Why your IT project may be riskier than you think. Business Harvard Review, 89 (9), 601-603.

Century Link (2013, September 17). ASU MSA Annual Review. Meeting Minutes. Retrieved September 17, 2013 from Arizona State University Annual Review.

Chiang, J. (2013) 21st Century Project. California State Controller's Office. http://www.sco.ca.gov/21century.html.

Costello, T., Mcclaim, E. (2013, October) Obamacare glitches: Gov't contract for troubled site has swelled; GOP targets Sebelius. NBC News. http://www.nbcnews.com/news/other/ob amacare-glitches-govt-contract-troubled-site-has-swelled-gop-targets-f8C11419179.

Cutter Consortium. (2008) How agile projects measure up, and what it means to you. Arlington, MA: Mah, M., Lunt, M.

DeMarco, T. (1982). Controlling software projects: Management, measurement & estimation. New York, NY: Yourdon Press.

Deming, W. E. (1986). Out of the crisis. Cambridge, Mass: Massachusetts Institute of Technology, Center for Advanced Engineering Study.

Dinan, S., Howell, T. (2014, April) Price of fixing, upgrading Obamacare website rises to $121 million. Washinton Times. http://www.washingtontimes.com/news/2014/apr/29/obamacare-website-fix-will-cost-feds-121-million/?page=all.

Dorsey, P. (2000) Top 10 reasons why systems projects fail. Dulcian Inc.

Duren, J. and Doree, A. (2008) An evaluation of Performance Information Procurement System (PIPS), 3rd international public procurement conference proceedings 28(30) pp 923-946.

European Services Strategy Unit. (2007). Cost overruns, delays and terminations: 105 outsourced public sector ICT projects (Report No. 3). Duagh, Ireland: Whitfield, D.

Eye4Management. (“Government & ICT “, n.d.) http://www.eye4management.nl/transitiemanagement/ict-samenwerkingsverbanden/overheid-verspilt-miljarden-aan-ict.

Failure Causes Statistics. IT Cortex. Retrieved from http://www.it-cortex.com/Stat_Failure_Rate.htm.

Gardner, D. J. (2000) How to avoid IT project failures. Consulting to Management, 11 (1), 21-23.

Geneca. (2011). “Doomed from the Start? Why a Majority of Business and IT Teams Anticipate Their Software Development Projects will Fail. Winter 2010/2011 Industry Survey.

Giarte. (2014) Report Transformers Outsourcing Performance 2014. Amsterdam, Netherlands: n.d.

Giarte. (2014) Satisfaction across service providers. Amsterdam, Netherlands: n.d.

Glaser, J. (2004) Management’s role in IT project failures. Healthcare Financial Management, 58 (10), 90-92.

Government Accountability Office. (2008). OMB and Agencies Need to Improve Planning, Management, and Oversight of Projects Totaling Billions of Dollars. (GAO Publication No. 08-105IT). Washington, D.C.: U.S. Government Printing Office.

Grossman, I. (2003). Why so many IT Projects fail and how to find Success. Financial Executive, 19 (3), 28.

Henderson, P. (2006) Why Large Projects Fail. School of Electronics and Computer Science University of Southampton.

Hershey, R. (1996, April) A technology overhaul of I.R.S. is called a fiasco. New York Times. http://www.nytimes.com/1996/04/15/us/a-technological-overhaul-of-irs-is-called-a-fiasco.html.

Institute for Defense Analysis (2011) Assessment of DoD Enterprise Resource Planning Business Systems. Alexandria, Virginia: Ketrick, P., Bailey, J., Cunningham, M., Odell, L., Douglas, G., Floyd, D., Insolia.

Kanaracus, C. (2012, February) Air Force scraps massive ERP project after racking up $1B in costs. Computer World.http://www.computerworld.com/s/article/9233651/Air_Force_scraps_massive_ERP_project_after_racking_up_1B_in_costs.

Kanaracus, C. (2013, February) California ends contract with SAP over troubled IT project. Computer World.http://www.computerworld.com/s/article/9236662/California_ends_contra ct_ with_SAP_over_troubled_IT_project?taxonomyId=214&pageNumber=2.

Kappelman, L., McKeeman, R., Zhang, L. (2009) Early warning signs of IT project failure: the dangerous dozen. The EPD Audit, Control and Security Newsletter, 40 (6), 17-25.

Kashiwagi, D. (2014). 2014 Best Value Standard. Performance Based Studies Research Group. Tempe, Az. Publisher: KSM Inc., 2014.

Kashiwagi, D. (2014a). 2014 Information Measurement Theory. Performance Based Studies Research Group. Tempe, Az. Publisher: KSM Inc., 2014.

Kashiwagi, D., Kashiwagi, J., Kashiwagi, A., and Sullivan, K. (2013). The Solution Behind The Revolutionizing Of The Dutch Construction Industry, ISEC-7, Honolulu, June 18 –23, 2013

Kashiwagi, D., Savicky, J & Kashiwagi, A (2002). Analysis of the Performance of 'Best Value' Procurement in the State of Hawaii. ASC Proceedings of the 38th Annual Conference, Virginia Polytechnic Institute and State University – Blacksburg, Virginia, pp. 373-380.

Kashiwagi, D. T. and Badger, W. W. (1991) Job Order Contracting: A New Contracting Technique for Maintenance and Repair of Construction ProjectsCost Engineering 33 (3) pp. 21-24, March.

Kashiwagi, D., Kashiwagi, J., Sullivan K. (2013) The Research Model that Revolutionized the Dutch Construction Industry. Journal for advancement of performance information and value, 4 (2), 147-160.

Kashiwagi, D., and Kashiwagi, J. (2013) "Dutch Best Value Effort." RICS COBRA Conference 2013, New Delhi, India, pp. 356-363 (September 10-12, 2013).

Kashiwagi, J. (2013). Factors of Success in Performance Information Procurement System / Performance Information Risk Management System. Retrieved from http://repository.tudelft.nl/view/ir/uuid:d5bd9eff-7bc9-4257-9227-f6a9261883cf/. (ISBN [978-1-889857-33-6]).

Kashiwagi, J., Sullivan, K. and Kashiwagi, D. (2009) Risk Management System Implemented at the US Army Medical Command, Vol. 7 No.3, 2009 pp. 224-245.

Kruimel (2012, September) Mislukte projecten van de overheid kost ons miljarden per jaar. Plazilla. http://plazilla.com/page/4294999411/mislukte-projecten-van-de-overheid-kost-ons-miljarden-per-jaar.

Levin, A. (2013, May) Air-traffic upgrade over budget, facing delays: report. Bloomberg. http://www.bloomberg.com/news/2013-05-31/air-traffic-upgrade-over-budget-facing-delays-report.html.

Mckinsey & Company. (2012). Delivering Large scale IT projects on time, on budget and on value. New York City, NY: Bloch, M., Blumberg S, Laartz, J.

Michael, J., Sullivan, K. and Kashiwagi, D.T. (2008) "Leadership Based Project Management Model Tested on Food Services at Arizona State University" 4th Scientific Conference on Project Management (SCPM) & 1st International Project Management Association (IPMA) / Mediterranean Network (MedNet) Conference on PM Advances, Training & Certification in the Mediterranean, Chios Island, Greece, pp.234-238 (May 29, 2008).

Moseley, J. (2013, November) Government computer failures are normal. American Thinker. http://www.americanthinker.com/2013/11/government_computer_failures_are_normal.html.

Nagesh, G. (2008, April) Census to scrap nadheld computers for 2010 count. Nextgov. http://www.nextgov.com/technology-news/2008/04/census-to-scrap-handheld-computers-for-2010-count/41957/.

Nato Science Committee. (1969) 1968 Nato Software Engineering Conference. Garmisch, Germany: Editors Naur, P., Randell, B.

Netherlands house of representatives state general. Tijdelijke commissie ICT (2014). http://www.tweedekamer.nl/kamerleden/commissies/tcict/verslagen_hoorzittingen.jsp.

PBSRG. (2014). Performance Based Studies Research Group Internal Research Documentation, Arizona State University, Unpublished Raw Data.

Perera, D. (2013, June) TRANCON air traffic control modernization faces prospect of more schedule, cost overruns. Fierce Government IT. http://www.fiercegovernmentit.com/story/tracon-air-traffic-control-modernization-faces-prospect-more-schedule-cost/2013-06-02.

Project Management Institute. (2014, May) PMI certification statistics. PMI Today.

QSM Associates. (2009) The agile impact report proven performance metrics from the agile enterprise. McLean, VA: n.d.

Rijt, J., Santema, S. (2013) The Best Value Approach in the Netherlands: a reflection on past, present, and future. Journal for advancement of performance information and value, 4 (2), 147-160.

Ringelestijn, T. V. (2014, June) Mislukt it-project kost Belastingdienst ruim 200 miljoen euro. Web Wereld. http://webwereld.nl/beveiliging/82955-mislukt-it-project-kost-belastingdienst-ruim-200-miljoen-euro

Sauer, C., Cuthbertson, C. (2003) The State of IT Project Management in the UK 2002-2003. Computer Weekly, 2003, London (82 page report).

Savolainen, P., Ahonen, J. (2010) Software engineering projects may fail before they are started: Post-mortem. The journal of systems and software, 83, 2175-2187.

Schmidt, R., Lyytinen, K., Keil, M., Cule, P. (2001) Identifying software project risks: An international Delphi study. Journal of Management Information Systems, 17 (4), 5 -36.

Schuberg Philis. (2014). Schuberg Philis Audit On Project Metrics 2009-2014. Netherlands: Sandeep Gangaram Panday.

Schuberg Philis. (2014a). Way of Working – ‘The WHAT’ 2014, Schuberg Philis PM Company Policy 2014.

Scrum Alliance. (2013) The state of scrum: benchmarks and guidelines. Orlando, FL: Kim, D.

Serena. (2012) There's more to agile than development. Dallas, TX: n.d.

Shine technologies. (2002) A passion for excellence. Melbourne, VIC: n.d.

Standish Group. (1995). CHAOS Manifesto 1995. Boston, MA: The Standish Group International, Inc.

Standish Group. (2011). CHAOS Manifesto 2011. Boston, MA: The Standish Group International, Inc.

Standish Group. (2013). CHAOS Manifesto 2013. Boston, MA: The Standish Group International, Inc.

State of Hawaii PIPS Advisory Committee (2002), Report for Senate Concurrent Resolution No. 39 Requesting a Review of the Performance Information Procurement System (PIPS), Honolulu, HI: U.S.Government, Available from: http://Hawaii.gov/dags/rpts/pips.pdf>.

Stockport, G. (2010) Semco: cultural transformation and strategic leadership. International Journal of Technology Marketing 5 (1), 67-78.

Sullivan, K., Kashiwagi, M. and Kashiwagi, D.T. (2005) "Transforming the MEDCOM Facilities/Construction Management Environment into an Information Environment" ASC International Proceedings of the 41st Annual Conference, University of Cincinnati, Ohio CD-T6 (April 6, 2005).

Thompson, J. (2012, April) Fixing the IRS. Government Executive. http://www.govexec.com/magazine/features/2012/04/fixing-irs/41637/.

United States Department of Commerce. (2011). Census 2010: final report to congress. (Final Report No. OIG-11-030-I). Washington, D.C.: U.S. OIG Office of Audit and Evaluation.

United States Senate Permanent Subcommittee on Investigations (2014) The Air Force's Expeditionary Combat Support System (ECSS). Washinton, D.C.: Levin, C., McCain, J., Bean, E., Kerner, H., Patout, B., Davis, L., Dean, A., Robertson, M., Henderson, A.

VersionOne. (2007) Agile development: results delivered. Alpharetta, GA: n.d.

VersionOne. (2007a) 2nd annual survey "the state of the agile development. GA: n.d.

VersionOne. (2013) 7th annual state of agile versionone agile made easier development survey. Alpharetta, GA: n.d.

Viergever, Nico (2014 March) ICT-projecten komen in de problemen omdat het ICT-projecten zijn. Management Site. http://www.managementsite.nl/43055/ict-internet/ict-projecten-falen-ict-projecten.html

Vlahos, K. (2013, October) Just how much did HealthCare.gov cost? Fox News. http://www.foxnews.com/tech/2013/10/11/just-how-much-does-healthcaregov-cost/.

Zembla (2014, October) ICT-bedrijf Ordina fraudeerde met overheidsaanbestedingen. Zembla. http://zembla.vara.nl/seizoenen/2014/afleveringen/02-10-2014/ict-bedrijf-ordina-fraudeerde-met-overheidsaanbestedingen/.