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W117 Visionaries:

Thank you for the efforts of the [W117 Best Value International Board](#) and the W117 journal paper reviewers for doing such a spectacular job. The objective of the journal this year is to meet the requirements of being a ranked journal. To increase reads on the published papers, W117 is sending all papers to [Research Gate](#) if approved by the authors. Research Gate does the metrics on all papers. This is the journal's methodology to get the published papers reviewed and "on the street" as soon as possible to allow industry and academic researchers to utilize the research results. Using Dr. Kashiwagi as an example, the reads on 133 papers has increased from 5K reads in 2017, to 25K reads in July 2019, an increase of 500% in 2.5 years. We encourage all researchers in the specialty areas of the use of performance information, facility management, project management, risk management and supply chain management to get their papers in the journal and on the street.

W117 is increasing the innovation by aligning visionary stakeholders in the supply chain and utilizing them to help change the current paradigm. The approach being used by W117 is to use the Information Measurement Theory (IMT) as the foundation for the research. It assumes most stakeholders in the supply chain have the following characteristics:

1. Operations are based on decision making, management, direction and control.
2. Processes are ineffective and inefficient.
3. Poor project performance.

The research agenda for the next five years includes:

1. Changing the structure of W117. Research will be recursive as the actions of all the participants in the W117 structure will be actively participating in the research.
2. Forming an international board of experts in the Best Value Approach (BVA). This board will run tests, document the tests with peer reviewed papers, and become reviewers for other BVA papers.
3. Forming [PBSRG](#) education satellite sites that are facilitated by BVA International Board members to proliferate the BVA.
4. Implementing the BVA into, both a private and public, organization in the United States to replace management, direction and control in the delivery of services by identifying and utilizing expertise.
5. Design an Information Based Continuous Improvement (IBCI) system which uses accurate and timely performance information to optimize the Kingdom of Saudi Arabia classification system.

6. A research effort to change the project management model from the management, direction and control approach to the utilization of expertise and transparency. This effort is integrating the BVA test projects, the IBCI project, and a research effort at the SKEMA Project Management School to define the Project Management Model of the Future.
7. Use a new component of W117, [Leadership Society of Arizona](#) (LSA), to test and implement IMT information concepts to prepare young students to operate in the age of automation by minimizing thinking, data collection and decision making. This education overcomes the paradox of how to understand reality without knowing anything. These programs produce Information Workers (IW) who use the language of dominant metrics to understand the present and future conditions of reality.

I encourage journal readers to dream of innovation. This next year (2020) will produce results which will dwarf the results previously discovered in the use of performance information. Best wishes to everyone!

Dr. Dean

Professor Dean T. Kashiwagi  
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(As presented at the CIB World Building Congress 2019)

# W117 Performance Information in Construction: Summer 2019 Research Roadmap

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## Introduction

W117 is responsible for the development and continuous testing of the following technologies:

1. Best Value Approach (BVA) (Kashiwagi, 2019).
2. Best Value (BV) Intellectual Property (IP) technology.
3. Performance Information Procurement System (PIPS).
4. Performance Information Risk Management System (PIRMS).
5. Information Measurement Theory (IMT) and Kashiwagi Solution Model (KSM) and related models such as Spectrum of Observation (Kashiwagi, 2019).
6. Industry Structure model.
7. A new project management model based on IMT.
8. Definitions of Risk, Expert and movement of Project Management by management, direction and control (MDC) to Project Management by simplicity, alignment of expertise, language of metrics and transparency.
9. A new risk management model that focuses on the risk that the expert vendor does not control.

To help understand the value of information and transparency, the Industry Structure (IS) model which was created in 1991, and modified continually, has been changed to an information based IS model (Figure 1). The development of the information based IS model has identified the importance of information and transparency. This has become the model that is transforming the Saudi Arabian Classification System.

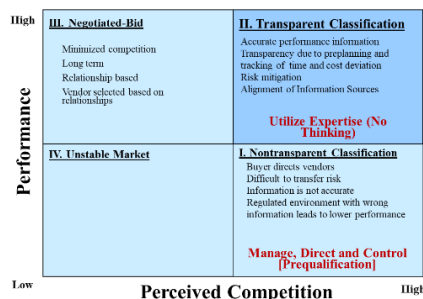


Figure 1: Information Based Industry Structure Model

The activities of W117 are responsible for the following impacts of the Best Value Approach (BVA) concepts on the delivery of construction:

1. Rijkswaterstaat, the largest user of construction services in the Netherlands, won the 2012 Dutch Sourcing Award (DSA) for the successful completion of a \$1B infrastructure project called “fast-track projects” using BV-PIPS.
2. NEVI, the Dutch procurement professional organization, has licensed the Best Value technology from ASU and has identified the approach as a mainstream approach to the delivery of services, educating and certifying procurement professionals in the delivery of construction and other services.
3. Dutch visionary and author Sicco Santema, and his protégé Jeroen Van de Rijt, published a Best Value Procurement (BVP) book, using Dutch test cases to show the BVA technology was compliant with European Tender Law (12,000 books sold). Other books (in Dutch) were also published for the contractor community.
4. RISNET, a Dutch risk management association, licensed the Best Value Approach in order to increase the use of the risk-based project management in the construction industry.
5. W117 BVA certification system was developed, which certifies competence of BV professional practitioners.
6. W117 introduced the BVA into Canada, resulting in \$3M research grants for the delivery of construction services in 25 different universities and government organizations.
7. W117/PBSRG Best Value signed a sole source agreement with the National Association of State Procurement Officials (NASPO) and their subsidiary, the Western States Contracting Association (WSCA), to allow all states to utilize the W117/PBSRG technical expertise by “sole source.” This has led to tests in 33 different states.
8. Introduction of BV into Malaysia in 2012, into the Project Management Master’s Program, led by Dr. Fah Choy Chia at Universiti Tunku Abdul Rahman (UTAR).
9. Introduction of BV into India in 2014 resulting in the noted engineering school, SJCE, adopting the curriculum into their engineering school.
10. Introduction of BVA into Norway in 2014, through the FIR, the construction engineering association. FIR also translated the Dutch book into Norwegian, going public on June 20, 2016, during a three-day event to include the first certification of Best Value professionals in Norway. The first BVA testing occurred in 2016 (with the award made in 2017), and with a minimum of five additional tests scheduled in 2017. The first large BVA certification testing sponsored by W117, occurred in 2017 in Trondheim, Norway. Earlier individual certifications occurred in 2014 and 2016.
11. Introduction of BV into Poland with a three-day conference in Krakow in March 2016, with the publication of the translated Dutch Best Value Procurement (BVP) book into Polish. The first W117 sponsored certification training occurred in April 6, 7th 2017 with the licensed Polish BV Foundation. The first BVA project is currently being run in 2019 to procure an IT software package.
12. A major classification system project is being designed for the Kingdom of Saudi Arabia [2016 – present].
13. A major joint venture is investigating creating a BVA training site in Belgium.
14. Introduction activities in Switzerland, Denmark, Finland, Hungary, and Germany.

These research efforts have led to the following future research and development opportunities:

1. Development of the language of metrics in the delivery of construction services.
2. The development of a new risk management and project management models.
3. Opportunity to test the sustainability of innovation in traditional environments.
4. Opportunities to test the innovative concepts in different countries.
5. Opportunity to identify and test the sustainability of testing new theoretical concepts in the industry without the traditional extensive academic research literature search and investigations.

### **Future Direction of W117 Research (2018 – 2023)**

The worldwide competitive marketplace is moving toward automation and information systems. The major user of automation is the country of China. By observation, once the user of low-cost labor, the inconsistency results have forced China to become the world's foremost user of automation. This type of competition is forcing the optimization of supply chains (lower costs and higher performance). W117 has been the leader in the documentation of performance information research and how to utilize the performance information to increase project performance in the CIB. Dr. Dean Kashiwagi (co-chair) has identified a very aggressive course of the next five years of W117 to address the following:

1. Make the current academic/industry research structure more efficient and effective.
2. Create a research structure that takes the information to the industry through a more effective website, presentations and satellite sites.
3. Create transparency through easy and fast access of information.
4. Change the education/training path to the industry by exposing the information environment to the future generation before they enter the industry.
5. Change the supply chain to take advantage of a more automated risk management and project management model utilizing the theoretical definitions of experts, risk, risk mitigation and project management. Although these concepts were previously identified by W117 research, implementation in the industry has been challenging.

This approach can be defined as an attempt to automate or streamline the W117 structure as well as the BVA IP technology utilizing performance information. By solving both problems by using performance information, W117 will propose that the performance information or BVA IP is recursive, and information is recursive in nature. The data which when analyzed normally identify the equation, will actually be used to replace the equation and thinking and decision making that goes along with the analysis.

### *Changing the Education and Research Structure*

The traditional academic research model (see Figure 3) for the past 25 years has been where academic research analyzes industry practices and publishes the analysis in academic journals. The research normally takes 4 – 10 years to create the journal publication. University professors normally participate in a funded system such as the National Science Foundation (NSF),

Department of Transportation and other federal grant programs, Construction Industry Institute (CII) or smaller institutes such as the Design Build Institute of America (DBIA), Associate General Contractors (AGC) or other funding group. Researchers then propose on needs of the industry and must continually find and receive grant opportunities to sustain their research. The traditional research professor's success depends on the ability to accomplish the following:

1. Get involved with the granting organizations.
2. Write proposals in the area of industry interest.
3. Be successful in winning a couple of grants.
4. Be promoted to academic administration positions such as director of research, department chair, or dean of the college and manage other young researchers.

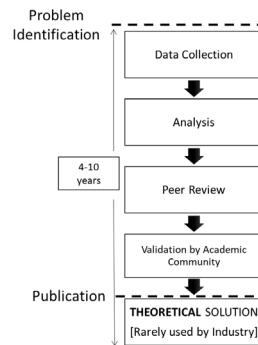


Figure 2: Traditional Academic Research Model

Academic researchers rarely get the opportunity to become experts in solving industry problems. They cannot drill down into problems and become industry experts. This role is normally left to industry consultants who have the experience to solve industry issues. Academics attempt to differentiate between research and consultation. They have created silos (see Figure 3a) and have concluded that research is more valuable than consultation.

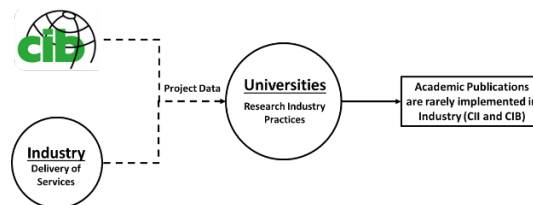


Figure 3: Traditional Academic Research Model (Silo-Based)

Dr. Dean Kashiwagi (founding co-chair) of TG61 and W117 was one of those individuals who was a research/industry expert (25 years, \$17.6M funding, 2,000 tests delivering \$6.6B of construction and other services, 9 different countries, and 62 intellectual property (IP) licenses (the most licensed IP developed at ASU), and 360 refereed journal papers, books, and conference presentations). He aligned his expertise with the Performance Based Studies Research Group (PBSRG) at Arizona State University, the W117, and the IP of Information Measurement Theory (IMT), the Best Value Approach (BVA) and the Performance Information Procurement System (PIPS) (Kashiwagi, 2019).

However, the inefficiencies of the academic research community (high overhead of university grants, the bureaucratic assignments of the university administration and complex rules of research engagement) encouraged Dr. Kashiwagi to move the research center PBSRG to the private sector to create a more dynamic research model which was more effective and efficient. Dr. Kashiwagi moved the financial support of PBSRG and leading W117 to KSM (a research consulting organization). It is the first Working Commission in the CIB that is being led by a private sector researcher and research group that has a foundation of concepts that were developed under the umbrella of the CIB (W117, 2018). To make this model successful, W117 is attempting to make the following changes:

1. Create a new structure where W117 researchers have full access to the IP and can educate and train others (see Figure 4).
2. Form an international board of industry experts for BVA IP certification to proliferate and development of the technology of performance information (see Figure 5).
3. Increase exposure into more countries by presentations, website, and publications through the creation of an international board of experts in using performance information and the BVA (Figure 5).
4. Increase the number of W117/PBSRG satellite sites that proliferate the technology through licensed and certified educators (see Figure 6).
5. Utilize Arizona State University intellectual property (IP) licensing to maintain successful implementation of the IP technology transfer.
6. Combine “research” and “consultation” to do a mixed methods approach which assumes that the construction industry after 60 years of research and practice, have not understood the major source of the problems in construction, risk and project management (see Figure 7).
7. Minimize the time to publish industry test findings and to immediately “put the information on the street” using free access, public website platform (W117 Journal and Research Gate open platform website) (Figure 8).
8. Test the BVA IP concepts on K-12 (high school students) to prove that the information concept is recursive and can not only be used to solve the industry problems, but also optimize the future generation of professionals’ comfort level with automation and information systems (see Figure 4, 9).
9. Implement the testing of BVA IP technology concepts into K-12 grades high school students to prepare the next generation for an information based and fully automated systems environment (Leadership Society of Arizona (LSA)). Implementation of the W117 IP Concepts (see Figure 9).

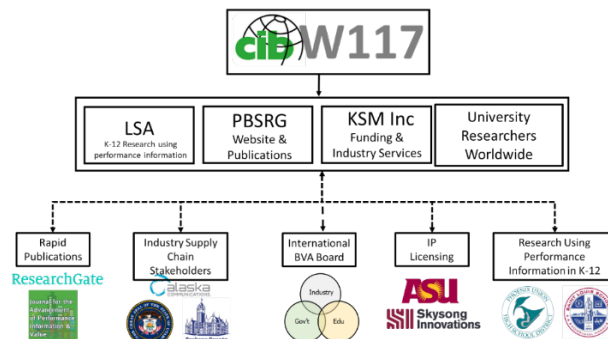


Figure 4: W117 Research Pipeline



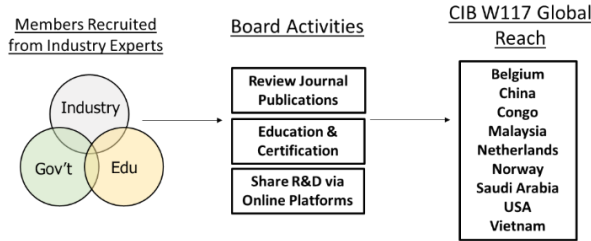


Figure 5: International W117 BVA Board

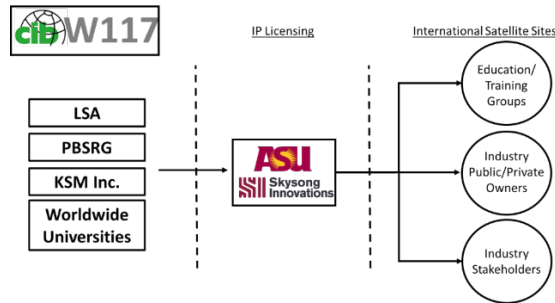


Figure 6: Licensing and Distribution Pipeline

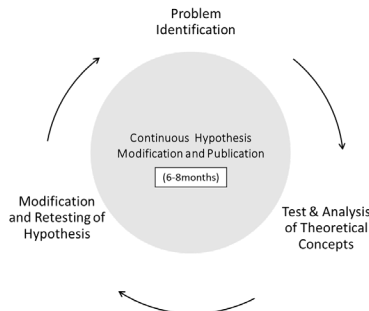


Figure 7: W117 New Research Environment Utilizing Actual Industry Testing



Figure 8: W117 and Research Gate Performance

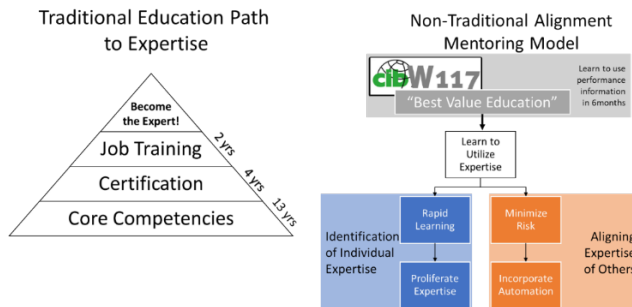


Figure 9: Changing the Education Training Model

W117 research has identified the following challenges in the implementation of BVA concepts:

1. In the Netherlands, the W117 research activity led to the Best Value IP becoming the mainstream procurement approach. It led to multiple Best Value Procurement (BVP) publications and papers. However, the implementation of the BVA clarification phase and the Weekly Risk Report (WRR) have not met expectations.
2. The Best Value Procurement hybrids have become an issue.
3. The concepts of minimized thinking and decision making in the delivery of services has shown to be difficult to implement and sustain.

### New Research Concepts

As a result of the Dutch experience with the BVA, the following concepts will be redefined, simplified, implemented/tested and retaught to the industry:

1. Move the emphasis from using the BVA technology (performance information) in the procurement function to the project management function (see Figure 10).
2. Semi-automate the procurement function by removing need to think or process and make decisions (see Figure 10).
3. Change the project management model from a management model to a leadership model. Remove management, direction and control from the current project management model (see Figure 11).
4. Redefine risk in simple terms that were previously identified in the Information Measurement Theory (IMT) (see Figure 12).
5. Redefine the definition of an expert to concur with the BVA definition (see Figure 13).
6. Minimize risk and cost by using performance information instead of competition and MDC and negotiation (see Figure 14).
7. Redefine performance information to “machine language” definition (countable and observable or can be verified by robotics) (see Figure 15).

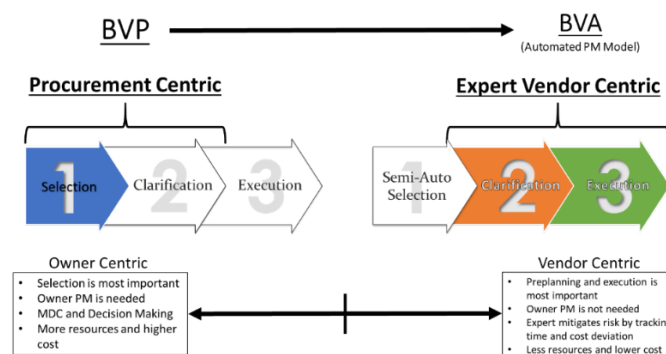


Figure 10: BVP to BVA

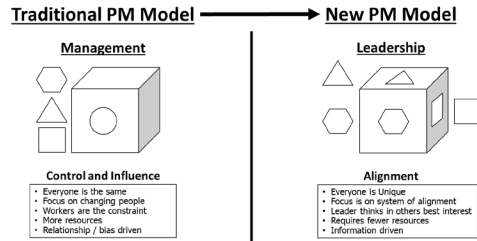


Figure 11: Traditional PM Model vs. New PM Model

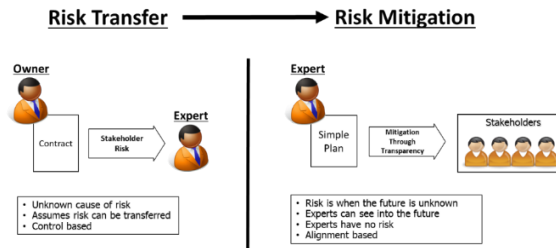


Figure 11: Risk Transfer vs. Risk Mitigation

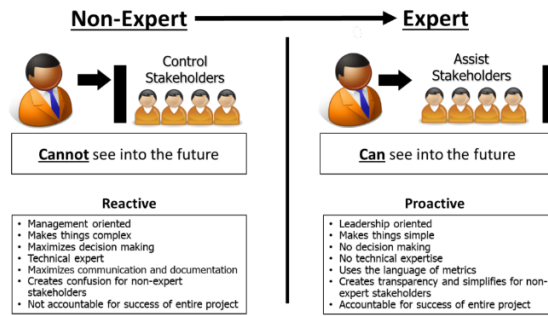


Figure 13: Non-Expert vs. Expert

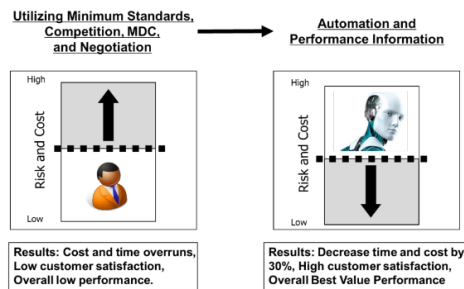


Figure 14: Maximization vs. Minimization of Risk and Cost

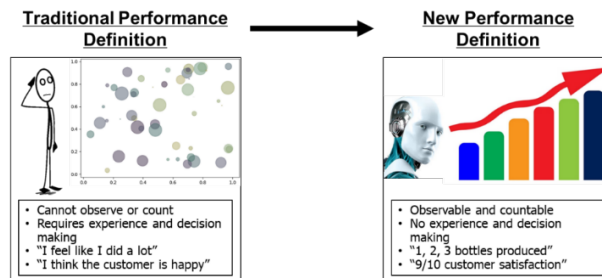


Figure 15: Traditional vs. New Definition of Performance

W117 will link the past/traditional approaches (procurement, project management and risk) with the future approaches (automation, minimized human thinking and decision making and identification and utilization of expertise and metrics which are observable and countable). W117 is the only organization that has published work on BVA development and has the expertise to link the past BVA concepts to the future concepts that align with automation and information systems. W117 was organized around the expertise of its founder Dean Kashiwagi. As successful as W117 has been in identifying performance, improving performance, and documenting performance, W117 has perceived that a part of the problem in getting to change the industry may be the academic research model itself.

The new W117 research structure eliminates the bureaucracy and limitations that slow down the academic model. In the traditional academic model, research institutions collect data from industry projects, but the data is never applied to industry solutions (see Figure 3 on page 14). Instead, institutions use the data to write publications with the goal of gaining more research funding. This process involves lengthy review stages and publication restrictions. The goal of the academic-centric model is to receive recognition from highly praised academic sources.

The new W117 Industry-Centered model subverts the traditional publication process (see Figure 3a on page 14). Research data is taken directly from applied projects where it is rapidly published online and shared with industry stakeholders. This model creates a transparent flow of information between researchers, educators, and industry leaders. This model accomplishes more than publications, its goal is to improve industry performance. This model achieves the following:

1. Minimizes time to publish research findings on the street using W117 journal and free access, public website platform (see Figure 7 on page 17).
2. Form international board for BVA certification to proliferate the technology and increase exposure to more countries by presentations, website, and publications (see Figure 5 on page 16).
3. Increases the number of W117/PBSRG satellite sites that proliferate and maintain technology performance through Arizona State University intellectual property (IP) licensing (see Figure 6 on page 17).
4. Implements the BVA technology into the education cycle to prepare the younger generation for information based and fully automated systems (see Figure 9 on page 18).

### **Accelerate the Change in the Industry Supply Chain Structure to Overcome Industry Challenges**

The W117 information technology research implements critical changes in the supply chain structure that can increase project performance. The change in the supply structure has the following facets:

1. Semi-automate the procurement function and transition to a project management focused model (see Figure 10).
2. Redefine project management focus from a management model to a leadership model.
3. Redefine risk management (see Figure 12).

4. Clarify the definition of an expert (see Figure 13).
5. Minimize risk and cost by using performance information instead of competition and MDC and negotiation (see Figure 14).
6. Redefine performance information to “machine language” (countable and observable or can be verified by robotics) (see Figure 15).

The newest BVA model will be created by semi-automating the procurement model and putting emphasis on the project management model which will also be a semi-automated model using the Weekly Risk Report (WRR) in the BVA model. The WRR will be the structure for the new, leadership-based project management (Kashiwagi, 2019).

The previously identified terms “expert”, “risk”, and “risk mitigation” will be documented in publications. Experts are defined by personnel who minimize their thinking, decision making and can see into the future from the beginning to the end of a project (see Figure 12 on page 20). Valid performance information minimizes thinking and decision making. If performance information must be analyzed, BVA does not define it as useful performance information.

## **Conclusion**

The five-year future of W117 research will include the following:

1. Change the structure of W117. Take the leadership and operation participants from a university platform to a private sector platform. Create a structure of international experts who are vested in the theoretical area of performance information and the Best Value Approach (BVA). Use the information approach to optimize W117.
2. Have the private organization based W117 identify experts, researchers and university participation.
3. Move primary focus of W117 and research to project management instead of procurement. Develop a new project management platform to change the traditional management, direction and control (MDC) PM approach to a leadership-based PM approach that is based on information.
4. Increase the number of publications and decrease the time to publish the performance information technology. Make all publications from the W117 journal to the open platform Research Gate. Continue to double the reads, citations, and research followers.
5. Redefine the terms information, transparency, expert, risk and risk mitigation.
6. Increase the number of presentations of the information based intellectual property worldwide by industry experts.
7. Move into other industries such as services and education to implement the concepts of performance information to optimize the industries.

Much of the content of this paper is from the CIB W117 Roadmap, the latest published in Dec 2018. Permission has been received from the W117 to use the material (W117, 2018).

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# A Structured Approach for Questionnaire Survey of Construction Delay

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Construction delay is a common problem costing the industry billions of dollars every year. The first step to reduce this unnecessary loss is to identify the major delay factors. More than 200 studies on major construction delays have been reported using self-administered questionnaire surveys of views of project participants. The present approach adopted is reviewed by a case study of Egypt. Thirty-two delay factors were identified as major construction delay factors. A thorough review of these eight studies revealed many shortcomings in the present approach. A structured approach is proposed for questionnaire survey to study major construction delay factors.

**Keywords:** Egypt, schedule performance, construction delay factors, structured approach, questionnaire survey.

## Introduction

Construction delay is a common problem costing the industry billions of dollars every year. Identifying the major construction delay factors is the first step in understanding poor schedule performance. Appropriate measures can then be implemented to address issues related to the major construction delay factors to achieve good schedule performance. More than 200 studies on construction delays reported used self-administered questionnaire surveys of owners, contractors and consultants. The questionnaire was developed based on either construction delay factors reported in the literature or by open ended interviews with selected panels of contractors, consultants and owners. The major construction delay factors were established by statistical analysis of the survey data. There were several short comings in the present approach for such studies resulting in a diverse and inconsistent range of the top major construction delay factors identified for a country. Obviously, some of the top major construction delay factors were inappropriate. This is important because it is confusing to practitioners in devising appropriate measures to achieve better schedule performance. The purpose of this paper is to use a case study to identify the short comings of the present approach for questionnaire survey to study major construction delay factors. A structured approach will be proposed to address such short comings so that the most appropriate top construction delay factors can be identified.

Egypt is chosen for the case study. There are eight studies to identify major delay factors for construction projects in Egypt reported in the literature. All these studies were based on self-administered questionnaire surveys of views of project participants. Thirty two of the forty two construction delay factors reported in the literature had been identified as one of the major construction delay factors. Egypt is not a large country in its physical size. The wide diversity of major construction delay factors identified was illogical. To clarify this confusion, a review of the eight studies was undertaken to identify the top major construction delay factors for Egypt.

### *Egypt's Construction Industry*

Egypt has a population of 92 million in 2016 and is one of the most populous countries in Africa and the Middle East. Egypt is the largest oil refinery center in Africa. The largest market in the Egyptian construction industry was infrastructure construction accounting for slightly more than a quarter of the total volume. The second largest market was industrial construction accounting for slightly less than a quarter of the total volume, followed by commercial construction accounting for about 20% of the total volume. The residential and institutional constructions account for the remaining about 20% of the total volume.

In the past, the Egyptian construction industry stemmed from a lack of resources and technological expertise. More recently it was the management and administration of construction projects. The construction industry was facing a skills deficit that extended to engineers and there was a need to create a more institutionalized and structured system for training skilled labor and engineers. Specific training programs could potentially help contractors. A shortage of raw materials, an uncertain political environment, price controls and excessive government interference in the operation of construction industry were among the main obstacles affecting the construction industry. There were not many contractors in Egypt relative to its population. Its capability was also limited. It had been estimated that the new capital city needs at least 500 contractors, whereas there were not more than 300 qualified. If Arabtec's one million homes were built, at least 200 more contractors were needed. Before the revolution, there were 49,000 contractors registered with the Egyptian Federation for Construction and Building Contractors. It had reduced to 11,000 now. Most of them did not have the requisite classification to take on sizeable projects. There were only 280 contractors classified as level 1 to level 3, with the capability to execute projects worth US\$2.7 million and above. Only around 20 contractors were in level 1 classification. According to the Egyptian Federation for Construction and Building Contractors, 12,000 of the 15,000 registered small and medium-sized construction companies were experiencing problems in 2014-2015. The main challenge for smaller contractors lied in funding and financing their projects. The banking sector lacked confidence in financial and administrative management of small and medium-sized contractors. For larger contractors, the challenge was to avoid stretching their resources too thin. Many construction projects faced delays. Financing large construction projects was also an issue. It was not a preferred area for banks given the risks and delays in the past. Banks would only finance fast-track projects and not longer-term projects. When financing and debt was available, it was expensive. Overdraft fee facilities could reach as high as 16% for contractors. This was not an issue for international contractors because most of them accessed funding abroad. For local contractors, the lack and cost of financing posed a stern challenge to their operability.

### **Major Construction Delay Factors in Egypt**

#### *Standardization of Delay Factor*

One of the major difficulties in the present study is the lack of standardization of delay factors. Some of the delay factors have to be revised to those that are commonly found in the literatures. The standardization of delay factors is summarized in Table 1. It is not clear what is meant by



‘sudden failures actions’ of Aziz (2013). It is certain that sudden failures were not referring to equipment because another factor ‘frequent equipment breakdowns’ was ranked thirteen among the major construction delay factors identified. Therefore, it is not possible to include ‘sudden failures actions’ in the present study.

Table 1: Standardization of Delay Factors

Reference	Delay factor in reference	Standardized delay factor
Abd El-Razah et al. (2008)	<ul style="list-style-type: none"> <li>• ‘delays in contractor’s payment by owner’ and ‘partial payments during construction’</li> <li>• ‘the relationship between different subcontractors’ schedules’</li> <li>• ‘preparation of shop drawings and material samples’</li> <li>• ‘non-utilization of professional construction/contractual management’</li> </ul>	<ul style="list-style-type: none"> <li>• ‘finance and payments of completed work by owner’</li> <li>• ‘ineffective planning and scheduling’</li> <li>• ‘poor site management and supervision’</li> <li>• ‘poor contract management by consultants/substandard contract’</li> </ul>
Marzouk and El-Rasas (2014)	<ul style="list-style-type: none"> <li>• ‘effects of subsurface conditions (e.g., soil, high water table, etc.)’</li> </ul>	<ul style="list-style-type: none"> <li>• ‘inadequate site investigation/unforeseen subsurface conditions’</li> </ul>
Aziz (2013)	<ul style="list-style-type: none"> <li>• ‘selecting inappropriate contractors’</li> <li>• ‘poor financial control on site’</li> <li>• ‘inadequate planning’ by owner</li> <li>• ‘global financial crisis’</li> </ul>	<ul style="list-style-type: none"> <li>• ‘inadequate contractor experience/incompetence contractor’</li> <li>• ‘poor site management and supervision’</li> <li>• ‘owner’s lack of experience/incompetent project team’</li> <li>• ‘economic conditions’</li> </ul>
Shibani and Salah (2015)	<ul style="list-style-type: none"> <li>• ‘change orders during work’ and ‘changes of design by owner or his agent during work’</li> <li>• ‘poor communication and coordination of contractor’</li> <li>• ‘inappropriate government policy’</li> </ul>	<ul style="list-style-type: none"> <li>• ‘variation orders/changes of scope by owner during construction’</li> <li>• ‘poor site coordination’</li> <li>• ‘government regulation and permit approval’</li> </ul>
Nawar (2017)	<ul style="list-style-type: none"> <li>• ‘the amount of changes and owner behavior towards changes’</li> <li>• ‘level of constructability and extent of design review’</li> <li>• ‘owner management capability and ability to take timely decisions’</li> <li>• ‘scope definition and clarity’</li> <li>• ‘time allowed for project planning’ and ‘schedule accuracy’</li> <li>• ‘market conditions’</li> <li>• ‘project complexity’</li> <li>• ‘investigation of existing site conditions’</li> </ul>	<ul style="list-style-type: none"> <li>• ‘variation orders/changes of scope by owner during construction’</li> <li>• ‘lack of constructability reviews in design’</li> <li>• ‘owner’s lack of experience/incompetent project team’</li> <li>• ‘slow decisions from owner’</li> <li>• ‘lack of clarity in project scope’</li> <li>• ‘ineffective planning and scheduling’</li> <li>• ‘economic conditions’</li> <li>• ‘inadequate contractor experience/incompetence contractor’</li> <li>• ‘inadequate site investigation/unforeseen subsurface conditions’</li> </ul>

Reference	Delay factor in reference (cont'd)	Standardized delay factor
Hafez et al. (2016)	<ul style="list-style-type: none"> <li>• ‘change orders by owner during construction (variation)’, ‘variation order in extra quantities’, ‘change in drawings &amp; specifications’ and ‘materials changes in types and specifications during construction’</li> </ul>	<ul style="list-style-type: none"> <li>• ‘variation orders/changes of scope by owner during construction’</li> </ul>
Kholif et al. (2013)	<ul style="list-style-type: none"> <li>• ‘financial difficulties of contractor’ and ‘high insurance and high interest rates’</li> <li>• ‘high cost of skilled labor’</li> <li>• ‘inaccurate bill of quantities’</li> </ul>	<ul style="list-style-type: none"> <li>• ‘financing by contractor’</li> <li>• ‘inaccurate estimating of construction materials quantities/price’</li> <li>• ‘poor contract management by consultants/substandard contract’</li> </ul>

*Major Delay Factors of Egypt*

The methodology for the present study is to count the number of times each delay factors had been identified by the eight studies. The top major construction delay factors are factors identified by the most number of studies. The rational is obvious. Most of the respondents in the eight studies on Egypt had identified that delay factor. This methodology had been adopted by the studies reported by Kog (2017a, 2017b, 2017c, 2017d, 2018a, 2018b, 2018c, 2018d, and 2019) for Ghana, Nigeria, Jordan, UAE, Pakistan, Sri Lanka, Iran, Portugal, UK, US, Saudi Arabia, Kenya, India, Indonesia, Malaysia, Thailand, and Vietnam respectively. Table 2 tabulates the major construction delay factors identified by the eight studies for Egypt under project participants related factor, owner related factors, contractor related factors, consultant-related factors, and other factors. Each construction delay factor is placed in the category linked to the party which can exert the most influence on that factor. Delay factors that are beyond the control of project participants are grouped under ‘other factors’.

*Table 2: Summary of Construction Delay Factors from Existing Literature on Egypt*

Reference	1	2	3	4	5	6	7	8
Methodology of study	S	S	S	S	S	S	S	S
Number of respondents in the questionnaire survey/projects	74	33	@	2,500	63	40	52	15
Response rate (%)	NA	NA	@	83.3	@	40	65	60
Consistency check of questionnaire	No	No	@	No	No	No	No	No
Type of construction projects studied	B	A	A	A	A	A	B	B
<b>All project participants related factor</b>								
Communication problems/lack of adequate project coordination	X				X	X		
<b>Owner-related factors</b>								
Finance and payments of completed work by owner	X	X	X	X	X	X	X	X
Variation orders/changes of scope by owner during construction	X	X	X		X	X		X
Contractor selection methods (negotiation, lowest bidder)		X					X	
Slow decisions from owner								X
Owner interference					X			
Owner’s lack of experience/incompetent project team								X
Excessive bureaucracy in project-owner organization							X	
<b>Contractor-related factors</b>								
Inadequate contractor experience/incompetence contractor	X			X			X	X
Ineffective planning and scheduling	X	X	X	X			X	X
Inaccurate estimating of construction materials quantities/price							X	
Poor site management and supervision	X		X	X		X		

Reference (cont'd)	1	2	3	4	5	6	7	8
Poor site coordination					X			
Late delivery/shortage of construction materials		X	X					
Financing by contractor	X	X		X		X	X	
Subcontractor problems/mechanical and electrical construction						X		
Rework due to mistakes in construction/construction defects				X				
Low productivity level of labors		X			X			
Shortage of labors					X			
Unqualified workforce/low skilled labors		X		X	X			
Labor disputes/strikes/personal conflict among labors						X		
Equipment (or operator) availability and failure				X				
<b>Consultants related factors</b>								
Inadequate site investigation/unforeseen subsurface conditions		X				X		X
Lack of clarity in project scope								X
Poor contract management by consultants/substandard contract	X					X	X	
Mistakes and discrepancies in design documents by consultant						X		
Delay in revising design documents		X						
Lack of constructability reviews in design								X
<b>Other factors</b>								
Rise in prices of materials					X		X	
Economic conditions				X			X	X
Security/political situations	X			X			X	
Corruption				X	X			
Government regulation and permit approval					X		X	

S= study is based on a survey of views of owners, contractors and consultants; A= Building, road, water and sewer etc. projects; B= Building projects; @=not able to check; NA=not applicable

References: 1= Abd El-Razek et al. (2008); 2= Marzouk and El-Rasas (2014); 3= Amer (1994a) and Amer (1994b); 4= Aziz (2013); 5= Shibani and Salah (2015); 6=Hafez et al. (2016); 7= Kholif et al. (2013); 8= Nawar (2017)

Views are not reality and may not be correct. Views are not based on facts that have been critically reviewed and validated by an independent party. The quality of the survey data determines the accuracy of findings of studies based on self-administered questionnaire surveys. Respondents' views are derived from working experience and the number of years of working experience is crucial. Kog & Loh (2012) reported that views of respondents with less than 15 years were found to be not consistent with respondents with more than 15 years. This seems to be an objective criterion on the suitability of survey respondents. The construction period for a reasonably sized project will be around 3 years. A respondent with 15 years working experience will have completed a number of projects equivalent to about 5 reasonably sized construction projects. Such experience enables a broader and more incisive understanding of construction delay factors affecting construction projects. A respondent with less than 6 years of experience will only have completed one project. Some of the construction delay factors this respondent identified are unique to the completed project only and not typical for the construction industry. It is not surprising that the major delay factors identified by these studies with large proportion of 'inexperienced' respondents are not among the major delay factors identified by the present study.

Of the eight studies using self-administered questionnaire survey, no information on the profile of working experience of respondents was reported in Abd El-Razek et al. (2008), Hafez et al. (2016) and Shibani & Salah (2015). There was also no consistency check of the views of the survey respondents as demonstrated in Kog & Loh (2012). In Marzouk & El-Rasas (2014), "all

respondents hold senior positions with related working experience and the majority of them had practiced in the field for 20-30 years.” It is not clear what is meant by ‘majority of them’. Is it more than 50%, 60%, 70%, 80% or 90%? There were three out of the eight studies using questionnaire survey that provided information of the profile of working experience of respondents. Out of the 2,500 respondents of Aziz (2013), there were 903 respondents (36.12%) with more than 15 years working experience. In Kholif et al. (2013), 30 out of 52 respondents (57.6%) had more than 15 years working experience. In Nawar (2017), 3 out of 15 respondents (20%) had more than 15 years working experience. This shows the importance of working experience to the validity of the major construction delay factors identified is not fully appreciated.

The evidence from existing literature is that the views of respondents of the top delay factors depended on their occupations (owner, contractor, or consultant). There was no breakdown of the number of the occupations of respondents reported in Amer (1994a, 1994b), Marzouk & El-Rasas (2014) and Shibani & Salah (2015). The views of consultants were not sought by Marzouk & El-Rasas (2014). The views of contractors were over-represented in Abd El-Razek et al. (2008), Aziz (2013), Nawar (2017), and Kholif et al. (2013). The views of consultants were over-represented in Hafez et al. (2016). The number of owners, contractors and consultants of the eight studies were not equal. This meant that the views of one or two of these occupation groups were over-represented in such studies.

The response rate of Abd El-Razek et al. (2008), Marzouk & El-Rasas (2014), Amer (1994a, 1994b), and Shibani & Salah (2015) could not be calculated because the needed information was not given. As shown in Table 1, the response rate of Hafez et al. (2016) was less than 50% while that for Kholif et al. (2013), Aziz (2013), and Nawar (2017) were more than 50%.

None of these studies had carried out a consistency check with a pilot survey after finalizing the survey questionnaire. Despite these criticisms, the eight studies are not without values. The major construction delay factors identified by combining the findings of the eight studies are more credible than the individual studies.

The number of times each major delay factor identified by the eight studies summarized in Table 1 was calculated. Table 3 shows the top seven construction delay factors most cited in the eight studies. It is noted that the top construction delay factor was identified by 100% of the eight studies and the seventh construction delay factors were identified by 37.5% of the eight studies. This clearly illustrates the wide diversity of the views of the respondents. The wide diversity can be attributed to the inclusion of a significant proportion of respondents with less than 15 years working experience in the eight studies and the very small number of respondents in Nawar (2017).

Table 3: Top Seven Construction Delay Factors for Egypt

Rank	Construction delay factor	Identified in studies	
		No.	Proportion (%)
1	Finance and payments of completed work by owner	8	100
2	Variation orders/changes of scope by owner during construction	6	75
2	Ineffective planning and scheduling	6	75
4	Financing by contractor	5	62.5
5	Inadequate contractor experience/incompetence contractor	4	50
5	Poor site management and supervision	4	50
7	Communication problems/inadequate project coordination by all participants	3	37.5
7	Unqualified workforce/low skilled labor	3	37.5
7	Inadequate site investigation/unforeseen subsurface conditions	3	37.5
7	Poor contract management by consultants/substandard contract	3	37.5
7	Economic conditions	3	37.5
7	Security/political situations	3	37.5

The major delay factors identified by various studies were apparent causes. Some of these factors might not be the root causes of delay as defined by Ellis & Thomas (2002). Ellis & Thomas (2002) found that the root cause for a highway project was insufficient resources even though ‘utility relocations’ was identified as an apparent delay factor. Generally root causes were fewer; apparent causes were many in number. The approach to identify root cause was to trace the process beyond the point of the apparent cause to find the root cause and appropriate corrective action (Ellis & Thomas 2002). During interviews with all project participants, root causes of delay will emerge from repeatedly hearing similar problems and statements. The root cause may be different in different countries for the same apparent delay factor because of differing practices in the construction sector, economic and political conditions, and cultural background. The construction delay factors ‘finance and payments of completed work by owner’ and ‘variation orders/changes of scope by owner during construction’ are under the owner category. The construction delay factors under the contractor category accounting for five of the top construction delay factors are: ‘inadequate contractor experience/incompetence contractor’, ‘ineffective planning and scheduling’, ‘poor site management and supervision’, ‘financing by contractor’ and ‘unqualified workforce/low skilled labor’. The construction delay factors ‘inadequate site investigation/unforeseen subsurface conditions’ and ‘poor contract management by consultants/substandard contract’ are under the consultants-category.

It must be pointed out that the shortcomings discussed for the case study of Egypt are common in the 123 studies for other countries reviewed by Kog (2017a, 2017b, 2017c, 2017d, 2018a, 2018b, 2018c, 2018d, and 2019). This amply demonstrates that the present approach adopted for the study of major construction delay factors is not satisfactory.

### Proposed Structured Approach Using Questionnaire Survey to Study Major Delay Factors

A review of the eight studies to identify major construction delay factors for Egypt performed in the present study reveals several short comings in the present approach for such studies. These short comings include the lack of standardization of delay factors; consistency check of the questionnaire design; the number of respondents in the questionnaire survey; the response rate (also known as completion rate or return rate); number of each occupational group, and the

number of years of working experience for respondents. These desirable conditions are not new in social science and business research. Judging from the large numbers of works using questionnaire survey to identify major construction delay factors reported in construction management journals (including the top journals) that do not comply with these conditions, this shows the inadequacy of such knowledge among the reviewers, researchers, and construction professionals is glaring.

#### *Standardization of Construction Delay Factors*

The advantage of standardization of construction delay factors is that no further explanation of the meaning of the delay factor is necessary. In many of the studies reported in the literature, some of the construction delay factors, such as 'sudden failures actions' of Aziz (2013) pointed out earlier, were not defined. It is not possible to understand what these construction delay factor mean. In addition, standardized construction delay factors facilitate comparison between different countries. It follows that the delay factors listed in the survey questionnaire must be those standardized delay factors. If non-standardized delay factor must be used, then it must be fully defined in the questionnaire.

#### *Design of Questionnaire*

After finalization of the questionnaire for the survey, a consistency check of the questionnaire is required before it is used for the survey. The consistency check is normally performed with a pilot survey. In statistics, procedures such as computing confidence intervals and conducting hypothesis tests are normally performed. A desired property of procedures is consistency as the number of items in the data set increases indefinitely. More importantly, consistency requires that the outcome of the procedure with unlimited data should identify the underlying truth. As shown in Table 1, none of the studies on Egypt has conducted such a consistency check of the questionnaire design. Internal consistency is usually measured with Cronbach's alpha ( $\alpha$ ), a statistic calculated from the pairwise correlations between items. Internal consistency ranges between negative infinity and one. Coefficient alpha will be negative whenever there is greater within-subject variability than between-subject variability. Cronbach's alpha coefficients of internal consistency reliability tests for each of the responses to the questionnaire must be at least 0.7. Higher values of alpha are seemed to be more desirable. A commonly accepted rule for describing internal consistency using Cronbach's alpha is as follows: excellent:  $0.9 \leq \alpha$ ; good:  $0.8 \leq \alpha < 0.9$ ; acceptable:  $0.7 \leq \alpha < 0.8$ ; questionable:  $0.6 \leq \alpha < 0.7$ ; poor:  $0.5 \leq \alpha < 0.6$ ; unacceptable:  $\alpha < 0.5$  (George & Mallery 2003). Revision to the questionnaire will be required when Cronbach's alpha coefficients are less than 0.7.

#### *Number of Respondents of Questionnaire Survey*

The number of respondents of the eight studies ranges from 15 to 2,500. It is clear that these studies do not follow any specific guideline on the minimum sample size. In most of the studies using questionnaire survey, the population of the respondents is not fully known to the researchers. Therefore, it is not possible to adopt random or probability sampling as a sampling frame. Normally, a self-administered survey questionnaire is sent to contractors, consultants and owners (including civil servants in charge of construction projects) who are members of the trade

associations and professional bodies. Most of the times, the mailing address of the respondents is obtained from trade associations and professional bodies. This means that those project participants who are not members of such organizations are left out. Mailing addresses of project participants who are not members of such organizations should be secured whenever possible so that questionnaire can also be sent to them.

Respondents are requested to assess the frequency of occurrence and severity for each construction delay factors listed in the questionnaire. A Likert scale of 1 to 5 is adopted for evaluating the frequency of occurrence and severity of each delay factor. Numerical values of 1 = very low, 2 = low, 3 = medium, 4 = high, and 5 = very high for frequency are assigned to the respondents rating. A similar scale is adopted for severity.

The sample proportion,  $p$ , is given by  $p=x/n$  where  $x$  is the count of each rating for each delay factors in the sample collected and  $n$  is the size of the sample obtained from the population (Fleiss et al. 2003). When the ratings are independent,  $p$  has a binomial distribution. For sufficiently large  $n$ , the distribution of  $p$  will be closely approximated by a normal distribution. Using this approximation, it can be shown that this distribution's probability lies within 1.64 standard deviations of the mean at 95% confidence level. Using the Wald method for the binomial distribution, an interval of  $p \pm 2\sqrt{(0.25/n)}$  derived from Central Limit Theorem for proportions will form a 95% confidence interval for  $p$ , i.e. the estimate of  $p$  is within  $p \pm e$ , where  $e$  is the error. This means that  $e$  of the estimate of  $p$  is  $2\sqrt{(0.25/n)}$ . It follows that  $n=1/e^2$  (NIST/SEMATECH 2013). For  $e = 10\%$ ,  $n = 100$ , and for  $e = 5\%$ ,  $n = 400$ . These numbers are often quoted in news reports of opinion surveys. Except for Aziz (2013), the errors of the rating of the studies for Egypt listed in Table 1 ranged from 11.6% to 31.6%. This meant that the sample sizes in these studies were too small.

### *Response Rate*

Only a fraction of questionnaires sent is completed and returned. A survey's response rate is obtained by dividing the number of people who returned the completed survey questionnaires by the total number of survey questionnaires sent. A survey's response rate is viewed as an important indicator of survey quality. The range of the response rate of the eight studies for Egypt listed in Table 1 is 40% to 83.3%. A low response rate gives rise to sampling bias. The only way to ensure that a survey sample is unbiased is to obtain a 100% response rate, but this is very difficult and almost impossible in practice. Many researchers believed that higher response rates assured more accurate survey results (Aday 1996; Babbie 1990; Backstrom & Hursh 1963; Rea & Parker 1997). According to Evans (1991), a high response rate (>80%) from a small, random sample was preferable to a low response rate from a large sample. According to Moser & Kalton (1993), the response rate should be more than 40% in order for data to be acceptable for analysis. Data failed to be representative if the response rate was lower than 30% and result of the analysis was of little value for further interpretation. Babbie (1973) and Kidder (1981) regarded a response rate of 50% as an acceptable response rate in social research postal surveys. Baruch (1999) researched the response rates reported by 141 published studies and 175 surveys in five top management journals published in 1975, 1985 and 1995. He found that the overall average response rate was 55.6%. It seems that there was no consensus on the minimum response rate required. In view of the above discussion, it will be reasonable to conclude that a

minimum response rate of 50% is desirable. All the studies with known response rates listed in Table 1 complied with this requirement except Hafez et al. (2016).

#### *Numbers of Owners, Contractors and Consultants*

It is noted that the number of owners, contractors and consultants of all these studies with known information were not equal. The evidence from existing literature was that the views of respondents of the major delay factor depended on their occupations (owner, contractor, or consultant) of the respondents because they always blamed other project participants were responsible for most of the major delay factors (Abdul-Rahman et al. 2006, Akinsiku & Akinsulire 2012, Asiedu & Alfen 2016). Of the eight studies on Egypt, the views of one or two of these occupation groups were over-represented for studies where such information was given. There is a need to ensure that the numbers of each occupational groups; i.e. owners, contractors and consultants; are as close to equal as possible. This is to ensure that none of the occupational group is over-represented that will lead to a biased set of top major construction delay factors.

#### *Minimum Working Experience of Survey Respondents*

The present study has shown that respondents of questionnaire surveys should have a minimum working experience of 15 years. Alternatively, it will be necessary to conduct a consistency check of the views of respondents using statistical technique demonstrated in Kog & Loh (2013) for those respondents with less than 15 years working experience. If the consistency check shows that they share similar views of the top major construction delay factors with respondents with more than 15 years working experience, their views can be included in the sample for further analysis.

#### *Proposed Approach for Questionnaire Surveys*

Based on the preceding discussion, the proposed approach for questionnaire surveys is as follows. Consistency check of the questionnaire designed must be conducted with a pilot study to achieve a Cronbach's alpha coefficient of at least 0.7. The minimum working experience of respondents must be 15 years. The views of respondents with less than 15 years working experience can be included after consistency check as discussed earlier. It is important to achieve more than 400 completed questionnaires and a response rate of at least 50%. The number of respondents who are owners, contractors and consultants must be as close to equal as possible so that the views of each occupation group are not over-represented. When there is over-representation, or the required number of completed questionnaires and response rate is not met, those potential respondents of the required occupational group and working experience who do not return their questionnaires should be contacted for direct interview to complete the questionnaires to make up any shortfalls. Once all the above requirements are complied with, analysis of the data collected from the completed questionnaires can proceed to identify the major construction delay factors. The major delay factors identified by questionnaire survey are apparent causes. Root causes of delay can be determined during interviews or panel discussions of selected groups of owners, contractors, and consultants after identifying the major delay factors by questionnaire survey.



## **Conclusion**

A review of the eight studies to identify major construction delay factors for Egypt is performed in the present study. Major construction delay factors for construction projects in Egypt identified by the present study include: ‘communication problems/inadequate project coordination’, ‘finance and payments of completed work by owner’, ‘variation orders/changes of scope by owner during construction’, ‘inadequate contractor experience/incompetence contractor’, ‘ineffective planning and scheduling’, ‘poor site management and supervision’, ‘financing by contractor’, ‘unqualified workforce/low skilled labor’, ‘inadequate site investigation/unforeseen subsurface conditions’, ‘poor contract management by consultants/substandard contract’, ‘economic conditions’, and ‘security/political situations’.

The review has identified several short comings in the present approach adopted for studies using questionnaire survey to identify major construction delay factors. These short comings are pertaining to standardization of delay factor; minimum number of respondents; response rate; numbers of owners, contractors and consultants; and minimum working experience of respondents. A structured approach is proposed addressing these short comings of the present approach.

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# A Large Private Organization Tests the Best Value Approach Against Traditional Roofing Practices

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The Best Value Approach (BVA) is a new project delivery method that has been documented to increase performance and value. It does this by changing the traditional project delivery characteristics of managing the expert and focusing on the technical side of the project, to utilizing the expertise of the experts and using performance information and risk mitigation to manage the project. Large organizations have had difficulty in sustaining the BVA. A large private organization agreed to test the BVA on the replacement of a roofing system on one of its facilities. A case study research was performed on this project, using the grounded research approach, to identify if a large supply chain stakeholder can utilize the BVA to sustain high performance, value, and low price at the same time in a highly competitive marketplace. The research proposal is to document issues and benefits of utilizing the BVA. Identifying why large organizations have an issue with sustaining the approach and being utilized on more projects. The results of the paper will identify issues organizations have with implementing the BVA and the benefits in using the delivery system on construction services. The case study utilizes a stakeholder in the roofing industry supply chain and shows an approach to construction services that utilizes performance information and risk mitigation.

**Keywords:** Best Value Approach; Roofing; Facility Management; Large private organization; Innovation; Culture.

## Introduction

The Best Value Approach (BVA) was developed by Dr. Dean Kashiwagi in 1991 (Kashiwagi, 1991; Kashiwagi, 2017; Kashiwagi, 2019b). Since then it has undergone multiple name changes including: Performance Information Procurement System (PIPS), Performance Information Risk Management System (PIRMS), and Best Value Procurement (Kashiwagi, 2018). The approach has been applied and investigated by organizations all over the world including: University of Botswana, Brunnsfield, Democratic Republic of Congo, NEVI (Netherlands), United States Medical Command, Hazim Consulting: Saudi Arabia, and Simon Frasier University (Canada). The majority of the BVA implementations have been performed with the assistance of the Performance Based Studies Research Group (PBSRG). PBSRG was originally housed under Arizona State University (from 1992 to 2017), but then moved under the International Council for Research and Innovations in Building and Construction Working Commission 117 (CIBW117) in mid-2017. In the last 26 years more than 130 organizations have used the BVA to improve efficiency in their organizations and receive higher performing services (PBSRG, 2018).

The documented performance of the BVA is as follows (Rivera, 2017; PBSRG, 2018):

- Founded in 1992 [26 years of operation] and has documented performance on over 2000 projects and services delivered (construction and non-construction).
- \$6.6B of projects and services delivered with a 98% customer satisfaction and 9.0/10 client rating of process.
- \$17.6M in research funding generated, due to the effectiveness of decreasing buyer cost of services on average by 31% [57% of the time, the highest performing expert was selected and was the lowest cost].
- Contractors/vendors could offer the client/owner 38% more value and decreased client efforts by up to 79%.
- Change order rates were reduced to as low as -0.6%.
- 130 unique clients [both government and private sector] and received 12 National/International Awards.
- The most licensed technology out of Arizona State University [60 licenses].
- It is internationally recognized through repeated testing [Canada, Netherlands, Sweden, Norway, Finland, Botswana, Malaysia, Australia, Democratic Republic of Congo, France].
- Some of the largest projects documented were: \$100M City of Peoria Wastewater Treatment DB project (2007); \$53M Olympic Village/University of Utah Housing Project (2003); \$1B Infrastructure project in Netherlands (2009).
- Some of the highest performing projects documented include ASU tested BVA in their business services and procurement department, resulting in \$100M of revenue. Changed the entire procurement service industry in the Netherlands through the success of a \$1B infrastructure test that cut procurement cost by 50% and help the project finish 25% faster. As a result, the Rijkswaterstaat won the most prestigious procurement award in the Netherlands, the 2012 Dutch Sourcing Award, and now NEVI [Dutch Professional Procurement Group] is licensing BVA technology and certifying in the Netherlands (PBSRG, 2018).

The BVA has been audited multiple times in the last 26 years. Two of the audits identified the impact and effectiveness of the BVA in detail:

- The State of Hawaii Audit (Kashiwagi et al. 2002; State of Hawaii Report 2002 (DISD)).
- The two Dutch Studies on the Impact of PIPS (Duren & Doree, 2008; Rijt & Santema, 2013).

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

- 93.5% of clients who worked with BVA identified that their projects were delivered on time.
- 96.7% of clients who worked with BVA identified that their projects were delivered within budget.
- 91% of the clients stated that there were no charges for extra work.
- 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).
- 94% of clients would hire the same supplier again.

The other groups that conducted audits were COE PARC, 2008; Zuyd University & University Twente, 2008; WSCA/NASPO Agreement, 2011 (PBSRG, 2018).

Interestingly, though documenting high performance, one of the major issues identified with the BVA has been the difficulty for organizations to sustain implementation. Out of the 130 organizations that have implemented the BVA, less than 1% have been able to sustain the effort for more than 6 years. The longest implementing organization being Neogard, who have used the BVA for more than 20 years. This issue is more prominent in large organizations. In many cases the BVA was stopped before the organization even tested the process.

Some of the major issues organizations have experienced in following the process and sustaining it, are as follows ((Rivera, Kashiwagi and Kashiwagi, 2017); PBSRG, 2018):

1. Resistance to the process from client personnel.
2. Client's personnel making decisions to modify the process.
3. Inability to explain the value of the process to the C-Suite.
4. The BVA supporter in the organization retires or leaves the organization.

Interestingly, it has still been difficult for organizations to take full advantage of the BVA, despite having projects that experienced high performing results. This could be due to how different the BVA and current traditional project practices are when delivering services.

The traditional practices (Figure 1 – Quadrant I: Price Based) involve the following when delivering a project/service (Kashiwagi et.al, 2016a):

1. The client develops the technical requirements for a project.
2. Technical information is reviewed by the client to determine the best vendor for the project.
3. The client develops the contract for the project.
4. The client and the vendor partners to deliver the project.
5. The client controls and makes the decisions for the project.

The BVA practices (Figure 1 – Quadrant II: Best Value Approach) involve the following (Kashiwagi, 2018; Kashiwagi, 2019a):

1. The vendor develops the technical requirements for a project.
2. Technical information is only shared with the client when a vendor is selected.
3. The vendor develops the contract for the project.
4. The client and the vendor do not partner to deliver the project.
5. The vendor has total control of the project and the client only approves the actions.

<b>Performance</b>	<b>High</b>	<b>III. Negotiated-Bid</b> Minimized competition Long term Relationship based Vendor selected based on performance	<b>II. Best Value Approach</b> Identify and utilize expertise Transparency Language of metrics Value of expertise increases Lower cost and high quality <b>Utilize Expertise (No Thinking)</b>
	<b>Low</b>	<b>IV. Unstable Market</b>	<b>I. Price Based</b> Buyer directs vendors All vendors are the same Lowest price wins Minimum standards No accountability Low performance is acceptable <b>Manage, Direct and Control (Influence)</b>
		<b>Low</b>	<b>High</b>

Figure 1: Industry Structure

The industry structure diagram in Figure 1, developed by researcher Dr. Dean Kashiwagi, identifies that the major difference between the price based (low bid) environment and the Best Value quadrant, is that the client utilizes the expertise of the vendor to increase performance instead of trying to manage, direct, and control (MDC) the vendor. The opposite nature of the BVA from the traditional project delivery approaches, may contribute to organizations having difficulty implementing and sustaining it.

To assist organizations to overcome the resistance of the BVA’s new ideas and project practices to delivery services, it has been adjusted over the last 10 years (Kashiwagi, 2019a). The focus has been on continually simplifying the process and automating normal project delivery methods, to minimize the decision making of the client and ensure the process is followed and can show its value.

*Large Private Organization*

In the Spring of 2017, the global facility management director for a large private organization (LPO), identified an opportunity within his organization to implement the BVA and be able to document its value, the issues and difficulties with running it, and the reaction of the technical personnel utilizing the process.

The LPO needed to replace their 18-year-old Roof “A”. Roof “A” was 70,000 square feet and covered many important upper management personnel (i.e. lawyers and C-suite executives). Between 2013 – 2017, 30 unique reports were filed with the facilities management department (FMD) on leakage. Over the course of four years, the FMD had to replace many damaged ceiling tiles, repair light fixtures, and dry out wet carpet. The occupants became more concerned with massive roof failures at the end of 2016, due to the roof approaching its 20-year life and warranty. The concern was heightened, due to Arizona’s impending monsoon season (June to September) 6 months away. Replacement of roof “A” became a high priority project for the FMD.

Although PBSRG had the support of the FMD, it still needed to convince the LPO project management staff to use the BVA and allow PBSRG to support them.

## **Methodology**

PBSRG, planned to take the following steps to implement and document the BVA for the LPO's Roof "A" project:

1. Propose using the BVA to the LPO's project management team.
2. Provide education to the LPO's internal staff and roofing contractors.
3. Run BVA.
4. Document issues and difficulties:
  - a. Review each phase of the BVA and how it was implemented.
  - b. Identify how the organization dealt with the differences.
5. Analyze the documented information.

### *BVA Proposal to LPO*

The LPO's FMD invited consultants to bid on the Roof A project. They only had two weeks to choose a consultant. Two consultants expressed interest in bidding on the project. PBSRG was one of the consultants. The FMD requested both parties submit a cost, scope of work and performance information. Table 1 identifies the difference between the two proposals:

1. PBSRG's scope provided more value to the client for the same cost.
2. PBSRG could complete the project 10% quicker.
3. PBSRG's provided past performance information that showed they were experts:
  - a. 34 years roofing experience (started in 1983 with U.S. Airforce).
  - b. 20 roofing journal articles.
  - c. 6 books on roofing.
  - d. 19 roofing conference publications.
  - e. Over 2,000 site walks of roofs.
  - f. Over 100 roofing projects in State of Hawaii alone
  - g. Over 100 roofing projects at DISD over 4 million square feet
  - h. Ran projects for: Motorola Scottsdale, Motorola Arlington Heights, IBM, Intel Corp., United Airlines, Honeywell, Facilities Management Group, PECO Nuclear Facility, IPI, State of Hawaii, Dallas Independent School District, Raytheon (Tucson), GSA Region 6).
  - i. Customer satisfaction is 98%.
  - j. Saved customers between 10-30% of the cost of projects.



*Table 1: Consultant Proposals*

<b>Consultant A</b>	<b>PBSRG</b>
<b>Cost:</b> \$15,000	<b>Cost:</b> \$25,000
<b>Scope of Work</b>	<b>Scope of Work</b>
Review the Owner’s Requirements and related information, including schedule, budget, service life expectations, warranties, history, building usage, and contractor insurance requirements.	Would perform the same scope of work (SOW), but would also include the following: <ul style="list-style-type: none"> <li>• Provide education to internal personnel and vendors.</li> <li>• Hold a roof site inspection for all potential vendors.</li> <li>• Help write the RFP</li> <li>• Hold a clarification phase that ensures the vendor will plan the entire project before an award is given.</li> <li>• Require the vendor to submit a weekly risk report that track all project performance metrics with impacts to cost, time, and quality.</li> <li>• Provide a close-out report to the LPO that documents the entire project from beginning to end.</li> <li>• Help on with any meditation that is needed during the project.</li> </ul>
<b>Schedule:</b>	<b>Schedule:</b>
January: Contract negotiation period	January: Start immediately
February 20: Create request for proposal	February 1: Create request for proposal
March 1: Bid	February 16: Bid
March 20: Evaluation	February 17: Evaluation
March 23: Identify contractor	February 22: Identify contractor
April 20: Anticipated authorization to proceed	March 20: Anticipated authorization to proceed
July 15: Project completion	May 31: Project completion
n/a	June 16: Project report
<b>Performance Information:</b> no documentation was provided	<b>Performance Information:</b> Documentation was provided

PBSRG used the BVA to respond to the bid request and showed clear performance metrics that it was the highest performing vendor. However, for PBSRG to convince the LPO management to award them the project, they had to lower their cost to \$15,000.

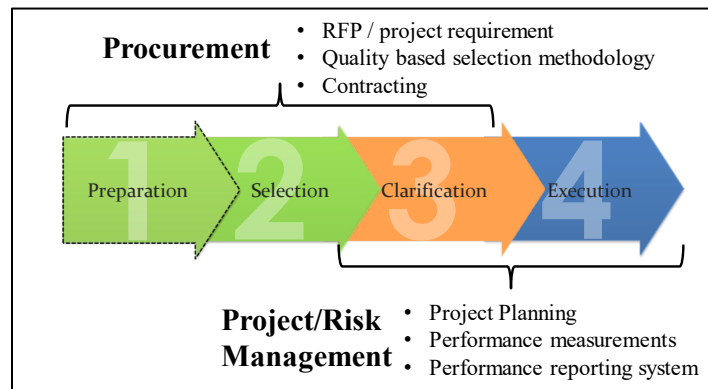
Clients focusing on cost instead of performance, is one of the issues with implementing the BVA. Although research on more than 2,000 projects show that large cost savings when delivering services come by hiring an expert, traditional clients continue to hire the lower costing vendor or attempt to force the high performing vendor to lower their cost.

Most organizations do not understand the detrimental impact [in terms of cost, time and quality] of hiring a low performing vendor or forcing a high performing vendor to perform a service, with less cost, than they usually need.

## **Best Value Approach (BVA) Implementation**

The Best Value Approach has four phases (see Figure 2) (Kashiwagi et al., 2007; Kashiwagi, 2011; Kashiwagi et al., 2015; Kashiwagi and Rivera, 2016; Kashiwagi, 2018; Kashiwagi, 2019a):

1. **Prequalification:** Educates vendors and client stakeholders on the Best Value Approach. Explains to vendors how to be successful in the bidding process. During this time PBSRG also helps the client collect any information required to enable the vendors to bid for the project.
2. **Selection:** uses a decision-less structure to rate contractors based on level of expertise (performance) and selects the high prioritized one.
3. **Clarification:** the highest prioritized contractor is required to create a non-technical plan from begin to end that creates transparency for all stakeholders.
4. **Execution:** the awarded contractor begins the plan they set forth in clarification and measures themselves throughout the entire project.



*Figure 2: Best Value Approach*

This section will review each step of the BVA and identify how each step was implemented at the LPO.

### *Prequalification*

The BVA uses prequalification differently than traditional project delivery models (Kashiwagi et al, 2016b; Kashiwagi et al., 2017; Kashiwagi and Tisthammer, 2002; Kashiwagi, 2019a). Instead of the owner identifying what requirements make a vendor qualified, it assumes all vendors are qualified if they decide to bid on the project. The prequalification phase focuses more on educating the vendors on the BVA to ensure they understand what the expectation of the client is and determine for themselves if they are qualified and can deliver the service. The BVA is designed so that a non-qualified vendor will never make it through the process. Thus, non-qualified vendors will only be wasting their own time and resources. The education performed in the prequalification helps them to understand this clearly. This involves explaining expectations of the client, current condition of the service (Roof A), and the BVA process.

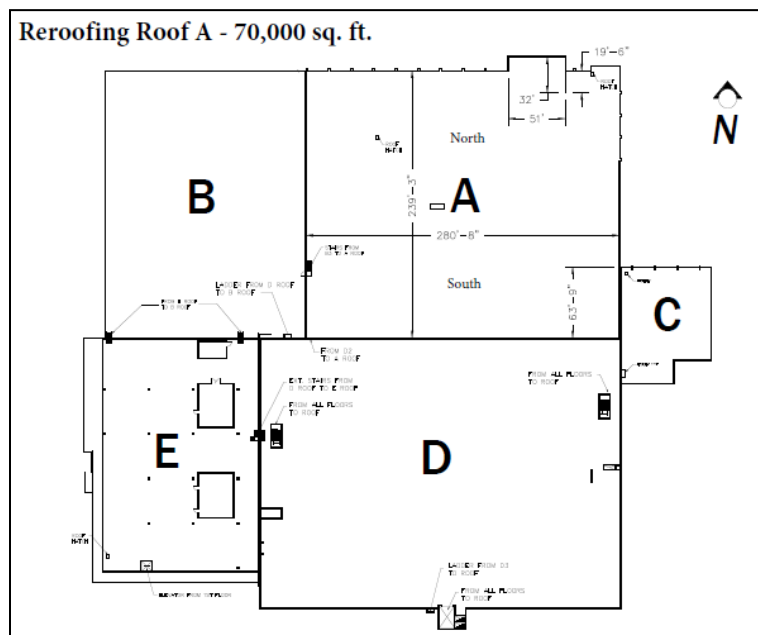
The first group on the Roof A project that PBSRG educated was the ON internal management team. This was performed in 2 meetings. From these meetings it was documented that the technical workers on the team had a very difficult time accepting the process. Since the BVA minimizes the technical participation of the client, the role of the technical personnel was minimized, which they had a difficult time accepting.

The information PBSRG proposed to provide the vendors were as follows:

1. Budget of the roof (\$8/sq. ft.).
2. Size of the roof and date installed (70,000 sq. ft., reinforced single ply roof in 1995 and modified bitumen roof in 1998).
3. Client Satisfaction of the Roof (client was unsatisfied with previous roofs due to leaking).
4. Deck Composition (North side, insulation is unknown but mechanically fastened down, and South side insulation is glued down on a proposed stainless-steel deck).
5. Number of penetrations [equipment/material on the roof that protrudes from the surface] that the LPO would like removed.



*Figure 3: Roof "A"*

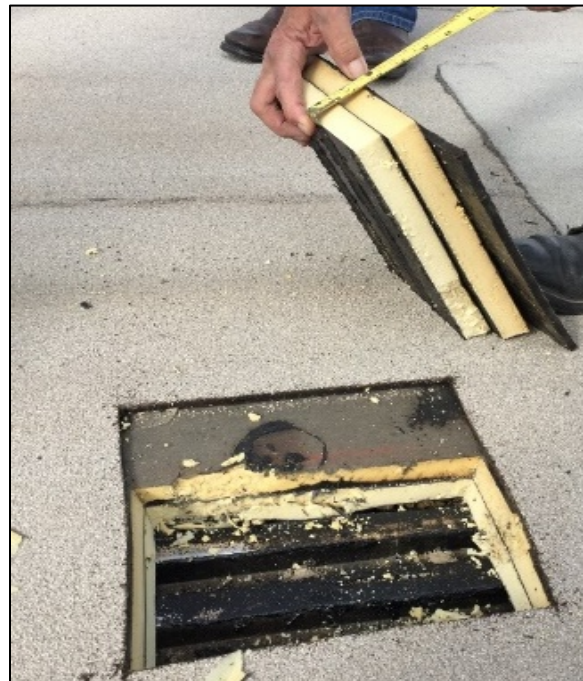


*Figure 4: Roof "A" Full Facility View*

The LPO's technical personnel felt that more information needed to be given to the vendors and required PBSRG to set up a moisture scan for the roof. A moisture scan identifies what percentage of the total roof has moisture in it. The reason PBSRG proposed to not perform the moisture scan, is because the awarded vendor would have to do it anyway, before being awarded a contract. In addition, performing the scan at that early point in the process would add a couple of weeks to the schedule. They also wanted the contractors to be able to take core samples [see Figure 5] from the roof to verify the roof's layer composition. This caused PBSRG to not only hold an educational session for the vendors but also hold a 2 more roof walk meetings for the vendors.



*Figure 5: Roof "A" North Side*



*Figure 6: Roof "A" North Side*

The moisture scan discovered that only 8.4% of the roof detected moisture. See Figure 7 below for results. Neither the core sampling nor the moisture scan changed the contractor’s pricing. In fact, the expert contractor already knew what percent of the roof had moisture and previously prepared for it. In the end, none of the technical information the LPO wanted to provide the contractors was needed, but due to the traditional way of doing things, the technical people still required it.

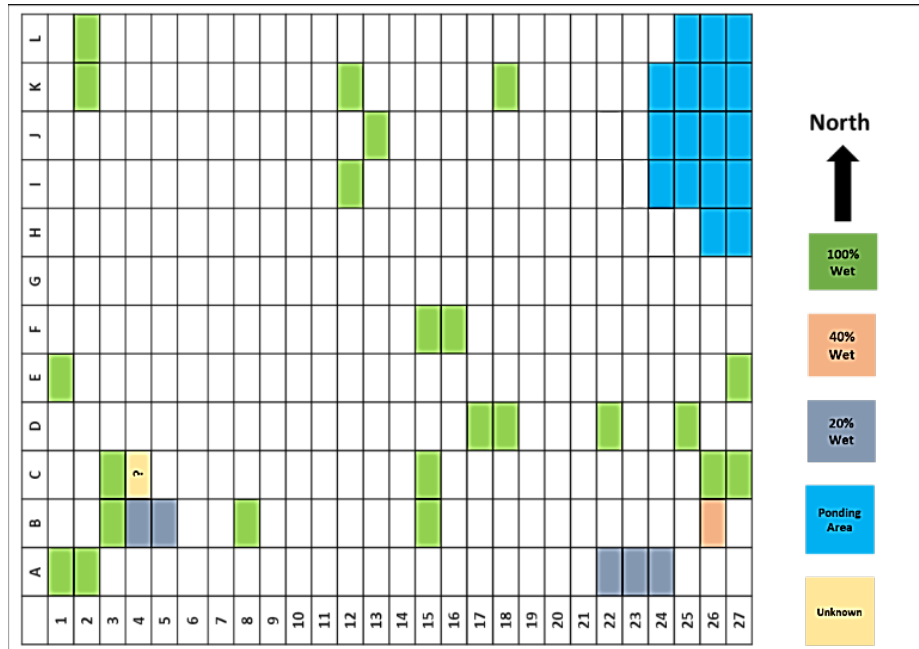


Figure 7: Moisture Scan Results

Selection Phase

The selection phase was delayed by a couple of weeks due to the changes in the prequalification phase. The LPO management team did agree to not create requirements for the vendors but allow the vendors to propose the best roofing system. This was identified in the Request for Proposal sent to the vendors. To select the best value vendor, the vendors were asked to submit bid proposals that included the following components:

- Key personnel proposal form (1 page) – leadership team with references.
- Level of expertise plan (4 pages) – performance claims about roofing project ability, supported with verifiable performance information, and a roof list [includes warranty length, leakage performance, and customer satisfaction].
- Risk management plan (2 pages) – claims about risks that could occur on a project, their experience with it and variable performance information to support.
- Value added plan (2 pages) – options that identify schedule and cost impact.
- Project cost proposal – roof system proposed, its specifications and cost.
- Project schedule (2 pages).
- A proposal for also doing Roof B.

The following evaluation weights were applied to the criteria:

- Level of Expertise, 35%
- Price, 35%
- Interview, 20%
- Risk and Risk Mitigation, 5%
- Value Added, 5%

In total, six bid proposals were submitted by four roofing contractors. Table 2 identifies what the contractors submitted.

Table 2: Bid Proposal Requirements Matrix

Requirements	Vendor A [10-year coating option]	Vendor B [25 year]	Vendor C [20 year]	Vendor D [20 year]
RFP Cover page/Checklist	X		X	
Key Proposal Form	X		X	
LE Submittal (LE, RMP, VA)	X		X	
Schedule			X	
Roof Performance List	X	X	X	X
Actual Performance Info				X
Asbestos		X		X
Performance Bonding		X		
Penetration/steel platform components removal		X		X
Roof B		X	X	X

Table 3: Roofing System Comparison

Company	System	Cost	\$/sq. ft.	Annual \$	Age of Roofs	# of References	Warranty
Vendor B	System 1 (BUR)	\$761K	\$10.74	\$31K	Avg: 2 yrs. Max: 4 yrs.	3	25 years [QA]
Vendor B	System 1 (BUR)	\$659K**	\$9.30	\$27K	Avg: 2 yrs. Max: 4 yrs.	3	25 years [QA]
Vendor C	System 2 (PVC)	\$630K	\$8.53	\$32K	Avg: 2 yrs. Max: 4 yrs.	5	20 years [NDL]
Vendor D	System 2 (SPF)	\$528K	\$7.54	\$27K	Avg: 4 yrs. Max: 5 yrs.	Surveys: 94 Roof list: 47	20 years [NDL]
Vendor D	System 3 (PVC)	\$504K	\$7.19	\$26K	Avg: 5 yrs. Max: 15 yrs.	30	20 years [NDL]

An analysis on the proposals identified the following:

- None of the vendors turned in all the information requested from the Request for Proposal.
- 2 (out of 6) proposal costs were below the budget.
- One vendor was disqualified for turning in a roof system that was only warranted for 10 years (Client wanted a 20-year warranty).
- Only one vendor turned in adequate performance information on their roof system to verify their roof system met the performance expectations of the client.

After seeing the information, it minimized thinking and decision making by the selection committee to determine that the Vendor D System 3 and the Vendor C PVC roof systems as the two options that would move on to the interview stage.

After the interview of both contractor’s and their systems, Table 4 shows their final evaluation ratings.

*Table 4: Final Evaluation Ratings*

No	Criteria	Vendor C PVC	Vendor D System 3
1	Level of Expertise rating	17.5	17.5
2	Risk Management Plan rating	2.5	2.5
3	Value Added rating	2.5	2.5
4	Interview rating	18.3	19.5
5	Cost	28.0	35.0
<b>Total Score</b>		<b>69.0</b>	<b>77.0</b>

Vendor D System 3’s option was identified as the best value. It was \$70K below budget, \$127K below competing PVC roof, and had greater documented performance information [30 references, average age of roof is 5 years, maximum age is 15 years].

#### *Clarification Phase*

The clarification kick-off meeting is the first time the vendor brings in their entire leadership team to discuss the details of the project with the LPO (Kashiwagi, 2018; Kashiwagi, 2019a). The vendor was expected to have the following documents prepared to present:

1. Full draft plan.
2. A detailed schedule by roof area.
3. A detailed cost estimate, including the requested value-added items. Any removal activities and costs should be separated from the installation of new material. The rationale is that the LPO is charging the project from two different sources of money.
4. Detailed specifications with any changes proposed.
5. Manufacturer’s warranty with any changes proposed.

The contractor did not come prepared with all the above requirements. This led to the LPO identifying numerous documents missing:

- Safety plan.
- Copy of warranty.
- Letter that roof system meets FM Global requirements [NAV #].
- Roof system section, attachment pattern, and all flashing details and cap work.
- City of Phoenix Permit.
- Steel removal plan.
- Roster for safety training and completion of it.
- Updated cost breakout to include above items.



The Vendor proposed a start date of 3/27/2017 with an end date of 5/22/2017, which would meet the deadline requirement of 5/31/2017. Interestingly, in the clarification kick off meeting, the LPO identified a new requirement previously unknown to anyone. They identified that their facilities are insured by FM Global and need to maintain an FM Global standard rating that meets their minimum. Currently, the contractor felt comfortable they would meet the requirement, but the LPO's technical staff required the contractor to perform a pull test in order to show the roof would maintain the FM Global minimum standard. A pull test is when a screw is drilled into the deck, and a machine pulls the screw out of the deck. The pressure that was required to extract the screw out of the roof deck is recorded and compared to the standards to identify if it meets the minimum. The LPO was concerned that the screws holding down the roof would not meet the minimum. The pull test results showed that the strength requirement to screw (fasten) down the roof system met the FM Global minimum standard (see Figure 8).



*Figure 8: Pull Tester*

In addition, the LPO required the contractor to bring in a professional structural engineer to verify if their plan to remove the steel structure (far left pop out in Figure 9) would not compromise the integrity of the roof.

The additional requirements from the LPO were not necessary, but the LPO's technical personnel decided to require them. Their decision making did not change the vendor's plan but did delay the start of the project by a month, putting the project at risk of not completing before monsoon season.

#### *Execution Phase and BVA Roof "A" Project Results*

Despite the contractor not submitting a full plan until weeks after the project started, the roof was completed and the LPO was satisfied. The project was completed one month after the intended deadline but was 100% due to the LPO. Despite the schedule delay, the monsoon season was not



in effect in Arizona at that time. In total, the LPO saved \$270,000 on roof “A” and rated it 10/10. See comparison of before and after in Figures 9 and 10.



*Figure 9: Roof “A” Before*



*Figure 10: Roof “A” After*

### **Analysis of Issues in Implementing BVA**

Throughout PBSRG’s implementation of the BVA at the LPO, the biggest issue was the resistance from its technical personnel (Bos, Kashiwagi and Kashiwagi, 2015; Rivera et al., 2015; Santema et al., 2016). If PBSRG did not bring in Dr. Dean Kashiwagi, who had been running BVA since 1992, the technical personnel would not have even tried the approach. Many times, the technical personnel would challenge the BVA ideas, and even after it was proven correct on the project, they still would claim the ideas was flawed. In fact, even after the success of Roof “A”, the LPO team immediately made a decision to deviate from fully following the BVA and revert to their traditional way of doing business on their secondary roof project [Roof “B”]. The next section will explain the results of Roof “B”.

Additional issues documented while implementing the BVA were the following:

1. The need to convince multiple stakeholders and gain their approvals.

2. The BVA practices are different than the traditional way of doing things; it is difficult for the personnel to follow them.
3. Current relationships with vendors. Traditional project delivery is based upon creating a relationship between the client and the vendor. BVA requires the client to minimize the relationship and base the selection and execution off identifying the expert and letting them do their job.

*Traditional Roof “B” Comparison*

Due to the cost savings from Roof “A”, the LPO decided to also complete another roof that was in need of replacement, Roof “B”. Roof “B” was similar to Roof “A”. The layers of Roof “B” were as follows:

- GBS granulated top layer.
- SP4 (smooth inner ply).
- Vented Base sheet.
- 2 polyisocyanurate.

Although, Vendor D was identified as the high performing vendor for Roof “B”, the LPO decided to not follow the BVA prioritization and chose Vendor C [roof incumbent] to deliver the roof (see Table 5), due to their history with the contractor. The LPO did try to follow the BVA steps, however, after the initial clarification steps they stopped coordinating with PBSRG. Without the help of PBSRG, the LPO began falling back into the traditional model of management, direction, and control (MDC). PBSRG Director Dr. Dean Kashiwagi warned the LPO to stick with the structure and beware of developing a relationship with the contractor and the importance of sticking with the BVA process.

*Table 5: Roof “B” Bid Proposal Comparisons*

<b>Company</b>	<b>System</b>	<b>Cost</b>	<b>\$/sq. ft.</b>	<b>Warranty</b>
Vendor B	N/A	\$ 81,382.00	\$1.85	n/a
Vendor C	60 Mil Fleeceback TPO	\$ 167,000.00	\$3.80	20 years [NDL]
Vendor D	GAF Acrylic/Silicon Coating	\$ 97,960.00	\$2.23	15 years [Emerald Pledge Limited]

The LPO project management team spent time working with the vendor on the technical aspect of the proposed roofing system, requiring the contractor to perform a moisture scan and do an adhesive test [test how much wind is needed to uplift the top layer of the roof system from the deck] of the roofing material with the existing modified bitumen system. The LPO team also was concerned with the manufacturer’s lack of warranty for the existing roof system. These issues along with waiting to get a budget for Roof “B” approved from internal management, caused a project start date of 5/24/2017 delay by 2 weeks [initial end date of 6/16/2017].

The contractor started the project on 6/7/2017 and projected to finish it on 7/15/2017. The major risk of this adjusted time frame was monsoon season. The last two weeks of the project had a high chance of rainstorms. The contractor was awarded the project without successfully completing the clarification phase, and did not consistently submit a weekly risk report, which required them to report on the project each week.

Most of the project went well, and was looking to be completed on 7/3/2017, 12 days quicker than the adjusted schedule. The day before the contractor would finish the roof (7/2/2017) a major rainstorm swept through Phoenix and uplifted 20% of the new TPO roof system (see Figure 11), destroying the existing modified bitumen system underneath as well. It was proposed that this issue occurred because the contractor does not normally seal up the ends of the roof until the very last step. This enabled a storm to come through and have the ability to get underneath the new TPO roof system and uplift a portion of it.

Roof “B” would end up completing, 3 months over schedule in October. The decision was made to remove the entire existing Roof “B” and replace it with a new roof. Insurance would end up covering the cost of the roof.



*Figure 11: Roof “B” After Storm*

### **Conclusion**

The Best Value Approach (BVA) is a new approach that has been documented to improve the performance and efficiency of delivering services and projects. However, it has been difficult to sustain at organizations, especially larger ones. This paper documented a case study of a large private organization (LPO) that utilized the BVA on the replacement of a roofing system as a test to document its value, the issues and difficulties with running it, and the reaction of the technical personnel utilizing the process. To select, hire and deliver the project was done in record time and with high performance.

Despite the high performance and decrease in management, PBSRG identified that the biggest issue in implementing BVA at large organizations is due to the resistance caused by the technical personnel not wanting to switch their traditional approach of management, direction, and control (MDC) of the vendor to the utilization of their expertise.

However, despite the technical personnel not agreeing with the BVA and even making minor adjustments to it, it is able to override their resistance and deliver amazing performance. It

requires the BVA implementers to be an expert at using information and metrics to simplify the project and create transparency, to minimize any decisions that the technical personnel would make.

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# A Case Study Analysis on the Impact of a Hybrid Application of the Best Value Approach

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The Best Value Approach (BVA) has been used as a method to procure and manage services. As the BVA is further proliferated, there are applications of the BVA which deviate from the standard approach which are labeled as hybrid processes. This research focuses on better understanding BVA hybrid projects and the implications that may arise with such deviations. Using case study research, the BVA was used to procure services for the construction of ships. The research findings show the impact of hybrid applications of the BVA including (1) the selection of suppliers based on decision making instead of expertise (2) attempts to share and transfer risk, (3) incomplete clarification phase planning by expert suppliers, and (4) incomplete use of the Weekly Risk Report and Director's report to track project deviation. The resulting hybrid application was found to have increased costs, increased decision making, and created a non-transparent environment. Suggestions have been made to improve upon these areas by applying the BVA structure including a selection process to identify expertise and a project management process which utilizes the supplier's expertise to create a structure of transparency through performance metrics.

**Keywords:** Best Value Approach, Hybrid, Best Value Procurement, Risk.

## Introduction

The Best Value Approach (BVA) was developed at Arizona State University by Dean Kashiwagi as a method to deliver projects through its complete life cycle including procurement, contract, project and risk management. The BVA is founded on the logic of the Information Measurement Theory (IMT) which Kashiwagi developed (2017). The BVA has shown to improve performance (Duren and Doree, 2008; Rivera, 2014) and has been tested in multiple industries including information communications technology, construction, human services, health services, food services, etc. (Kashiwagi, 2013) and has shown signs of growth (Rijt and Santema, 2013).

### *The Best Value Approach*

The Best Value Approach (BVA) is not a change in processes or steps; it is a change in paradigm applied to the entire supply chain of an organization. The BVA objective is the replacement of management, direction and control of suppliers with the utilization of expertise to create transparency. The transparency created by experts should minimize inefficient practices such as thinking, decision making, and communication. The BVA includes a standard framework of core activities to achieve this objective and assist in identifying experts including (Kashiwagi, 2017):

- Competition and identification of expert suppliers through a selection process which allows suppliers to differentiate themselves based on expertise. The differentiation should be created

through simple metrics of performance which show the supplier's ability to execute the client's specific project.

- Requiring suppliers to preplan a project from beginning to end. The planning requires a detailed schedule which is simplified into a milestone schedule including time, cost and quality metrics. Additionally, the plan identifies the activities of all stakeholders involved and assumptions made based on the lack of information of project information.
- Project and risk management through the Weekly Risk Report system which tracks deviation to initial schedule (time), cost and quality metrics and the stakeholder responsible for the deviation.
- Overall management through the Director's Report which compiles and tracks the organization's performance through the compilation of Weekly Risk Reports.

The application of these principles and core activities should (1) increase the use of expertise creating higher profit and (2) Decrease project costs through the minimization of management, direction and control and all associated activities.

### **Research Problem, Question and Methodology**

As the BVA is further proliferated in the industry there can be variations as to the application which deviate from the standard BVA process and IMT. These deviated applications can be labeled as hybrids. As the BVA process grows and a wider range of practitioners with differing levels of understanding begin to adopt the BVA, there is potential that the number of hybrid projects increase. There is a need to understand the potential impact of hybrids to the Best Value Approach.

The purpose of this paper is to explore the implications of hybrid applications of the Best Value Approach. The research seeks to answer the following main research question: *How can the impact of hybrid applications of the Best Value Approach be understood?*

To answer this research question, a case study has been performed to identify, understand and analyze the results a hybrid application. The following methodology was followed:

- Identify an organization which has implemented a hybrid Best Value Approach throughout their organization.
- Through organization documents, workshops and interviews document the organization's BVA application, deviations and results.
- Analyze the impact of the hybrid deviations and provide future actions to improve the BVA application based on the standard BVA processes.



## Case Study: Ship Builder

### Background

The Ship Builder (SB) employs over 200 people, maintains a network of over 137 project related suppliers and has built over 30 Ships since founded with an average of 1.7 Ships completed a year. Recently the organization has introduced a new strategic plan to provide the perfect ship. The objective is to ensure that the organization is capable to deliver a ship that fully complies with any client requirements while remaining profitable and competitive in the industry.

The SB is unique as they outsource 100% of their construction activities to their suppliers, creating a dependence and need in the correct selection and utilization of suppliers. The Best Value Approach (BVA) was implemented in 2015 to improve the identification and utilization of the SB's network of expert suppliers. However, despite implementing the BVA for three years, the SB costs have increased, which has lowered profitability.

### Network of Suppliers

The SB deals with an extensive network of over 1,000 suppliers. These suppliers are separated into three categories including: 14 comakers, 123 key-suppliers and over 1,000 suppliers. Each category has a distinct relationship with the SB. Comakers are seen as partners as they cover almost 80% of the project cost. Comakers work directly with project stakeholders including the SB personnel, other comakers and key suppliers in the development and design of the project. Key suppliers are considered subcontractors to the Comakers, their interface with other key-suppliers and the SB is limited and rarely assist in the development and design process. Suppliers are subcontractors with a small spend and risk to the project.

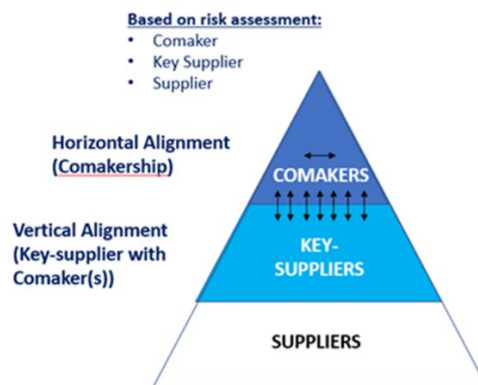


Figure 1: Co-Maker Model

### Project Workflow

The SB has no standard sales process for every ship as each one is unique. However, a general framework has been defined using 5 phases (pre-preparation, preparation, selection, clarification and execution) to create transparency. The framework starts from a first sketch which eventually is developed into a final lumpsum price, based on a set of requirements defined by the SB and



the ship purchaser referred to as the client. This process is coordinated by the SB's personnel including the strategic purchaser, cost engineers, technical experts and of sales specialists.

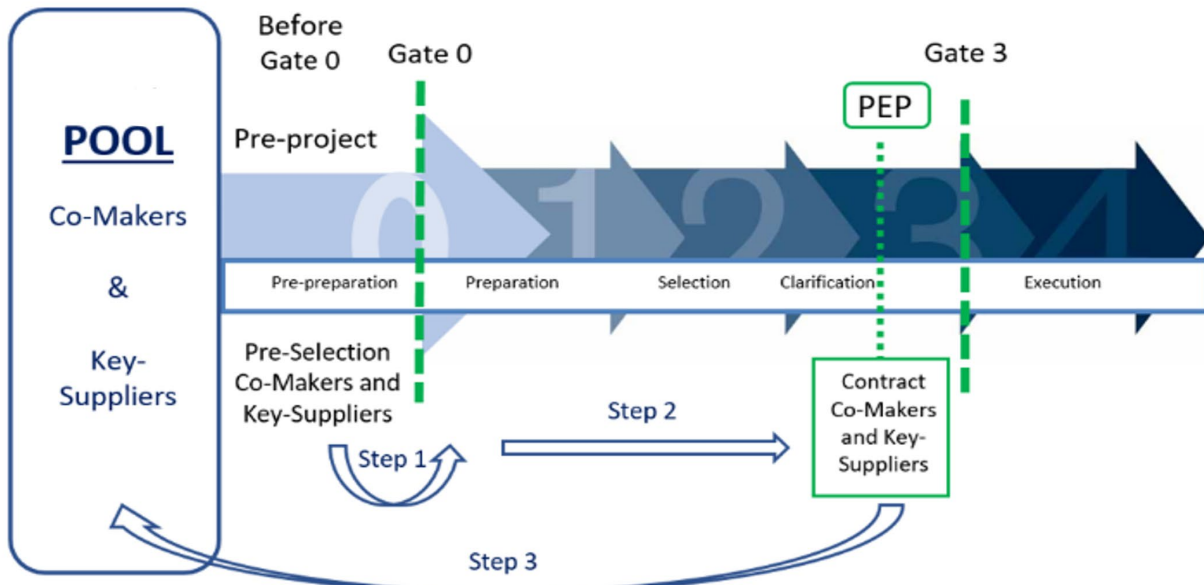


Figure 3.b

Figure 2: Project Framework Milestone Gates

- Phase 0 (Pre -preparation): a cost estimate is calculated by the SB based on a first sketch to have a rough budget indication to build the ship.
- Phase 1 (Preparation): the SB's purchaser creates a Supply Chain Initiation Document (SCID) which defines which Comakers per category will be required and requests a lumpsum price per category. Along with the SCID, the SB's naval architects then deliver a clear scope requirement which is used in the Request for Proposal (RFP).
- Phase 2 (Selection): co-makers and key suppliers are competed and selected.
- Phase 3 (Clarification): A letter of intent is created with the comakers which requires them to clearly identify and offer a fixed price for 80% of their total work. At the end of this phase the SB creates a contract and sells the ship to the client.
- Phase 4 (Execution): After the ship is sold, the SB will take the lead and start negotiations with the client to finalize the contract. Additionally, the remaining 20% of the project cost is to be procured by the SB.

### Case Study: Application and Deviations from the Best Value Approach

The BVA was first introduced to the Ship Builder (SB), also referred to as the Buyer, in 2015. Due to the drastic change in paradigm, education of both the buyer's and supplier's personnel were required. The adoption level of each individual varied with some open to the approach, while others found it difficult to make the shift. For example, there were no performance metrics available on either the SB or their network of comakers. For years the SB had relied on opinion and relationships to decide which suppliers would be considered comakers in the future.

Similarly, many of the comakers who had been working with the SB for years had become accustomed to existing relationships and did not see the need in using the BVA to compete on expertise. The incomplete adoption of the BVA paradigm by both buyer and supplier was reflected in the deviations (hybrids) to the standard BVA processes.

*Selection: Identification of Expertise*

In running the standard BVA selection process, comakers are competed based on their expertise through the selection criteria including the level of expertise (LE), risk assessment (RA), value added (VA), and an interview. However, the SB did not strictly follow the process. For some areas, the Comakers were selected based on the SB's traditional approach of relationships and decision making instead of the comaker's expertise.

For example, during the rating of the submittals, the evaluators would recognize the Comakers from their claims and references. Instead of rating the claims and references, the evaluators would rate the comaker based on their personal experience in working with them. The evaluators heavy reliance on experience, feelings and intuition caused inaccuracy in predictions as they were not driven by metrics and transparency (Snijders, et al., 2003).

*Clarification: Pre-planning and Risk Mitigation*

Through the standard BVA process of the clarification phase, the expert suppliers are to take control of the project in defining the final scope, plan and contract. Releasing control of the project to the expert suppliers allow the client to ensure that sufficient pre-planning, risk management and quality control is provided on all their projects. The client would also ensure quality assurance could be performed allowing them to hold the suppliers accountable for their plans, risk management and quality control throughout the project.

In the selection phase, based on SB's project requirement, the Comakers are expected to commit 80% of their pricing up front as a "fixed cost". After the comakers submit their pricing, the SB structure does not incorporate the BVA clarification phase (as shown in figure 2) which would allow the comaker's the opportunity to clarify their complete plan and pricing through:

1. A detailed schedule which is simplified into a milestone schedule including time, cost and quality metrics.
2. Identification of the activities of all stakeholders involved and each stakeholder expected contribution to the project.
3. Supplier assumptions based on incomplete or inaccurate project information given by the SB.
4. Suggested improvement to the client's requirement based on the comakers expertise.

The clarification phase is intended to utilize the expertise of the comakers to improve and complete the inaccurate and incomplete requirement created by the SB. Instead of utilizing the comaker's expertise, the SB has skipped the clarification phase and is attempting to use management, direction and control (MDC) to transfer the SB's risk (caused by their inaccurate and incomplete requirement) and force the comakers to absorb the costs.

It is estimated by the Comakers that change orders due to the SB's inaccurate and incomplete designs is 20% per project. As a result of the SB's attempts to transfer their risk through a "fixed cost contract", Comakers have responded by increasing their costs by 20% with what they call the "SB factor" to serve as a contingency. The SB did not realize that a fixed price does not assume that suppliers must absorb the cost of risk outside their control. This type of assumption forces all stakeholders and participants into a decision making made, reactively trying to protect their own interests.

### *Execution: Project Management*

In the standard Best Value Approach, after the clarification of the project, the supplier would then move into the execution phase. The execution phase would utilize the weekly risk report (WRR) and director's report (DR) to track the performance of the supplier. The WRR would be reported on a weekly basis with regular meeting to discuss progress. The WRR would have the following functions:

1. Track the milestone schedule and quality metrics.
2. Track deviations to the project schedule, cost and quality with the assigned stakeholder which caused the deviation.
3. Provide the performance metrics including deviation to time, cost, and quality metrics (by stakeholder).

The WRR system maintains regular meetings to the coordinate and update these core areas. The Director's report is then used to compile the WRRs and provide the organization's overall performance including deviation to time, cost, and quality metrics (by stakeholder). The DR allows projects and comakers to be compared on a relative basis.

Through the proper use of the WRR system comakers can be held accountable to mitigate risk they do not control but are not financially responsible for the impact it may cause to the project. In the situation which these risks cause deviation, the comaker can clearly document the reason for the risk and the stakeholder responsible for it. In this way, through the WRR system, transparency can be created which utilizes the supplier's expertise to mitigate risk without using MDC to transfer the financial burden of another stakeholders' risk.

The SB deviated from the BVA standard process by introducing bi-weekly reporting to monitor the Comakers performance. The WRRs being used are often not completed or used inconsistently. This causes a lack of performance information [metrics] regarding a project's status [on time, budget and client satisfaction]. Additionally, currently the only area being tracked through the WRR are the number of risks to the project and the time to mitigate those risks (see figure 6). The WRRs do not provide any of the functions the BVA WRR including milestone schedule, quality metrics, deviations to project and assigned stakeholder, and performance metrics.

Comaker									
		WEEK	22	24	26	28	30	32	34
COM 1	mitigated before due date		3	7	3	1			
	mitigated after due date with impact		0	1	0	2			
	In progress (after due date)		0	1	2	0			
	In progress (before due date)		7	3	1	1			
	new	10	5	2	1	2			
	Total open risks	10	12	6	4	3	0	0	

Figure 6: WRR example: Risk Tracking

Due to the incomplete tracking of the WRRs, key performance information is similarly lacking in the Director’s report (DR). The SB’s DR only tracks risk metrics. Some of the results of project Y720 are shown in figure 7. Here you can see the number of risks per project and per comaker on a monthly basis.

Without proper schedule tracking, the documentation of deviation to cost and time caused by risk, and the identification of the stakeholder responsible for the deviations, there is a lack of transparency on projects. The lack of transparency has increased the MDC functions of the Buyer including the attempts to transfer the financial burden of risks to comakers. The Buyers actions have discouraged comakers to utilize their expertise to preplan, mitigate risk and improve performance.

Package	Comaker	Metrics	Month Projects	JULY-1			JULY-2		
				NO. 1	NO. 2	NO. 3	NO. 1	NO. 2	NO. 3
CONSTR	COM 1	mitigated after due date with impact	2	2	1	3	3	4	
		In progress (after due date)	3	1	3	2	1	1	
CONSTR	COM 2	mitigated after due date with impact	0	0	0	0	0	0	
		In progress (after due date)	0	0	0	0	0	0	
HVAC	COM 3	mitigated after due date with impact	4	2	2	2	3	4	
		In progress (after due date)	0	2	4	1	3	5	
ELEC	COM 4	mitigated after due date with impact							
		In progress (after due date)							
ELEC	COM 5	mitigated after due date with impact							
		In progress (after due date)							

Figure 7: Director’s Report format SB

The SB has introduced a different method of coordination during the execution phase. The project Steering Committee introduced the GAME idea, with the objective to improve collaboration between the SB and a group of Comakers. The steering committee defined three topics (Learning, Strategic Goals, and Unbound) which are discussed every 4 months. These sessions are used to improve “Working Together.”

In analyzing these meetings, it was identified that there was a focus on collaboration and trying to understand each other. However, since the WRR and DR performance metrics are not available, this resulted in maximized communication. During interviews with four of the Comakers it was confirmed that there is a need for having metrics which would identify

performance. All agreed that having metrics would predict the outcome of a project without decision making or increased communication.

The meetings created an environment of non-transparency which does not allow for the critical information to be communicated nor for stakeholders to understand each other. The current structure is based on “working together” and sharing of responsibility and accountability. It is a natural law that if a group shares responsibility, no one is responsible. Sharing responsibilities leads to questions and decisions when risk occurs. It is therefore important that risk is not transferred, but expertise is used to mitigate risk caused by nonexpert stakeholders. As a result, the meeting provided little understanding of one another, minimized accountability and wasted resources.

This GAME idea is an example of how the SB and Comakers are struggling to create simplicity and transparency, caused by the deviated approach in the clarification and execution phase. The SB structure does not provide simple documentation of the plans, risk mitigation and performance of comakers that is collected through implementation of the WRR and DR.

### **Analysis of Resulting Hybrid Model**

The BVA selection documents (LE, RA, and VA) and rating process were created to minimize the use of decision making through performance metrics (Kashiwagi, 2014). The SB’s selection process does not strictly follow the BVA selection documents and rating system, as a result the SB does not have documentation which justifies the selection of comakers through objective evidence. The lack of objective documentation increases the risk of selection based on criteria other than the comakers expertise.

The BVA clarification documents are intended to provide transparency of the schedule, cost and responsibilities of each project stakeholder (Kashiwagi, 2014). The SB’s clarification process does not require such clarification documents and as a result the SB projects do not start with a project plan inclusive of a schedule with assigned responsibilities of each project stakeholder, detailed project cost, and risk management plan. The lack of a clear plan inclusive of costs and responsibilities increases the risk of project failure (Jiang et al., 1999; Kappelman et al., 2002).

In the execution phase the SB should does not utilize the standard functions of the WRR and DR including tracking of project deviations, tracking of milestone schedule and quality metrics, and displaying the project performance of deviation to time, cost, and quality metrics [by stakeholder]. The adoption of these standard functions have shown to (Kashiwagi et al., 2009; Sullivan et al., 2007):

- Create transparency for all parties involved.
- Communicate information as quickly as possible without getting into issues with Comakers.
- Utilize the expertise of makers to preplan and mitigate risk.
- Assign accountability and encourage continuous improvement.

As a result of the deviation of the WRR and DR the SB does not have accurate performance metrics on their projects including the time deviation, cost deviation, project stakeholders

responsible for deviations or customer satisfaction. Without accurate performance metrics it is not possible to identify the current state of their projects nor the effectiveness of the methods used.

In the analysis of the implementation of the BVA in the SB, there were various deviations to the standard BVA process. In answering the papers research question, the impact of the hybrid application of the Best Value Approach resulted in performance results (increased cost and decreased profit) which were lower than the documented results of standard BVA applications. Additional project characteristics contrary to the BVA emerged including:

- Shared responsibilities and reliance on relationships.
- Increased flow of detailed information.
- Increased communication (meetings, emails, etc.).
- Silo and self-preservation mentality.

In order to improve the situation, it is advised to integrate and adopt the standard BVA core processes as mentioned in the selection, clarification and execution phase without any deviations.

### **Conclusion**

The Best Value Approach (BVA) is not a change in processes or steps; it is a change in paradigm. However, to assist in this change in paradigm and framework has been created to simplify and assist in emphasizing this new paradigm. In deviating from this framework hybrids have an increased risk of poor performance as shown through the SB case study. Applicators of the BVA should be conscious and aware of these risks and ensure they have a Best Value Approach Expert when making any deviations to the standard framework.

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# A Private Organization Utilizes the Best Value Approach on an Enterprise Resource Planning System

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The Best Value Approach (BVA) is a new project delivery method that has been documented to increase performance and value on projects by the identification and utilization of expertise instead of management, direction, and control (MDC). It utilizes performance information that is simple, observable, and countable. It allows the expert vendor to know what the client project requires, why they can achieve success and what they will do before they do it. The tracking of the project cost and time deviation requires an initial plan and method to track it. Preliminary results of the BVA have shown a 90% decrease in effort by client organizations, 98% customer satisfaction and has led to 1% vendor cost and time deviation rate. It applies to construction, services/IT projects, and any long-term service. In 2014, a large private organization having difficulty delivering information technology (IT) and construction/facility services identified the BVA as a potential solution. This paper will summarize a major IT Enterprise Resource Planning case study that the large private organization used the BVA on and identify the full results.

**Keywords:** Best Value Approach, Information Technology, Large Private Organization.

## Introduction

In 2014, a Large Private Organization (LPO) was having difficulty delivering two types of projects: information technology (IT) and construction/facility services. The organization had recently tried to deliver an enterprise resource planning (ERP) software platform upgrade for the entire organization but was not successful. The organization ended up spending a year and \$3M+, in attempts to work with a vendor to reach an agreeable plan and specifications, only to find out their expectations could not be met. The project was stopped, and the purchasing of the service was postponed.

The LPO was using a traditional process to deliver its IT services. This model required them to create technical specifications to relay the requirement of the service to the vendors. Since most of the time the LPO did not have expertise in the service, the process required them to use time and resources to hire an IT consultant to help them create the specifications to deliver the service.

The traditional approach to delivering services has not had a good past performance history. The documented performance of the service industry has had low performance (in terms of on budget, on time, with high customer satisfaction) (Deming, 1982; Egan, 1998; Kashiwagi, 2009; IHS Markit, 2013; Goff, S., 2014; CII, 2015; Rivera, 2017; Kashiwagi, 2018; PBSRG, 2018).



Organizations are continually trying to find different methods that ensures they will receive high performing services. A recent literature search was performed, as part of a Ph.D. student’s dissertation (Rivera, 2017), to verify the poor performance of services. The study reviewed over 208 publications from six major research databases. Thirty-six of the publications had documentation of performance in terms of cost and schedule overrun, customer satisfaction and quality. Table 1 identifies six major industries performance. The literature verified the low performance of services and identified that despite the differences in technical difficulty of each industry, the performance levels were still similar.

*Table 1: Performance of Service Industries*

<b>A Few Major PM Industries</b>	<b>On Time</b>	<b>On Budget</b>	<b>Customer Satisfaction</b>	<b>Quality</b>
Information Technology	40%	43%	3.6/10	Fair
Construction	25%	32%	N/A	Poor
Health Sector	N/A	N/A	6/10	Poor
Aerospace and Defense	14%	38%	N/A	N/A
Manufacturing	67%	50%	7/10	N/A
Energy	59%	59%	7/10	N/A

Like many other organizations the LPO began looking for a way that minimizes their issues and failures in delivering IT services. In 2015, the Director of construction/facility services reached out to the Performance Based Studies Research Group (PBSRG) to train the organization on the Best Value Approach (BVA). The LPO Director had learned about the BVA in conferences and identified it as a potential solution to the organization’s issues. After the organization received training on the approach and was able then to identify its performance results, the organization was interested in using the process to try to re-deliver its ERP software upgrade.

*Best Value Approach (BVA)*

The BVA was derived from the industry structure model (IS) (see Figure 1). The IS model splits the industry up into two main quadrants:

1. The Value Based quadrant that has high competition and performance; and
2. The Price Based quadrant that has low competition and performance.

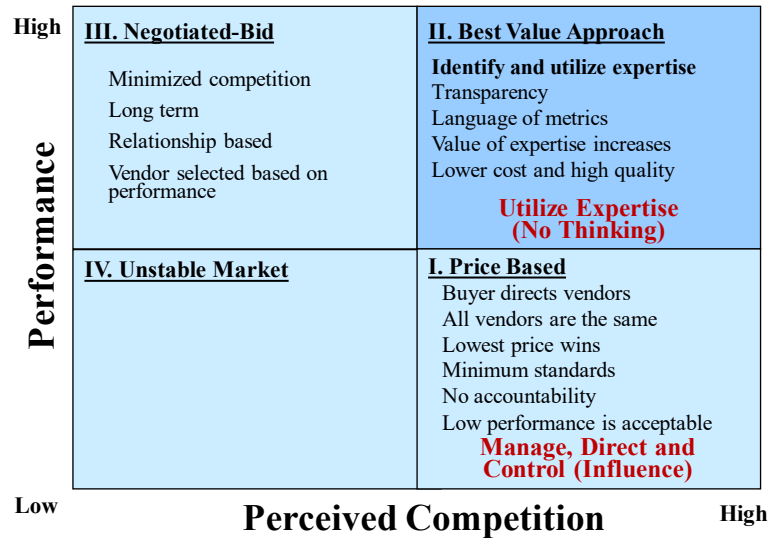


Figure 1: Industry Structure Model

The model identifies that low performance is caused due to buyers trying to manage, direct, and control (MDC) vendors. The only way to move to the Value Based quadrant is to utilize the expertise of the vendor, by moving the management and control of the project to the expert vendor.

The IS model identifies the following buyer traditional activities that are used to MDC vendors (Kashiwagi, 2018; PBSRG, 2018):

- Creating technical requirements and specifications.
- Partnering and developing relationships with vendors to enable the client to be involved with the management and development of the service.
- Using the contract as leverage over the vendor.
- Using a project manager to manage a vendor after they were awarded a contract.

The IS model also identifies that the following activities will enable buyers to utilize the expertise of vendors:

- Minimize involvement in technical details of services.
- Move buyer activities to that of quality assurance (ensuring the vendor has created a plan and is measuring their performance through non-technical metrics) instead of quality control (ensuring the vendor is performing all their technical work correctly).
- Require vendors to tell the client what the technical specifications and requirements should be.
- Utilize internal buyer personnel to help and protect the vendor.

The BVA was developed to help buyers to understand and move to the Value Based quadrant and perform the activities that enable them to utilize the expertise of vendors. The BVA splits a project up into three major phases (selection, clarification, and execution) (see Figure 2):

### Selection Phase

All vendors compete based on their level of expertise instead of their technical scope of work. During this phase, the vendors are not given technical requirements or specifications, but a list of expectations and explanation of “what the client thinks they want”. They are selected upon their past performance metrics, ability to identify risk, and capability of their key personnel. The vendor that is highest ranked moves into clarification.

### Clarification Phase

This is the most important phase, as the vendor with the highest level of expertise is now required to create their scope of work and technical requirements which are required to:

- Explain how they will accomplish the work efficiently and with high customer satisfaction;
- Identify their plan from beginning to end, all risks that they do not control, all major milestones, how they will measure their performance, and justify their costs; and
- Respond to the client’s concerns and feedback about the vendor’s plan and the vendor must address those concerns in their plan.

Regardless, if the concerns from the client are technical or non-technical, the vendor is required to resolve the concern using non-technical language. The contract is only signed when the client is totally comfortable with the vendor’s plan, otherwise, the vendor will be eliminated from clarification and the next in line vendor will be notified for clarification.

### Execution Phase

Upon signing the contract, the contractor can proceed to work according to their plan. Since the vendor was the entity that developed the plan and the metrics, it has now put them in full control of the project. Performance will be tracked and posted online for each contractor through Weekly Risk Reports (WRR) which the contractor will turn in on every Friday. If ever another stakeholder tries to control, the expert, that is also reported on the WRR and the vendor identifies what the impact that control will have on the project’s performance.

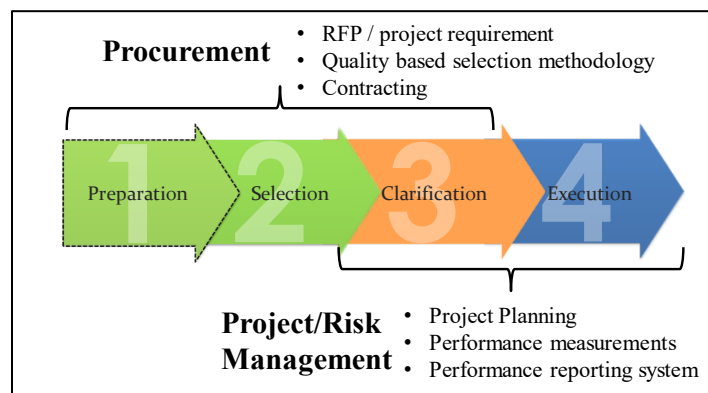


Figure 2: The Best Value Approach

Many of these ideas are different from the traditional delivery models. However, the LPO was convinced that the concepts were accurate due to the performance of the BVA system which include the following (Rivera, 2017; PBSRG.com, 2018):

- 2000+ projects and services delivered (construction and non-construction).
- \$6.6B of projects and services delivered with a 98% customer satisfaction and 9.0/10 client rating of process.
- Services delivered: construction, facility maintenance, IT, professional (design), redesign of systems and organizations and supply chain applications.
- \$17.6M in research funding generated, due to the effectiveness of decreasing buyer cost of services on average by 31% (57% of the time, the highest performing expert was selected and was the lowest cost).
- Contractors/experts could offer the client/owner 38% more value, and decreased client efforts by up to 79%.
- 90% of all project cost and schedule deviation is caused by the owner's non-expert stakeholders.
- Change order rates were reduced to as low as -0.6% (Rivera, 2017).
- CIB W117 has worked with over 123 unique clients (both government and private sector) and received 12 National/International Awards.
- 5 to 30 percent cost savings are achieved on the projects.
- The BVA is the most licensed technology to come out of Arizona State University licenses (54).
- It is internationally recognized through repeated testing (Canada, Netherlands, Sweden, Norway, Finland, Botswana, Malaysia, Australia, Democratic Republic of Congo, France). Education efforts are in Poland, Saudi Arabia, India, Vietnam and China.
- Been audited four times: The State of Hawaii Audit [Kashiwagi et al. 2002; State of Hawaii Report 2002 (DISD)]; The Dutch Study on the Impact of PIPS (Duren & Doree, 2008); The Corps of Engineers (COE) PARC, 2008 (Kashiwagi, 2018); The Western States Contracting Alliance (WSCA) Agreement, 2011 (PBSRG, 2018).

### **Problem and Proposal**

The BVA proposes that the reason the LPO was having difficulty in delivering high performing services was due to their use of a traditional process that required them to manage, direct, and control their vendors instead of utilizing the vendor's expertise.

PBSRG proposed that in using the BVA, the LPO would no longer have to perform MDC activities and would be able to begin utilizing the expertise of the vendors. Using the BVA, the LPO would not only begin to see the performance of services go up, but also would see that the cost and time to implement services would decrease.

A 2013 study (Kashiwagi) was performed comparing the BVA with traditional delivery systems and it identified that not only did performance increase, but the cost went down and the value the buyer received went up (see Figure 3).

Criteria	Overall Comparison	
	Traditional	BVA Factors
# of outsourced Services	31	
Cost of Services	\$274,480,342	\$189,001,943
Added Value	-	\$72,762,248.60
Average Customer Satisfaction (CS)	3.43	8.02

Figure 3: Traditional Delivery Systems

### Methodology

The LPO agreed to the implementation of the BVA and agreed to the following steps:

1. Educate staff on the BVA.
2. Use the BVA on implementing the ERP software upgrade service.
3. Document and analyze the project and its results.

### Large Private Organization Enterprise Resource Planning Software Upgrade Service

The ERP service was led by the LPO procurement group in the Human Resources Department. The ERP would affect every area of the organization, as it would be changing the way all 4,000 employees would track their work hours, receive payment, and work with the LPO's electronic business processes. The ERP would replace its current legacy IT software platform.

The first step in doing this was to educate all the LPO's upper management personnel that was included on the core team. Many of the personnel had their disagreements with minimizing the management, direction, and control of the vendors, but in the end, all agreed to follow the process as a result of receiving training and achieving a better understanding of BVA.

The second step was developing the scope of work without using technical requirements or specifications. The following was what the LPO finally agreed to publish as the SOW:

*The intent of the overall project is to provide Large Private Organization (LPO) with a Human Capital Management, Payroll, and Time/Attendance system. The system will replace the current systems, which are either out or soon to be out of support and compliance and will need to integrate with applications that LPO will maintain related to HR, Payroll and Time/Attendance.*

*The Scope of Work to be considered in your proposal includes both: Product Solutions (software, hardware, ongoing support, maintenance and upgrades), and Consulting and Project Support (business process design, system integration design, development, testing, and implementation, technical support, technical and end-user training).*

*A. A cost-effective integrated Hardware/Software solution for delivery of core HR including benefits enrollment and integration with third party providers, Payroll, and Timekeeping activities. Desired solution will provide: data integrity, positive user experience, data analytics,*

*compliance, risk mitigation, and efficiencies. It will also enable LPO to meet its complex business requirements (i.e. multiple jobs, mixed FLSA types, multiple pay types and pay rates, multiple managers and approvers, labor allocation, reporting, labor laws, teacher contract pay, etc.)*

*B. Demonstrated ease of integration of related HCM content and activities (Value Adds) including compensation, benefits, talent management, recruitment, and learning management.*

*C. Evaluation and estimate of “cost of ownership” for your proposed solution, including hardware/software purchase and licensing, ongoing costs for maintenance and support, and estimated support needs (LPO staff resource and non-payroll cost needs) from LPO and Partners. Costs for updates, upgrades, maintenance, security, and customizations. Provide a 5-year cost of ownership projection based on LPO employee levels (approx. 4200 employees with annual turnover approx. 13%).*

*D. Evaluation of existing related best practice business processes and technical support to update and redesign these processes as necessary to ensure data integrity, positive user experience, integration, compliance, and efficiencies aligned with best practices.*

*Technical support, coordination, and evaluation of system implementation and testing including SIT and UAT testing of all processes and interfaces. Development and availability of test environments.*

*F. Consultation, advice, and collateral material related to change management and adoption of new systems/processes including communications plans, templates, and evaluation, development, and design of training for LPO technical users and end users.*

*G. Maintenance: Provide a recommended plan which outlines ongoing maintenance requirements, including updates and upgrades for the system going forward.*

This was extremely different than what both the buyer and the vendors were used to seeing. Many of them questioned why more information and explanation was not provided. The response given to them was, “you tell us what should be required and what would be best to receive.”

This enabled a Request for Proposal (RFP) to be created within five days compared with the previous attempt that took 1 year. The rest of this section will review all the major phases of the ERP software upgrade BVA project.

### *Selection Phase*

On August 17, 2016, the LPO released the RFP and received six responses. In the selection phase, no technical details were discussed, but the vendors were required to show their documented past performance, identify the major risks that the project could encounter, submit options for anything they thought could add more value to the buyer that no one else could offer, and price. The top three submittals’ teams were brought in for interviews. The interviews only asked high level questions and did not go into the details of the vendors offers. A selection

committee of three persons provided the ratings. Table 2 shows the evaluation scores (out of 100). Vendor A was the lowest price (\$2.9M from the most expensive and \$53K from the second lowest), and highest prioritized vendor. The highest ranked vendor (Vendor A) was also the lowest cost. The selection was simple and took no decision making from the team.

*Table 2: Human Resources ERP Evaluation Ratings*

No	Criteria	A	B	C	D	E	F
1	Level of Expertise rating	25.0	22.7	13.6	13.6	18.2	20.5
2	Risk Assessment rating	25.0	21.4	14.5	14.3	20.2	19.0
3	Value Added rating	15.0	11.3	11.3	11.3	11.3	11.3
4	Interview rating	22.0	25.0	0.0	0.0	16.3	0.0
5	Cost	10.0	9.8	9.0	5.5	7.9	5.4
	Total	97 (\$3.4M)	90 (\$3.5M)	48 (\$3.8M)	45 (\$6.2M)	74 (\$4.3M)	56 (\$6.4M)

*Clarification Phase*

As the highest ranked, Vendor A was advanced into the clarification phase with the purpose being:

- Ensure the vendor is an expert by requiring them to
  - Create the technical requirements,
  - Create a simple plan that resolves any concerns from the buyer and
  - Shows the buyer how they will be able know the vendor is delivering a quality service throughout the entire project.
- Resolve any inaccurate buyer expectations.
- Ensure all parties are informed and accountable of their part in the implementation of the service.

They were expected to develop a complete technical scope of work and pre-plan the entire project, before they could receive a signed contract with the LPO. Their deliverable for the Clarification Phase was called clarification documents (full plan). It included the following:

- Scope of work
- Assumptions and Resource Breakout
- Price schedule
- Schedule
- Performance metrics
- Risk management plan

After Vendor A created the first draft of their clarification documents, a meeting was held with the client and the following issues were identified:

- Plan identified multiple testing strategies, which would identify if the ERP system is working, with no explanation of how it will be conducted upfront prior to award.
- Plan did not identify all resources and expectations from the LPO in order to bring the project to completion.

- Client was confused and did not know how to proceed.

Vendor A initially had a difficult time laying out the entire plan for the client. They were used to the traditional process of the client telling them what the schedule should be, what meetings and communication was required, and to figure out who was responsible for what after a contract was signed throughout the entire project. By requiring the vendor to lay out a plan, it resolved many issues before the contract was signed, and ensured the project would be successful by allowing the expert vendor to determine what should be done:

1. Vendor had to clarify the scope of work with the client. Figure 3 shows the original scope of work submitted. After review, the client did not understand at a high level what was being delivered, the cost and time requirement, and which stakeholder would be responsible for all the major parts of the project. The vendor eventually clarified this information to the client and helped the client to understand the major deliverables (see Figure 4 and Table 3) steps the vendor would make to finishing the service.

Service	Subscription Description	Excluded from Implementation
<b>Benefits - LDP</b>	Benefits enables the set-up of benefit plans, benefit groups, eligibility rules and benefit rates; maintenance of enrollment event and cross plan rules for benefit plans; management of benefit and open enrollment events, evidence of insurability, and individual rates for workers.; tracking of beneficiaries and dependents.	Custom Reports Excluded (WD provides delivered reports and dashboards and has included 16 hours of knowledge transfer to assist customerin building custom reports)
<b>Absence Management - LDP</b>	Absence Management supports the management of leave of absences and time off. It enables the set up and administration of leave plans; the definition of the impact a leave has on employee compensation, as well as whether employees can request leave types directly. It enables viewing of leave results for a worker or organization; set up and administration of time off plans, and whether time off can be requested directly by the employee. Absence Management enables the viewing of time off plan balances including projections.	Custom Reports Excluded (WD provides delivered reports and dashboards and has included 16 hours of knowledge transfer to assist customerin building custom reports)
<b>Time Tracking - LDP</b>	Time Tracking enables the collection, processing, and distribution of time data for a global workforce. The Time Tracking module is unified with HCM and Payroll and includes the scheduling, time entry (hourly, time in/time out), approvals, and configurable calculation rules.	Custom Reports Excluded (WD provides delivered reports and dashboards and has included 16 hours of knowledge transfer to assist customerin building custom reports) Scheudling is not included as part of the implementation
<b>Payroll for United States - LDP</b>	Payroll for US supports the creation and management of Payroll for U.S. employees. Configure earnings, deductions, accumulations, and balances. Identify tax authorities each company wishes to withhold for. Manage worker tax data, payment elections, involuntary withholding orders, and payroll input. Calculate, review/audit, and complete payrolls and settlement runs. Configure and calculate payroll commitments. Payroll includes connectors that facilitate integration to select partners that provide capabilities, including: time and attendance, tax filing, check printing, and direct deposit.	Custom Reports Excluded (WD provides delivered reports and dashboards and has included 16 hours of knowledge transfer to assist customerin building custom reports) Integrations will need to be reviewed and confirmed to determine what is in scope.



Service (cont'd)	Subscription Description	Excluded from Implementation
<b>Cloud Connect for Benefits - LDP</b>	Cloud Connect for Benefits extends ██████████ HCM by providing integration to a growing catalog of benefits providers, including: health insurance, health and flexible spending accounts, retirement savings plans, life insurance, AD&D insurance, and COBRA administrators.	Custom Reports Excluded (WD provides delivered reports and dashboards and has included 16 hours of knowledge transfer to assist customer in building custom reports)
<b>Core Human Capital Management - LDP</b>	Core HCM includes management of the unified worker system of record; organization management; staffing management; basic compensation management; safety incident tracking; business asset tracking; management of business plans. Core HCM includes ██████████ Foundation elements such as dashboards, reporting, analytics, Business Process Framework and self-service. ██████████ HCM includes connectors that facilitate integration to select ██████████ partners that provide capabilities including: recruiting, learning, time and attendance, and user account provisioning (LDAP/Active Directory).	Custom Reports Excluded (WD provides delivered reports and dashboards and has included 16 hours of knowledge transfer to assist customer in building custom reports)  Not included in the Implementation: <ul style="list-style-type: none"> <li>➤ Onboarding</li> <li>➤ Safety Incident Tracking</li> <li>➤ Business Asset Tracking</li> </ul>

Figure 4: Original Scope of Work

Table 3: Adjusted Scope of Work – Major Deliverables and Responsible Parties

Deliverables	Primary Owner	Date
Design Analysis – Vendor Integrations	Integration Consultant	4/25/2017
Design Analysis – Client Integrations	Client Technical Analyst	4/28/2017
Design Analysis – Business Processes Vendor Value Add	Principal Consultant	5/15/2017
Design Analysis – Reports	Client Team	8/2/2017

- Vendor had to clarify how many resources and how much time they would need to spend on the project to enable the vendor to deliver the service correctly. Figure 5 is what the vendor initially submitted. It was an 855-line detailed schedule of activities.

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Success	% Complete
1		████████ Lifecycle Deployment (LDP) Implementation	288 d	Thu 12/22/16	Fri 1/26/18			0%
2		Plan & Prepare Stage	21 d	Thu 12/22/16	Thu 1/19/17			0%
3		████████ Customer On-Boarding	3.5 d	Tue 12/27/16	Fri 12/30/16			0%
4		Create Customer Scorecard and Contacts into SFDC	0 d	Tue 12/27/16	Tue 12/27/16		5	0%
5		Send Customer "Welcome" letter	0.5 d	Tue 12/27/16	Tue 12/27/16	4	13,10	0%
6		Set up customer in ██████ Community	0 d	Tue 12/27/16	Tue 12/27/16		7	0%
7		Obtain SFTP site	1 d	Tue 12/27/16	Tue 12/27/16	6		0%
8		Obtain AMU tenant	0 d	Tue 12/27/16	Tue 12/27/16		9FS+1 d	0%
9		Send notification to Customer Project Manager to in	0.5 d	Wed 12/28/16	Wed 12/28/16	8FS+1		0%
10		Complete requested documents from welcome letter	3 d	Tue 12/27/16	Fri 12/30/16	5		0%
11		Sales to Service Transition	5 d	Thu 12/22/16	Wed 12/28/16			0%
12		Create Sales Transition Deck	2 d	Tue 12/27/16	Wed 12/28/16			0%
13		Review Deployment Discovery questionnaire	0.1 d	Tue 12/27/16	Tue 12/27/16	5	14	0%
14		Review Integration Discovery Document	0.1 d	Tue 12/27/16	Tue 12/27/16	13	16	0%
15		Review Contractual Commitments	0.03 d	Thu 12/22/16	Thu 12/22/16		16	0%
16		Request Project Resources	0.5 d	Tue 12/27/16	Wed 12/28/16	14,15		0%
17		Joint planning tasks	2.85 d	Tue 12/27/16	Thu 12/29/16		23,29,21	0%
18		Develop Phase and Transition Plan (High Level Gantt	1 d	Tue 12/27/16	Thu 12/29/16			0%
19		Review/Confirm SOW Scope (Functionality)	0.5 d	Tue 12/27/16	Tue 12/27/16			0%
20		Confirm Project Resources	0.5 d	Wed 12/28/16	Wed 12/28/16			0%
21		Discuss Kick-off dates	0.25 d	Wed 12/28/16	Wed 12/28/16			0%
22		Customer-owned planning tasks	2 d	Thu 12/29/16	Mon 1/2/17			0%
23		Discuss SOX/Safe Harbor requirements	1 d	Thu 12/29/16	Fri 12/30/16	17		0%
24		Review Testing Strategy	1 d	Thu 12/29/16	Fri 12/30/16	17		0%

Project: LDP - HCM Project Plan B  
Date: Sun 12/11/16

Task		Inactive Task		Start-only	
Split		Inactive Milestone		Finish-only	
Milestone		Inactive Summary		Deadline	
Summary		Manual Task		Progress	
Project Summary		Duration-only		Manual Progress	
External Tasks		Manual Summary Rollup			
External Milestone		Manual Summary			

Figure 5: Original Detailed Schedule

- After the detailed task line items were simplified, the vendor was able to break the project down into major phases (see Figure 6), general assumptions (see Table 4), major resources associated with hours and a schedule of when the resources are expected (see Figure 7 and 7a). When completed, it helped to ensure the client and the vendor had the right expectations and assumptions of what would happen during the contract to minimize any surprises.

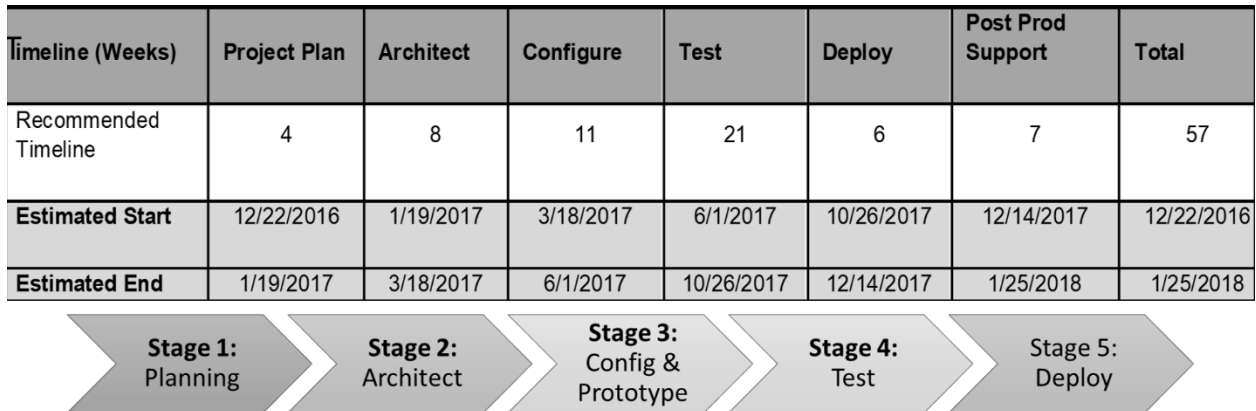


Figure 6: Major Phases

Table 4: General Assumptions

General Assumptions	Client Questions / Concerns	Vendor Response
Professional Services in this SOW will be performed ~70% offsite and 30% onsite at a client location.	- Vendor's breakout of presence by major activities?	Vendor will provide presence by major activities for each stage/roles.
	- How do we know this is the right approach?	Typical approach for commercial side is 80% offsite and 20% onsite.
	- What other off-site tools [besides emails and phone] will be used to communicate?	Additional offsite tools: WebEx, Skyper, internal collaboration tool.

Team/Group	Planning Stage Estimated Hours	Estimated Full Time Equivalent (FTE @ 40 hours a week)
PMO Resources	472	3.0
HCM Resources	440	2.75
Finance/Payroll Resources	440	2.75
IT Resources	360	2.25
Totals	1712	10.75

Figure 7: Responsible Parties – Hours Associated

Project Months	December				January		
	5	15	22	29	5	12	19
Project Stage	Prc				Plan		
SC / Exec Sponsors	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Project Manager	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Project Admin	10.0	10.0	10.0	20.0	20.0	20.0	20.0
C M - (Training/CM/Communications)	0.0	0.0	0.0	40.0	40.0	40.0	40.0
Testing Lead	0.0	0.0	0.0	10.0	10.0	10.0	10.0
Testing Support	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>PMO Resources</b>	<b>58.0</b>	<b>58.0</b>	<b>58.0</b>	<b>118.0</b>	<b>118.0</b>	<b>118.0</b>	<b>118.0</b>
HCM Lead - (HCM & Comp)	20.0	20.0	20.0	40.0	40.0	40.0	40.0
HCM Support Team	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Benefits Lead	20.0	20.0	20.0	40.0	40.0	40.0	40.0
Benefits Support Team	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Absence	10.0	10.0	10.0	20.0	20.0	20.0	20.0
Absence Support Team	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>HCM Resources</b>	<b>70.0</b>	<b>70.0</b>	<b>70.0</b>	<b>120.0</b>	<b>120.0</b>	<b>120.0</b>	<b>120.0</b>
Payroll Lead	20.0	20.0	20.0	40.0	40.0	40.0	40.0
Payroll Support Team	0.0	0.0	0.0	20.0	20.0	20.0	20.0
Time Tracking	10.0	10.0	10.0	40.0	40.0	40.0	40.0
Time Tracking Support team	0.0	0.0	0.0	10.0	10.0	10.0	10.0
<b>Fin / Payroll Resources</b>	<b>30.0</b>	<b>30.0</b>	<b>30.0</b>	<b>110.0</b>	<b>110.0</b>	<b>110.0</b>	<b>110.0</b>
Conversion Team / .5 per application	20.0	20.0	20.0	60.0	60.0	60.0	60.0
Integration	0.0	0.0	0.0	20.0	20.0	20.0	20.0
Security	20.0	20.0	20.0	10.0	10.0	10.0	10.0
Reporting	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Help Desk Training / Support	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>IT Resources</b>	<b>40.0</b>	<b>40.0</b>	<b>40.0</b>	<b>90.0</b>	<b>90.0</b>	<b>90.0</b>	<b>90.0</b>
Internal Auditor	4.0	4.0	4.0	4.0	4.0	4.0	4.0
<b>KS Other Resources</b>	<b>4.0</b>	<b>4.0</b>	<b>4.0</b>	<b>4.0</b>	<b>4.0</b>	<b>4.0</b>	<b>4.0</b>

Figure 7a: Responsible Parties – Hours and Schedule Associated

- Vendor had to clarify when and how much they would bill the client. Table 5 shows the original price schedule submitted. It was unclear to the client what was being billed, when and for how much. Table 6 shows the adjusted price schedule. The client was able to identify how much the vendor was charging for each deliverable and ensure they were comfortable with when the vendor would expect payment.

Table 5: Original Price Schedule

Fee Summary	Project Plan	Architect	Configure/Prototype	Test (E2E and Parallel)	Deploy	Post Prod	Total
Professional Services Hours	276	1044	1578	1629	505	84	5116
Delivery Assurance Checkpoints							150
T&M Fees	\$71,160	\$228,140	\$333,610	\$349,130	\$112,575	19,980	\$1,154,490

- Table 6 shows the adjusted price schedule. The client was able to identify how much the vendor was charging for each deliverable and ensure they were comfortable with when the vendor would expect payment.

Table 6: Adjusted Price Schedule

Price Schedule				
Invoice Month	Task/Activity	Initial Invoice Amount	Invoiced Date	Date Payment Received
Jul	Data Analysis	\$2,500.00	1/29/2016	7/29/2016
Aug	Draft Report	\$50,000.00	1/29/2016	8/15/2016
Sep	...	...	...	...
Oct	...	...	...	...
Nov	...	...	...	...
Dec	Final Report	\$3,500.00	1/29/2016	12/15/2016

- Vendor had to clarify their schedule. Table 7 shows the vendors milestone schedule. It did not help the client understand what major activities were to be conducted and major client and stakeholder action items. Table 8 shows the adjusted milestone schedule. It helped the client to see the major phases of the project, major activities and client and stakeholder action items all associated with dates.

Table 7: Original Milestone Schedule

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Planning	Architect	Config & Prototype	Test	Deploy

Table 8: Adjusted Milestone Schedule

Task Name	Start	Finish
BUSINESS READINESS AND EDUCATION		
PLAN STAGE	12/22/16	1/19/17
CHANGE AMBASSADOR NETWORK	12/22/16	1/19/17
Recruit members	12/22/16	1/19/17
Change Ambassador Kickoff Meeting	12/22/16	1/19/17
ARCHITECT STAGE	1/19/17	3/20/17

TRAINING STRATEGY	1/19/17	3/20/17
Develop high level training strategy with LPO	1/19/17	3/20/17
Review/share draft with PMO and project team	1/19/17	3/20/17
Finalize training strategy	1/19/17	3/20/17
CONFIGURE & PROTOTYPE STAGE	3/18/17	6/1/17
CHANGE READINESS ASSESSMENT	3/18/17	6/1/17
Change Readiness Workshop (review/refine initial maps/questions)	3/18/17	6/1/17
Deploy 2nd Change Readiness Assessment	3/18/17	6/1/17
Compile survey results and prepare presentation of results	3/18/17	6/1/17
Review survey results with project team and Change Ambassadors	3/18/17	6/1/17
TEST STAGE	6/01/17	10/26/17
COMMUNICATION PLAN	6/01/17	10/26/17
Continue deployment of communication and user adoption events	6/01/17	10/26/17
DEPLOY STAGE	10/26/17	12/14/17
CHANGE READINESS ASSESSMENT	10/26/17	12/14/17
Change Readiness Workshop (review/refine initial maps/questions)	10/26/17	12/14/17
Deploy 3rd Change Readiness Assessment	10/26/17	12/14/17
Compile survey results and prepare presentation of results	10/26/17	12/14/17
Review survey results with project team and Change Ambassadors	10/26/17	12/14/17

8. Vendor had to clarify their risk mitigation and management plan (RMP). Table 9 shows the initial RMP submitted. It did not have any metrics to identify the cost and schedule impact if one of the risks occurred. The client was unable to prioritize which risks were more likely and critical. Table 10 shows the adjusted RMP submitted. The adjusted RMP identifies the risk, vendor’s plan of actions to mitigate or manage the risk, their client assumptions and cost and schedule impact to the project.

Table 9: Original Risk Mitigation and Management Plan

Risk	Risk Mitigation Approach	Risk Impact	Plan of Action
Ineffective approval, sign-off and decision making	<p>A strong commitment to decision making and sign-off is imperative to meet the established project timeline.</p> <ul style="list-style-type: none"> <li>• Vendor will outline the deliverables and milestones that require sign-off and decision making.</li> <li>• All client decisions will be documented by vendor.</li> </ul>	<p>Probability: High</p> <p>Impact: High</p>	<p>Client and vendor will meet about this issue. Vendor will track this in the weekly risk report.</p>

Table 10: Adjusted Risk Mitigation and Management Plan

Risk	Risk Mitigation Approach	Risk Impact	Plan of Action
Ineffective approval, sign-off and decision making	<ul style="list-style-type: none"> <li>• Vendor will outline the deliverables and milestones that require sign-off and decision making.</li> <li>• All client decisions will be documented by vendor.</li> <li>• <b>Vendors will review the outstanding tasks, actions, decisions, and sign-offs online via Central Desktop with client and will include this information in the WRR.</b></li> <li>• <b>Client Assumptions:</b> <ul style="list-style-type: none"> <li>o Will ensure management understand the impact of making decisions.</li> </ul> </li> </ul>	<p>Probability: High</p> <p>Impact: High</p> <p><b>Schedule: 1 week of additional work.</b></p> <p><b>Cost: 40 hours (\$ 10,600).</b></p>	<ol style="list-style-type: none"> <li>1. Vendor will document impact in WRR.</li> <li>2. Vendor will provide dominant information to client.</li> </ol>

	<ul style="list-style-type: none"> <li>o Will identify decision makers for each areas of the project.</li> <li>o Will publish, in advance, month-by-month assignments as appropriate (roles, commitment levels, and names of assigned individuals).</li> </ul>		
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The vendor clearly identified how they would measure the performance of the project before the contract was signed that enabled the client to know exactly what information the vendor would collect, report on throughout the end of the project, and how they would determine when the project was successfully completed.

All the vendor-completed steps helped the client to resolve all of their concerns and issues with the vendor’s proposal, which led to a contract being signed.

*Execution Phase*

After the contract was signed, the vendor then carried out the plan that they had created in the clarification phase. Each week the vendor reported on their performance and sent a simple report out to all the key stakeholders to ensure everyone understood where the project was at. The report was in the form of an Excel spreadsheet, which measures the final schedule and cost from its baseline, identify differential and who was responsible for it. The following tables show the key sections of the report.

Table 11 shows the first major section of the report, which records the baseline cost and schedule the report will measure from.

*Table 11: Project Setup*

Project Information		Contact Information	
Client	LPO	Client Project Manager	First, Last Name
Vendor	Vendor A	Phone	XXX-XXX-XXXX
Project Name	IT Project	Email	<u>XXXX@LPO.com</u>
Date Awarded	12/23/2016	Vendor Project Manager	First, Last Name
Award Cost	\$1,967,975.00	Phone	XXX-XXX-XXXX
Duration [Total days)	388	Email	<u>XXXX@VendorA.com</u>
Initial Start Date	1/3/2017		
Initial Completion Date	1/26/2018		

Table 12 shows the milestone schedule. The vendor was required to layout their plan from beginning to end using major activities with assigned dates. To assist in making the schedule simple, the milestone schedule includes all stakeholder activities. If a milestone deviates from its baseline, a deviation number (Dev #) is assigned to it. The Dev # correlates to the line item that the deviation is explained in the deviations section (see Table 13).

Table 12: Milestone Schedule

#	Activity	% Complete	Baseline Schedule	Revised Schedule	Dev #
1	Vendor Customer On-Boarding	100%	1/26/2017	1/27/2017	
2	Sales to Service Transition	100%	1/2/2017	1/2/2017	
3	Joint planning tasks	100%	1/2/2017	1/2/2017	
4	Customer-owned planning tasks	100%	1/2/2017	1/2/2017	
5	LPO / SCI Organization Readiness Plan	100%	1/2/2017	1/2/2017	
6	Workbook Reviews - Value Add	100%	1/2/2017	1/2/2017	
7	Training - for Workbook completion	100%	1/2/2017	1/2/2017	
8	Project Kickoff Meeting	100%	1/2/2017	1/2/2017	

Table 13 shows the deviations section. Each time a milestone did not meet the baseline schedule and caused a deviation beyond the end completion date, or an additional cost was incurred, it is recorded in the deviations report. In addition to the cost and schedule impact recorded and mitigation plan, the entity responsible is identified.

Table 13: Deviations

Dev #	Date Entered	Items	Plan to Minimize Risk	Impact to Critical Path	Impact to Cost	Entity Responsible
1	7/14/17	Assistance Benefits, Payroll and Time Tracking requirements and testing	LPO keeps adding requirements. To assist with requirements, LPO has signed a change order	0	\$110,800	Client

At the completion of the execution phase the project was able to be completed on time and on budget. The customer was extremely satisfied, and the internal project team could not believe how well the project went. There were no major issues that occurred on the project. Table 14 shows the final reported performance.

Table 14: Final Report

Budget		Schedule	
Initial Allocated Budget	\$1,967,975.00	Initial Start Date	1/3/17
<b>Current Estimated Budget</b>	<b>\$2,078,775.00</b>	Initial Completion Date	1/26/18
<b>\$ Over Budget</b>	<b>\$110,800.00</b>	<b>Current Completion Date</b>	<b>1/26/18</b>
\$ Due to Client	\$110,800.00	<b>Days Delayed</b>	<b>0</b>
\$ Due to Vendor	\$0.00	Days to Client	0
\$ Due to Unforeseen	\$0.00	Days to Vendor	0
\$ Due to Other	\$0.00	Days to Unforeseen	0
<b>% Over Budget</b>	<b>5.63%</b>	Days to Other	0
% Due to Client	5.63%	<b>% Over Schedule</b>	<b>0.00%</b>
% Due to Vendor	0.00%	% Due to Client	0.00%
% Due to Unforeseen	0.00%	% Due to Vendor	0.00%
% Due to Other	0.00%	% Due to Unforeseen	0.00%
		% Due to Other	0.00%

## Conclusion

The LPO was amazed at how well the BVA worked on their ERP software upgrade service. The LPO would eventually use the BVA to deliver seven other difficult services, including the following:

- OpenText Digital Media Workspace and Archive
- Small Unmanned Aircraft System Program
- Library System Replacement Project
- Master Strategic Plan
- Business Continuity Plan
- LED Fixture Replacement
- Electronic Health Records System

For each type of service, the LPO documented that the less the buyer managed, directed, and controlled the vendors and the more they utilized the vendor’s expertise, the higher performing services they received. The following (Table 15) are the overall performance metrics of all their BVA implementations:

*Table 15: Overall Performance of LPO BVA*

Program Overview		Project Deviations		
Total project cost (millions)	\$3.02	<b>% Overrun</b>	Cost	Schedule
Customer Satisfaction (out of 10)	9	<b>Overall</b>	<b>6.7%</b>	<b>34.6%</b>
Project Overview		Due to client	6.7%	27.3%
# of projects	6	Due to vendor	0.0%	0.0%
# projects on budget	4	Due to unforeseen	0.0%	20.0%
# projects on time	2	Due to other	0.0%	7.1%

The LPO also found that the following characteristics are required in order to enable the utilization of expertise:

- Transparency – The only way to utilize the expertise of the vendor and for the buyer to allow the vendor to take control of the project is if both sides are completely transparent and provide all the information and supporting documentation for all of the work they do.
- Simplicity / Non-Technical communication – The only way the buyer will feel comfortable enough to enable the vendor to take control of a project is if they can understand exactly what will happen and why the vendor is doing what they are doing. In order for a process to be efficient all participants, must also have the right expectations and know what their responsibilities are. This can only happen if everything communicated is clear and simple.
- Measure – The buyer and vendor will have no way of knowing if the service was successful and the value it produced unless clear metrics are in place ahead of time that all parties agree upon. In the BVA, a vendor is not hired to complete a set of technical requirements, they are hired to accomplish a certain level of performance.



The LPO also identified that through running the BVA the process to deliver services took less resources and was able to be completed faster.

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# Application of Best Value Approach to Resolve Educational Non-Performance

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Trends suggest that employers across various industry believe that the younger generation of employees are deficient at making decisions, thinking critically, and leading others. The Best Value Approach (BVA) is a management model shown to increase organizational efficiency and employee performance. Studies show that the BVA automates administrative work functions and minimizes human error associated with decision making and critical thinking. This research seeks to investigate the effectiveness of incorporating the BVA in high school. The authors hypothesize that BVA concepts can help students rapidly learn critical thinking, decision making, and interpersonal skills. To test this hypothesis, the authors created a BVA high school curriculum and tested it in four phases differing in timeframe, classroom structure, and population. The results show that when students understand BVA concepts they show improved mental stability (stress and confidence), increased academic performance (grades and test scores), and parents/teachers report significant positive behavioral improvements.

**Keywords:** Best Value Approach, Secondary Education, Classroom Management, Talent Management, Leadership.

## Introduction

The purpose of the education system is to prepare students for productive careers. A productive career requires students to use their training to meet the changing demands of a specific industry. The authors propose that successful graduates must adhere to the following assumptions:

1. Educated people will know how to meet job function requirements.
2. Educated people will select a career that fits their skill sets and interests.
3. Educated people will have more stable lifestyle.
4. A stable lifestyle will make educated people happier.

A 2013 combined research effort between Gallup and the Lumina Foundation found that only 11% of employers believe recent graduates possess the skills required to meet business needs (Gallup, 2013), supporting assumption 1. Over 90% of employers say critical thinking skills and decision making is more important than a graduate's degree or technical training (AACU, 2015). Yet, 11% of employers believe recent graduates can think critically and 30% believe graduates understand decision making. A 2014 CareerBuilder survey administered to over 2000 hiring managers and human resource professionals, echoes this sentiment by noting several observations about recent college graduates (Hunt, 2014):

- 40% do not think college prepared them for the “real world.”
- 49% are in a job fields unrelated to their major.

- 51% are in jobs that do not require a degree.

These problems have been prevalent for the past 40 years. Publications in the late twentieth century suggest that grades do not correlate to job performance or lead to more successful careers (Baird, 1985; Roth, 1996), as assumed by the authors. A long-term study of high performing students shows that valedictorians are no more successful than average students (Arnold, 1995). Despite these early findings, the authors have found no efforts proven to make curriculum more relevant to industry needs. The most widespread efforts (‘No Child Left Behind’ and ‘Common Core’) were reported failures (Garcia, 2015; Gates, 2017).

Besides poor job preparation, student mental health is rapidly declining. About one-third of U.S. college students had difficulty functioning in the last 12 months because of depression, and almost half said they felt overwhelming anxiety in the last year (Novotney, 2014). The number of child suicide attempts doubled between 2008 and 2015 and over half of those occurred between ages 15 and 17 (AAP, 2017). Further research shows that academic pressure causes 43% of child suicides (Cambell, 2017). These findings support assumptions 3 and 4.

These findings suggest that many US schools are not adequately preparing students for successful careers. Students do not possess important skill sets, they lack direction and motivation, they show signs of mental instability, and many are suffering widespread depression. Most school systems try to address these problems by obtaining more funding or providing students with more resources, but these efforts are inconclusive (Morris, 2017; Russakoff, 2015).

*A Solution to Poor Performance in Supply Chain Management*

The authors propose that the demand on the education will change with industry trends. Technology is changing the workforce and the nature of service delivery. In the next 10 years, 47% of US jobs will be automated (Frey, 2013). It is likely that automation will replace all job functions that do not require specialized training. Rivera et. al. (2017) propose that this will create a three-fold division of labor: technical experts, automated job functions, and information workers (see Figure 1). Highly specialized jobs that cannot be automated will require trained technical experts or artisans. Automated jobs will only use machines to accomplish key tasks.

<u>Technical Experts</u>	<u>Automated Jobs</u> Technical Information	<u>Information Workers</u>
<ul style="list-style-type: none"> <li>• Craft Labor</li> <li>• Artisans</li> </ul>	<ul style="list-style-type: none"> <li>• Information Technology</li> <li>• Artificial Intelligence</li> </ul>	<ul style="list-style-type: none"> <li>• Executives</li> <li>• Managers</li> </ul>

*Figure 1: The Future of Automation in the Industry*

All jobs that cannot be automated fall under a third category that encompasses executive roles and leadership positions. Kashiwagi (2018) calls this job function, the “information worker”. This category of workers will coordinate services between automation tools and technical

experts. Information workers are experts at using performance information to simplify decision-making, utilize expertise, and create organizational efficiency.

The Best Value Approach (BVA) is a management model designed to improve supply chain performance by training information workers (PBSRG, 2018). According to Kashiwagi (2018), most organizations and employees do not understand the job function of information workers, so they are not prepared for future industry demands. Kashiwagi (2018) proposes that the next generation of employees (and students) will be more prepared if they learn how to operate like information workers.

The BVA theory posits that performance issues arise when non-expert stakeholders attempt to manage, direct, and control (MDC) expert vendors. When expertise is properly used, BVA identifies that project costs decrease by 5-30% and project time and cost deviations fall under 1%. The BVA is the most licensed intellectual property (60 licenses over 20 years) developed at Arizona State University (the most innovative university for the past four years by the U.S. News and World Report) (Faller, 2018). This research has been tested over 2,000 times delivering over \$6.6B of services in ten different countries (Kashiwagi, 2017; Rivera, 2017; PBSRG, 2018).

Since its creation in 1991, the BVA spawned a diverse array of professional development programs. The foundational philosophy has proven applications in various personal and professional arenas. The core philosophy consists of four models (Kashiwagi, 2016; Kashiwagi, 1991; Kashiwagi, 2014; Kashiwagi, D. T. and Byfield, R. 2002; Kashiwagi, D. et al., 2016; Kashiwagi, D., et al., 2008; Kashiwagi, J. 2013; PBSRG, 2016; PBSRG, 2017; Rivera, 2014; Rivera, et al., 2016):

1. Information Measurement Theory (IMT)—“A predictive theory that simplifies reality and allows people to see into the future.”
2. Kashiwagi Solution Model (KSM)—A model that predicts human characteristics and behaviors based on “... individual’s perception of information”.
3. Spectrum of Observation (SOO)—A decision-making tool used to differentiate from observant and less-observant ideas/organizations/individuals.
4. Industry Structure (IS)—A model that describes the nature of professional services and relationships based on performance and competition.

The BVA leverages these models “... to optimize the participation of individuals by minimizing their time and effort in the delivery of services” (Kashiwagi, 2016). These models use performance information and deductive logic to minimize administration, decision-making, and risk (Kashiwagi, 2018). Kashiwagi (2016) suggests that this mirrors trends in modern technological advancements. Every industry is expanding its use of automation and robotics. Automation (robotics, IT, and intelligent software) reduces human error by providing solutions-based data driven analysis and reporting (Haight, 2007).

## **Research Questions & Methodology**

The US education system is not preparing high school students for modern workplace demands, such as soft skills, leadership capabilities, and accountability. Recent graduates never learn critical skills desired by modern employers. College and teenaged students are suffering mental health issues. Public education proponents have spent billions to resolve school performance issues, but no clear solution has arisen. The solution to poor performance must leverage a unique approach. The BVA information worker is shown to improve performance through minimization of cognitive functions inclusive of decision making, risk and administration. The authors seek to investigate BVA methodology as a potential solution for poor performance in the education by answering the following questions:

1. Can high school students learn BVA concepts to become information workers?
2. Will BVA help students develop critical thinking and decision-making skills?
3. Will learning BVA help improve student mental health?
4. Can BVA help schools address non-performance?

To answer these 4 questions, researchers first conducted a literature review to investigate past BVA education methods. Next, researchers used these findings to create a curriculum for high school students that teaches BVA concepts. Last, the authors conducted various classroom case studies and measured the impact on student performance.

## **Curriculum Development**

The authors identified 330 publications by searching for articles containing “Best Value Approach” or models relevant to BVA (“Performance Information Procurement System”, “Information Measurement Theory”, or “Kashiwagi Solution Model”). The authors could not identify any publications relevant to both BVA and education before 2013 (the commencement of this research).

In 2009, Dr. Dean Kashiwagi (BVA founder) developed a BVA honors course at Arizona State University (U.S. News’ most innovative university for four years) and Barrett, the Honors College (New York Times “Gold Standard”). After seven years of testing with over 1,200 graduate and undergraduate students, the education program showed impressive performance results. With a 94% student satisfaction rating, the course could decrease reported stress by 27% and help 30% of students overcome significant life challenges (depression, substance abuse, social anxiety, etc.) (PBSRG, 2018). The authors used the material from the college course to develop a high school curriculum.

## *Classroom Case Studies*

With an approved high school curriculum, and Kashiwagi’s approval of its connection to BVA concepts, the authors founded Leadership Society of Arizona (LSA) to test out curriculum effectiveness. LSA developed various case studies to measure student impact among different populations:

1. Phase 1: Summer pilot programs (7<sup>th</sup> & 8<sup>th</sup> grades)
2. Phase 2: In-school programs (9<sup>th</sup>–12<sup>th</sup> grades)
3. Phase 3: Hybrid programs (7<sup>th</sup>–12<sup>th</sup> grades)
4. Phase 4: Performance consulting in high schools

These case studies span five years, 40 programs, and over 1,200 teenage students. Performance data was collected for each program. Researchers issued several surveys at the commencement and conclusion of each program:

- Student comprehension of BVA concepts
- Student leadership self-assessment
- Student Perceived Stress Scale (PSS) (Cohen, 1983; Roberti, 2006)
- Parent and student satisfaction surveys
- School administrator satisfaction surveys

After each program, researchers interviewed select students and parents to further validate responses found in their surveys. The data shown in this report summarizes the survey responses from all 40 LSA programs.

## **Analysis & Results**

### *BVA High School Curriculum*

The BVA college curriculum was designed to introduce students to the logical foundation of the BVA model. Kashiwagi (2017) maintains that the foundation of learning BVA is “natural laws”, or principles of reality that remain unchanging and, thus, help to predict the future. The curriculum is designed to teach the following concepts:

- Using deductive logic and critical thinking to solve problems.
- Information-based decision making.
- Understanding new subject material by simplifying specialized language and the amount of data.
- Identify and utilize the expertise of others.
- Using a computer-like decision making system based on binary principles.
- Interpersonal skills based on “no influence”, accountability, predictability, “win-win”, and self-discovery.
- Replacing thinking with observation for stress management and problem solving.
- Using and interpreting performance metrics.

Traditional education does not measure based on these factors. Successful education in the U.S is dependent on grades, graduation rates, and standardized test scores (Loo, 2018) The traditional school environment causes students work alone in all assessments and must therefore rely on their own thinking abilities. BVA Education teaches students high-level concepts aimed at helping students simplify complex problems by using performance information (IW concepts). BVA students learn how to utilize expertise in all aspects of life. Traditional education supposes

that all students can learn any line of expertise with the right training. BVA education proposes that students must learn how to discover their own expertise and develop it. The difference between education system is shown in Figure 2.

The traditional path takes a bottom-up approach in which students must spend 13 years memorizing core competencies as determined by federal and state governments (Loo, 2018). Students are then tested and certified with specific degrees. After that, students typically receive on-the-job training for their specific job functions.

BVA Education takes a top-down approach in which students learn BVA natural law concepts within six months. In learning these concepts, students should understand how to utilize expertise in two primary ways. First, students will learn how to self-evaluate to determine their own area of expertise (or desired area of expertise). Second, students will assess their own deficiencies or areas of risk in which they lack expertise. With these areas identified, students look for other experts to help them. The final goal should be to automate any reoccurring areas of non-expertise so students can minimize their own risk.

The major difference between these two models is that in the traditional path, students need constant supervision, education, and testing. In the BVA Education model, students learn how to self-asses and teach themselves, so any management is minimized.

#### Traditional Education

- Requires 18-30 years
- Technical details and core competencies
- Treats everyone the same
- Silo-based (kids work alone)
- Rely on thinking and decisions
- Not industry related

#### BVA Education

- 6 months
- Natural laws and performance info
- Helps kids find own expertise
- No silos (kids identify and utilize expertise)
- No thinking or decisions
- Connected to industry research

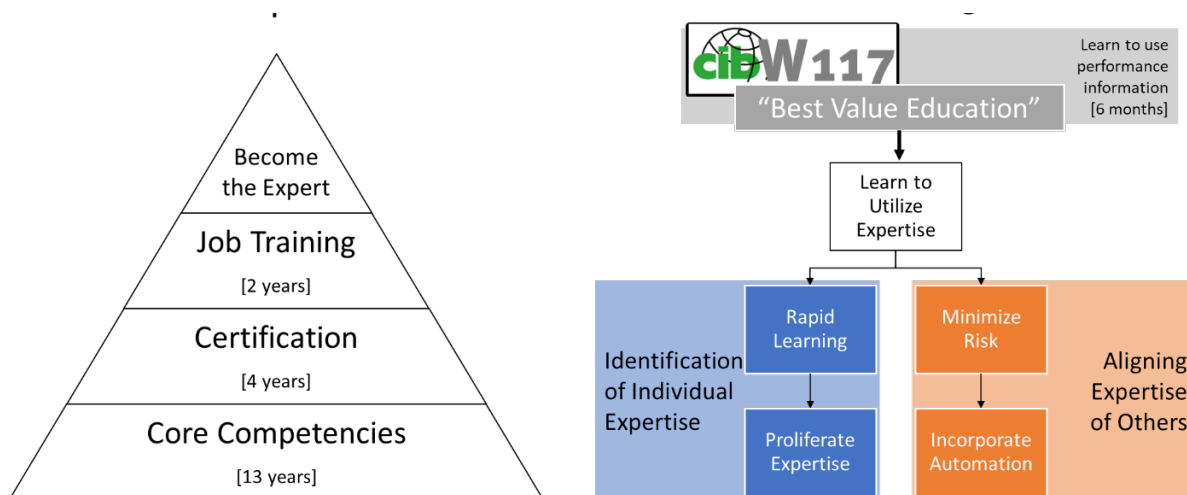


Figure 2: Comparing the Traditional Education System with the BVA Education Model

Based on these fundamental differences, the authors believe that BVA education addresses key problems in the education system and provides solutions for them. BVA education uses critical thinking, logic, and natural laws to help students improve decision making and manage their stress. This model teaches students how to recognize expertise within themselves and others.

*Performance Results of Classroom Case Studies*

In 2013, LSA adapted the BVA education model for teenage students. LSA created a curriculum designed to address the issues of non-performance in the school system (skill deficiencies and mental instability). The data collected spans five years, 17 research partners, 40 programs, 1,200+ students. The following sections will describe the performance results from each phase of this research.

*Description of Phase 1 – Summer pilot*

Phase 1 spanned 2013- 2015. LSA developed a week-long curriculum for 7<sup>th</sup> and 8<sup>th</sup> grades students in the Barrett Summer Scholars program hosted at Arizona State University. The course instructors were undergraduate and graduate research assistants who previously learned the BVA at ASU.

The results of the full three-year case study are shown in Table 1. Students were asked to evaluate their own perceived stress levels before and after the program on a scale of 1 (low stress) to 10 (high stress) (see Appendix A). The results suggest that, on average, students felt less stressed. In addition, students were asked to rate the BVA course and instructors compared to their other courses in the program (on a scale of 1 [dissatisfied] to 10 [highly satisfied]). The results show that students preferred the BVA education.

*Table 1: Performance Results of the Summer Pilot Program*

Case Study Length	3 years
Number of Students sampled	194
Decrease in reported stress level	-24%
Non-BVA Course Rating (1-10)	8.56
Non-BVA Instructor Rating (1-10)	8.78
BVA Course Rating (1-10)	9.06
BVA Instructor Rating (1-10)	9.60

Students completed an exam on basic BVA concepts before and after the program. Concepts include major ideas regarding IMT, KSM, and SOO (see Introduction). Before taking the course, students had an average comprehension score of 45%. After taking the class, students had an average comprehension score of over 80%. Upon further investigation of survey and exam results, students provided the following comments:

*“(The class) completely changed how I view and approach everyday situations. All the information that I learned through this program is completely applicable.”*

*“I like how this class made life easier and actually happier for me; teaching me how I am in control of my life.”*



*“I’m always trying to take challenging classes, but this is the first one that challenged me to think differently. I have learned more this week than in any other course.”*

The positive results of Phase 1 encouraged LSA to develop additional programs. LSA wanted to investigate how these impacts might affect performance in school settings and student behavior.

*Description of Phase 2: In-School Programs*

In 2015, LSA researchers began developing a year-long curriculum for high school students. During the 2015-2016 school year, LSA partnered with Saint Louis Schools (SLS) in Hawaii to offer a leadership course. One teacher from SLS offered to learn the curriculum and teach the course. Throughout the year, LSA researchers provided material and consultation services to guarantee program success.

Researchers used the same methods in Phase 1 to track the results of Phase 2. Students complete social-emotional surveys before and after the program. These surveys ask a series of 10-point scale questions regarding stress, confidence, happiness, and career readiness (see Appendix A). The SLS instructor submitted qualitative observations as well. The program results are shown in Table 2 below. Self-evaluation survey results show that students enjoyed the class and it made them feel less stressed, more confident, and more prepared for their future careers. Student comprehension was measured by testing students on IMT and IW concepts. The results suggest the comprehension increased by 79%.

*Table 2: Phase 2 Program Results*

<b>Criteria</b>	<b>Metrics</b>
Students	20
Student Satisfaction Rating	9.6/10
Change in Stress	-46%
Change in Confidence	+51%
Change in Career Readiness	+44%
Change in BVA Comprehension	+79%

In addition to these results, the SLS instructor noted a positive behavioral change in all 20 students. The instructor stated, “The biggest take away is that students are realizing that they control their lives. It is very empowering and has given these students a self confidence that was missing in their lives.” Positive behavior is also shown through student feedback:

1. “My process before taking this class was downhill, meaning I wasn't humble, I wasn't respectful to others, and it was all about me... There was a particular lesson when we were being taught to think about others before yourself. I really considered this and came out with good results. I found that when you help others you feel really good and pleased about what you did, which causes you to do more good acts.”
2. “I've learned to utilize experts, and if you do not know something, ask. The big area this affected was my fitness. I have a good knowledge about lifting and supplementation, but I do not know everything, so I will ask experts when I am unsure about a certain lift or a certain supplement. By asking questions, it's helped me to increase my knowledge on any subject.”

*Description of Phase 3: Expanded Programs*

The purpose of Phase 3 was to investigate how different populations respond to the curriculum. LSA researchers offered programs to the public for three years (2016–2018). In this timeframe, LSA offered 31 programs to 1,078 students from various backgrounds (race, ethnicity, and affluency). Each of these programs used the same BVA curriculum, but each program was administered according to the needs of specific schools or student groups. Some programs were facilitated over the course of four days, while others occurred throughout a semester. All programs consisted of 15–25 hours of in-class instruction.

Table 3 below summarizes the overall results of these programs. The data collection process was mimicked from Phase 1 and 2. Students completed a self-evaluation survey before and after the program. The survey results match Phase 1 and 2; most of the students feel less stressed and more confident after completing the programs

*Table 3: Phase 3 Program Results*

<b>Criteria</b>	<b>Metrics</b>
Students	1,078
Programs	31
Student Satisfaction Rating	9.3/10
Students who feel less stressed	67%
Students who feel happier	46%
Students who feel more confident	55%

*The Impact on Self-Perception*

In each phase, most of the students reported a positive mental impact (less stress, happier, and more confident). In order to measure the extent of this self-perception, researchers examined a focus group of 303 students from the 2017 and 2018 summer programs. The focus group was comprised of students who were willing to offer survey feedback. All students were invited. These students varied in race and ethnicity, but LSA staff estimate that over 95% of the students came from more affluent backgrounds (estimated household incomes of about \$40,000 or higher).

Of these 303 students, researchers examined the top 10% (30) of students who reported the greatest emotional impact from the program (e.g. showed the greatest before and after change in stress, confidence, and happiness). The results shown in Table 4 summarize data from students who perceived the greatest change in stress, confidence, and happiness respectively.

*Table 4: Percent Change in Self-Evaluation Scores Among the Top 10% of Students*

<b>Criteria</b>	<b>Metrics</b>
Students	33
Change in Stress	-63%
Change in Confidence	+43%
Change in Happiness	+46%

### Parent Perception

Researchers wanted to further validate student perceptions through parent feedback. The authors surveyed 192 families (mothers and fathers of students) from the 2017 and 2018 summer programs. The survey results showed:

- 97% were satisfied with the program.
- 92% noticed a positive behavioral change in their child after one week.
- 92% said they would sign their child up for another.

Parents were given the option to explain their child's changes in greater detail. Of the 192 families, 52 (27%) offered additional information. The authors categorized these responses and analyzed the results (see Table 5).

Table 5: Reported Changes that Parents Noticed in their Children

Description	Percent of Respondents
Better social skills (speaking & listening)	25%
More focused on goal setting/planning	23%
More confidence in self and future	21%
More responsible/accountable	17%
More open to new ideas	12%
More helpful around the house	12%
Less stressed	10%

### Impact on Academic Performance

A large Arizona school district contracted with the LSA to assist with the Title VI (Native American) tutoring program at a local high school. The program was designed to provide students with both math tutoring and leadership development education.

At the beginning of the program, LSA issued the same self-perception surveys and conducted an initial evaluation on their math and leadership comprehension skills and provided a psychological stress evaluation for every student. LSA found that 76% could not pass a basic ACT math practice test and 50% of students failed their previous math course. After four weeks of facilitating the program, LSA conducted the evaluation survey again. The results showed an increase:

- 60% of students received a passing grade in their math classes.
- 30% of students improved their math grades.
- 67% of students felt less stressed (16% average stress decrease for all students).
- 100% of students who attend more than 20 classes felt less stressed.
- 78% of students feel happier.
- 65% feel that they have more control over their lives.
- 80% improved their practice ACT scores.
- The passing rate increased by 36%

LSA staff issued a 10-question survey from the Coehn Percieved Stress Scale (see Appendix A)(Cohen, 1983). The max score (highest stress) that a respondent can have is 28, while the lowest is zero. This test was given to students three times throughout the program. Figure 3 shows the average stress of the full class during each one of these testing periods. The most dramatic decrease in stress occurred between the beginning of the program and the middle. Table 6 shows how stress changed among different groups of students between the beginning and midway analysis.

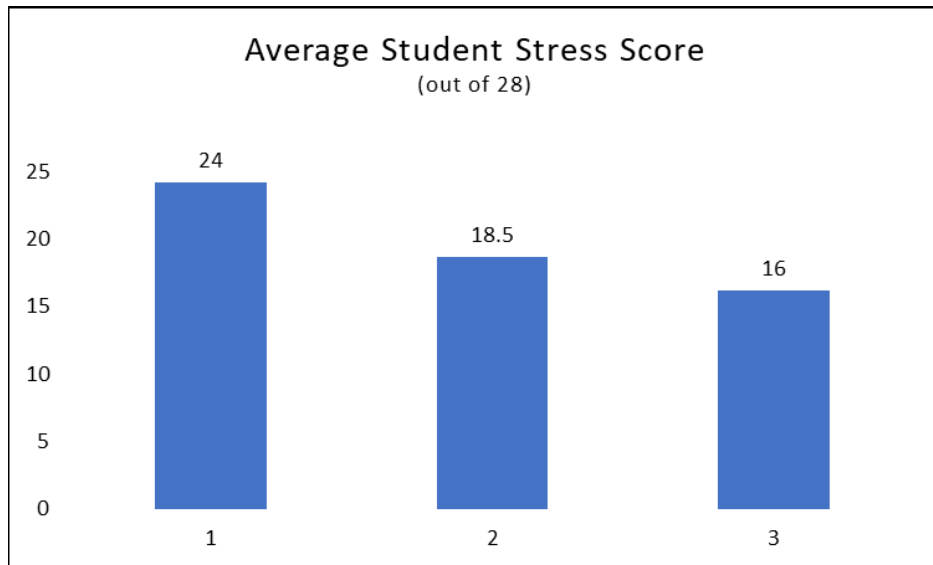


Figure 3: Average Student Stress Levels Based on the Physchological Stress Survey (max score: 28)

Table 6: Percent Decrease of Student Stress

Decrease in Stress (% change)	Number of Students (out of 18)
20%+	3
15-20%	3
10-15%	2
1-10%	4
0%	3
Stress increase	3

*Description of Phase 4: High School Consultation*

Phase 3 program results suggest that BVA concepts may have a positive impact on student academic performance (grades and test scores). To further validate this hypothesis, LSA initiated a new academic success program in Phase 4.

The purpose of Phase 4 was to investigate methods to improve student retention of math concepts. Researchers partnered with an Arizona high school that reported high failure rates in math classes and standardized tests. Researchers proposed that by applying BVA concepts to a

classroom, students could increase their concept retention and academic performance. The school elected to run a pilot program for Algebra I freshmen students.

For the duration of this program, LSA instructors worked with two Algebra I teachers (276 students). Before the program, only 24% of students past their first semester exam. LSA instructors spent ten weeks (25 hours) with each class period. Researchers incorporated BVA concepts by simplifying classroom instruction and reducing management, direction, and control by the leader of the classroom, thus reducing effort required. The following 5 changes were made:

1. Curriculum: Instructors simplified the curriculum and divided tests into separate 5 question exams. Teachers conducted a four-week review to reinforce key concepts.
2. Teaching Methods: Lecture was eliminated. Each day students were given a printout with simple instructions and 5-10 math problems. Teachers would walk around the classroom and provide help as needed.
3. Classroom Management: students were divided into groups of 4-5 and permitted to work together and share answers freely
4. Grading Policy: all students who came to class and participated would earn enough extra credit to pass the class (D). Higher grades were given to students who performed well on exams. All students were given multiple opportunities to retake exams.
5. Discipline: students who did not want to participate were given the option to sit in the back of the classroom with other non-participants. As a result, they would not earn extra credit for the day. Most non-participants became engaged toward the end of the two-month period.

Table 7 compares test performance of LSA students to non-LSA students (test scores range 1-4). Both groups included similar students. All students were freshmen in an Algebra I class.

*Table 7: Standardized Test Scores for BVA Math Students*

	Number	Average Score	Passing Rate (#)
All	549	1.44	14% (74)
BVA Students	276	1.53	17% (47)
Non-BVA Students	273	1.34	9% (27)

While both groups of students showed poor overall performance, nearly twice as many students passed the test in the LSA group compared to the other population of students. The math tests were divided into several sections. LSA students performed at least 5% better on all sections (including the statistics section which was not reviewed in the LSA class). These numbers are very promising given that LSA only had two months to prepare students.

In addition to their test scores, 38% of students improved their math grade from the previous semester and there was a 10% increase of students who received a B or higher. In the Fall semester, only 24% passed their final exam. After completing the review with the LSA instructors, 77% of students passed a make-up exam.

## **Conclusion & Recommendations**

Research trends suggest that employers are not satisfied with the younger generation of employees. Most employers believe that the education system is not preparing students for the workplace. Graduates lack soft skills (critical thinking, problem solving, and interpersonal skills) and their technical skills are outdated or irrelevant to modern workplace needs. New hires are often retrained regardless of receiving degrees and technical certifications in the school system.

Dr. Dean Kashiwagi created the Best Value Approach (BVA) to help increase worker efficiency by automating workplace functions and decision making. Previous research shows that the BVA reduces human error and minimizes the technical requirements for employees (Kashiwagi, 2016).

The Leadership Society of Arizona (LSA) was founded to teach BVA concepts to high school students in order to better prepare them for industry needs. The research presented in this paper examines the impact that BVA concepts on student performance, soft skill comprehension, and workplace preparedness. The authors hypothesized that when students understand BVA concepts, they are more prepared for the modern workplace. The research results shown herein support this hypothesis.

Since 2013, LSA facilitated over 40 programs for 1,200+ teenage students. Programs varied from weeklong summer sessions to yearlong leadership courses. In every iteration, researchers found that students responded positively to BVA concepts. Self-administered survey show that students feel more confident (up to 43% increase) and less stressed (up to 63% decrease) after learning BVA concepts. Researchers found that when struggling students learned BVA concepts, they increased their standardized test scores (8% increased passing rate). This research suggests that BVA education can help children improve mental stability, concept retention, and learning speeds (as shown by their ability to improve test scores in a shorter period compared to a control group).

The authors recommend continual study in schools outside of Arizona and the United States. The authors also recommend conducting a long-term study to investigate retention and career success rates of students who complete BVA education. Researchers suggest surveying past BVA students after they have completed college, and surveying employers to measure job satisfaction and performance.

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## Appendix A – Surveys

### Starting Survey

Name: \_\_\_\_\_ Age: \_\_\_\_\_ School: \_\_\_\_\_

Grade:            7<sup>th</sup> Grade            8<sup>th</sup> Grade            Freshman            Sophomore            Junior            Senior

Below are a number of statement. Please read each one and indicate to what extent you agree or disagree with each statement (circle one).

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. Chance and randomness do not exist.	1	2	3	4	5
2. Some people are successful because they are lucky.	1	2	3	4	5
3. I control my own life.	1	2	3	4	5
4. It is possible to control others.	1	2	3	4	5
5. It is possible to influence others.	1	2	3	4	5
6. It is important to talk to parents/teachers/mentors.	1	2	3	4	5
7. Successful people ask for help.	1	2	3	4	5
8. A person's environment is a reflection of the themselves.	1	2	3	4	5
9. Everyone in life has value and is important.	1	2	3	4	5
10. Mistakes are an important part of life.	1	2	3	4	5
11. I am confident about my future.	1	2	3	4	5
12. I am happy.	1	2	3	4	5
13. I am stressed.	1	2	3	4	5
14. I feel self-confident.	1	2	3	4	5
15. I know what I want in life.	1	2	3	4	5
16. I know my strengths and weaknesses.	1	2	3	4	5
17. I know what changes I have to make in order to improve myself.	1	2	3	4	5
18. I feel that personal improvement is directly related to my future success and happiness.	1	2	3	4	5
19. I have what it takes to be a good leader.	1	2	3	4	5

*Application of Best Value Approach to Resolve Educational Non-Performance*

**INSTRUCTIONS:**

The questions in this scale ask you about your feelings and thoughts during **THE LAST MONTH**. In each case, please indicate your response by placing an "X" over the circle representing **HOW OFTEN** you felt or thought a certain way.

	Never	Almost Never	Sometimes	Fairly Often	Very Often
	0	1	2	3	4
In the last month, how often have you been upset because of something that happened unexpectedly?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt that you were unable to control the important things in your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt nervous and "stressed"?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt confident about your ability to handle your personal problems?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt that things were going your way?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you found that you could not cope with all the things that you had to do?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you been able to control irritations in your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt that you were on top of things?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you been angered because of things that were outside your control?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Ending Survey

Name: \_\_\_\_\_ Age: \_\_\_\_\_ School: \_\_\_\_\_

Below are a number of statement. Please read each one and indicate to what extent you agree or disagree with each statement (circle one).

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. Chance and randomness do not exist.	1	2	3	4	5
2. Some people are successful because they are lucky.	1	2	3	4	5
3. I control my own life.	1	2	3	4	5
4. It is possible to control others.	1	2	3	4	5
5. It is possible to influence others.	1	2	3	4	5
6. It is important to talk to parents/teachers/mentors.	1	2	3	4	5
7. Successful people ask for help.	1	2	3	4	5
8. A person's environment is a reflection of the themselves.	1	2	3	4	5
9. Everyone in life has value and is important.	1	2	3	4	5
10. Mistakes are an important part of life.	1	2	3	4	5
11. I am confident about my future.	1	2	3	4	5
12. I am happy.	1	2	3	4	5
13. I am stressed.	1	2	3	4	5
14. I feel self-confident.	1	2	3	4	5
15. I know what I want in life.	1	2	3	4	5
16. I know my strengths and weaknesses.	1	2	3	4	5
17. I know what changes I have to make in order to improve myself.	1	2	3	4	5
18. I feel that personal improvement is directly related to my future success and happiness.	1	2	3	4	5
19. I have what it takes to be a good leader.	1	2	3	4	5
20. This program has helped me	1	2	3	4	5
21. I would recommend this program to others	1	2	3	4	5

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	Didn't like		Neutral		Loved
On a scale of 1 – 5, how would rate this program?	1	2	3	4	5
On a scale of 1 – 5, how would rate the instructors?	1	2	3	4	5

What did you like most about this program, and what did you like least?

Please leave any additional comments or suggestions below or on the back page.

**Favorite Lessons** (Circle your favorite lectures/activities for each day)

Day 1	Day 2	Day 3	Day 4
IMT Basics Lecture	No Thinking Lecture	WIOMM Lecture	Access ASU Lecture
Interview Game	Win-Win Game	Utilize Expertise Game	Leadership Lecture
No Randomness Disucssion	No Thinking Case Studies	Key to Selflessness Lecture	Lego Game
Lava Pit	Cone or Puzzle Games	The Harvest Game	College Prep
Steph Curry & Success	KSMs	No Influence Discussion	
Plan Your Week	Marbles or Movies	Minute to Win-it	
Dream	Presentations	Meditation & Journal	
Meditation & Journal	Meditation & Journal	College Prep	
	College Prep		

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**INSTRUCTIONS:**

The questions in this scale ask you about your feelings and thoughts during **THE LAST MONTH**. In each case, please indicate your response by placing an "X" over the circle representing **HOW OFTEN** you felt or thought a certain way.

	Never	Almost Never	Sometimes	Fairly Often	Very Often
	0	1	2	3	4
In the last month, how often have you been upset because of something that happened unexpectedly?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt that you were unable to control the important things in your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt nervous and "stressed"?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt confident about your ability to handle your personal problems?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt that things were going your way?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you found that you could not cope with all the things that you had to do?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you been able to control irritations in your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt that you were on top of things?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you been angered because of things that were outside your control?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### Starting Survey

Name: \_\_\_\_\_ Age: \_\_\_\_\_ School: \_\_\_\_\_

Grade:            7<sup>th</sup> Grade            8<sup>th</sup> Grade Freshman            Sophomore            Junior            Senior

Instructions: Answer each question below. Use the appropriate column.	Rating (1-10) 1=poor, 10=good
My parent(s) forced me to come to this program.	
I wanted to come to program.	
My current stress level is a...	
My current confidence about my future is...	
My current confidence with my academic performance is...	
My current happiness with the relationship I have with my parents is...	
I always ask for help from my teachers when I am confused.	

Comments:

List 1 thing you wanted to learn in this program: \_\_\_\_\_

List any major issues you are experiencing and would like help with: \_\_\_\_\_

**Additional Comments:**

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

### End Survey

Instructions:	Rating (1-10) 1=poor, 10=good
I am happy I attended this program.	
My current stress level is a...	
My current confidence about my future is...	
My current confidence with my academic performance is...	
My current happiness with the relationship I have with my parents is...	
I will now start asking for help from my teachers when I am confused	

Comments:

Did you learn the 1 thing you wanted to learn in this program: Circle one – [YES / NO]

Did you learn any tips to overcome the any major issues you have experienced: \_\_\_\_\_

**Additional Comments:**

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

## CLOSING CEREMONY SURVEY

Your name \_\_\_\_\_

Your email \_\_\_\_\_

1. Your student's name:

2. On a scale of 1 – 10, 10 being the *highest*, how satisfied are you with the program?

3. In this week, has your relationship with your child improved? **Yes / No**

4. In this week, has your child shown positive changes? **Yes / No**

5. Please circle which of the following you are most interested in learning more about:

Purchasing a book

Success Coaching

Speaking Engagements

Free Workshops

Advanced Summer Programs

Overnight Camps

Other \_\_\_\_\_

6. Please write your phone number to learn more about the above: \_\_\_\_\_

When is the best time to call you? (circle all that apply)

MON	TUE	WED	THURS	FRI	Other _____
am pm	am pm	am pm	am pm	am pm	

Additional Comments or questions?

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## Administrator Closeout Survey

Your name or affiliation will not be shared with external parties without your permission.

\* Required

1. Full Name \*

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2. Preferred Email Address \*

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3. School \*

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4. Overall Satisfaction with LSA Programs \*

Mark only one oval.

	1	2	3	4	5	
Very Dissatisfied	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly Satisfied

5. Overall Satisfaction with LSA Staff/Instructors \*

Mark only one oval.

	1	2	3	4	5	
Very Dissatisfied	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly Satisfied

6. Overall Satisfaction with the current school system

Mark only one oval.

	1	2	3	4	5	
Very Dissatisfied	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Highly Satisfied

7. Do you think LSA programs improved student academic performance (grades and test scores)?

Mark only one oval.

- Yes
- No
- Unsure



**8. Do you think LSA programs improved student wellbeing (stability and morale)?**

*Mark only one oval.*

- Yes
- No
- Unsure

**9. Please provide a statement on your experience with LSA. Consider mentioning how the programs have helped you, your students, or your school.**

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**10. Additional Comments**

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## Continual Involvement

**11. Please select any future LSA partnerships you might be interested in:**

*Check all that apply.*

- Publications (books and journal articles)
- Hosting Student Workshops
- Summer Programs
- Teacher Professional Development
- Data Collection and Analysis
- Curriculum Development
- Other: \_\_\_\_\_

**12. Do you want to continue receiving information from LSA (newsletters, conferences, & publications)?**

*Mark only one oval.*

- Yes
- No

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**13. Can LSA share your contact information with future program referrals?**

*Mark only one oval.*

Yes

No

**14. Please list the contact information of any references that would benefit from working with LSA.**

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