A Procurement Method that Considers Innovation

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A challenge facing buyers in the delivery of innovative construction and facility services is to utilize expertise without increasing project risk. The traditional price-based Design-Bid-Build approach minimizes the utilization of expertise of expert construction vendors by using an owner driven specification. The non-traditional approaches such as design-build, construction management @ risk (CM@Risk), and integrated project delivery are more flexible but still have no methodology to minimize the risk caused by innovative practices. The Best Value Approach utilizing the Performance Information Procurement System (PIPS) and the Information Measurement Theory (IMT) has been tested for over 20 years with high customer satisfaction and performance. However, the use of past performance information still gave the perception of high risk when considering innovative concepts that have never been previously utilized. This research uses a case study of a hospital owner competing the risk of innovative systems with existing, proven systems. The research group had the opportunity to interject the Best Value Approach into the case study delivering the innovative service/equipment requirement, allowing them to see how the approach and created Best Value environment reacted to the expertise that uses innovation. The case study involves the delivery of cutting edge cancer technology, the proton cancer treatment equipment/system. Even though the delivered service is not standard construction, the delivery approach can be easily used in construction.

Keywords: Procurement, innovation, risk, Best Value, proton therapy

Introduction

One of the questions to the Best Value Approach has been, “Are those who have limited experience at a competitive disadvantage when using this approach?” This topic becomes more important when a buyer is moving from a price based environment where every effort is made to ensure that all bidders have exactly the same opportunity to win, to a Best Value Approach where those with expertise and experience have the competitive advantage. PBSRG has been searching for a potential case where the Best Value Approach can be used to identify and utilize the value of innovation or new technology.

Medical facilities in the Netherlands have begun to investigate proton therapy, a relatively new medical procedure used to treat cancer. Currently in the Netherlands the use of proton therapy is regulated by a permit system. In February 2014, the Amsterdam Proton Therapy Center (APTC) was one of four Dutch initiatives to receive a permit to pursue Proton Therapy Treatment. APTC was founded by the Netherlands Cancer Institute (Antoni van Leeuwenhoek – AVL), the academic medical centers known as the VU University Medical Center (VUmc) and the Academic Medical Center (AMC). VUmc and AMC rank 15th and 44th in the field of medical sciences among 240 ranked European universities in the CWTS Leiden Ranking 2014 (Amsterdam Proton Therapy Center, 2014b).

Once a hospital receives a government permit, they still require funding for the construction of a new facility and proton therapy equipment. A key organization which intends to provide such funding is Zorgverzekeraars Nederland (ZN), an association which all Dutch healthcare insurance companies are a member. ZN has publicly stated that they do not intend to contract with all permit holders, and that they are considering a tender to decide with which initiative to contract. In anticipation of this tender APTC predicts the cost and quality of the proton therapy equipment purchased by them, will play a pivotal role in determining if they are selected.

APTC like other hospitals is in need of cutting edge technology for the lowest cost in procuring cancer treatment equipment. Due to the rapid development of proton treatment procedures, the methods and technology used are constantly advancing and improving. Considering these conditions, ATPC and similar hospitals are seeking to procure services that are innovative and upgradeable in order to remain cutting-edge and minimize the risk of their procured services losing their value over time (50M Euros price tag for existing proton treatment equipment).

The Oxford Dictionary of Economics refers to innovation as “The economic application of a new idea” (Black, 1997). Maranville adds by stating, “Innovation is an idea, product or technology which is perceived by the customers as new or having unique qualities,” (1992). The Oslo Manual, published by the Organization for Economic Cooperation and Development (OECD), defines innovation to be the implementation of technologically new or significantly improved products or processes (2005). There are many definitions of innovation, however, similar characteristics include something new, such as a change, a better way of doing a service or action that leads to an increase in value. (Maranville, 1992; OECD, 2005; Black, 1997; Vargas-Hernandez, 2011; Townsend, 2013). Innovation is found to be very difficult as the service or product being delivered has no past performance because it is new to the industry (Edquist, Vonortas, Zabala-Ituuriagagoitia, & Edler, 2015). By definition innovation appears to carry more risk and unknown factors than procuring traditional services and products (Georghiou, Edler, Uyarra, & Yeow, 2014).

The current level that any industry has to procure innovation is still very basic in terms of standardized processes and structures. This was confirmed through a literature search performed by the authors, in which they were unable to find any defined procurement processes that had shown consensus from multiple participants in the industry to deliver innovation successfully. There are currently various theories and guidelines researchers have found through case studies (Aberg & Bengtson, 2015; Cepilovs, 2014; Dale-Clough, 2015). Industry research has also made an attempt to create procedures (Kautsch, Lichon & Whyles, 2015; Rolfstam, 2015; Yellow & Edler, 2012); however, none had shown sufficient information to prove the ability to repeatedly deliver high performance and successful innovation.

Problem

Current procurement systems do not have the ability to consistently buy the latest state-of-the-art innovation in proton treatment equipment, without increasing risk due to the two-year lead time of construction, installation and rapid change in proton technology. A new approach will be identified, run and the results analyzed.

Proposed Solution

The APTC decided to use the BV approach to buying innovation. The BV system was selected for the following reasons:

1. The system is being heavily utilized in the Netherlands, and has shown to minimize risk by utilizing expertise.
2. The BV system has the ability to compare existing technology with future innovation that was still being developed.
3. The BV system has the ability to identify the requirement as the most state of the art equipment, without knowing what state of the art meant.
4. The BV system has the ability to minimize risk by utilizing the expertise of the vendors.
5. The process has the characteristic of minimizing the decision-making of the owner by forcing the expert vendors to show their expertise in a dominant way.
6. The BV system has the ability to compare the ability of the vendors to provide continual innovation to upgrade their installed system.
7. The BV system's use of metrics to minimize the risk of misunderstanding the proposed solution and minimize the decision making of the user/procurement team and the need to trust the vendor.

Methodology

This is a case study which utilizes the action research approach. It requires an actual test, both from the client/buyer and the innovative vendors. The methodology will be to:

1. Identify a client who is attempting to procure innovation.
2. Ensure that the client had an innovative procurement agent.
3. Ensure that the stakeholders utilized BV experts.
4. Identify an innovative vendor and assist them in competing for the project.
5. Identify how the approach and process of the client allowed vendors to use innovation.
6. Identify how the vendor was innovative.
7. Identify the success of the innovative vendor.

Visionary Procurement Group/Organization

The procurement agent of APTC (Jorn Verwey) was a BV visionary. The procurement agent already believed many of the core Best Value concepts before he was introduced to the Best Value Approach (Amsterdam Proton Therapy Center, 2014b):

1. Observed that traditional approaches led to litigation, over specified parameters, long delays and strained relationships between client and vendor.
2. Understood APTC was not just looking for proton therapy equipment but the development and implementation of innovative treatment processes and strategies, while continuously reducing the cost differential of the photon therapy for patients.
3. Recognized the expertise of the vendor is a pivotal element into remaining state-of-the-art for the operational life time of the center.
4. Understood that expertise would lead to lower costs.
5. Understood the vendor's role as the expert in the project.
6. Recognized managing, directing and controlling the vendor through specifications was not optimal (Verwey, 2015).

In 2014, the procurement agent was introduced to the Best Value Approach and saw the potential value. In 2014 he attended the annual conference held by the creator of the Best Value Approach, Dr. Dean Kashiwagi and eventually received his B+ certification (understanding of the deductive logic of Information Measurement Theory (IMT) and the simplistic understanding of the Best Value Performance Information Procurement System (PIPS)). He then identified that the BV PIPS system could accomplish the following for the Amsterdam Proton Treatment Care (APTC) consortium:

1. Ensure that the APTC procured the state of the art proton treatment machine/system.
2. Deliver a vendor who would be motivated to deliver state of the art technology when it was delivered two years after being procured (the facility and delivery of the 50M Euro proton cancer treatment system takes two years to deliver).
3. Over the lifetime of the 50M Euro proton cancer care treatment machine, the system would be continually updated to be state of the art in a quickly evolving industry.

To be able to use the Best Value Approach he required approval by all three partnering procurement departments that were part of APTC. To convince the three procurement departments, the procurement visionary hired a PBSRG trained Best Value expert (Wim de Vries), who was one of only eight Best Value Experts that were A+ certified (Highest certification of Best Value from PBSRG) in the Netherlands. Wim had extensive experience in Best Value Approach and became the focal point in answering questions and minimizing resistance from the other procurement agents and stakeholders. The BV expert was a critical piece of the ability to use such an innovative process. It became a requirement of the visionary procurement officer to have a BV expert as a part of the process. He also encouraged all competing vendors to utilize a BV expert. To ease concerns of the head of the department, an external legal advisor that had experience with the BV approach was also engaged. The BV visionary procurement lead understood that identifying and utilizing expertise was a change of paradigm from the traditional procurement approach. His expectation was that the approach would motivate all vendors to become visionary, to look ahead and use their expertise to identify what would be best for the client, and deliver services that are not managed, directed and controlled by the procurement agent or client.

APTC's Application of the Best Value Approach

Due to the different regulations placed on government procured services in the Netherlands, the Best Value Approach, the Performance Information Procurement System (PIPS) process was adjusted to conform to the Most Economically and Advantageous Tender (MEAT) process. Considering the slight changes made, APTC was able to follow the majority of steps from the BV PIPS process. The process remained as four phases (see figure 1) with each phase achieving the same requirements of the Best Value Approach (Kashiwagi, 2015).

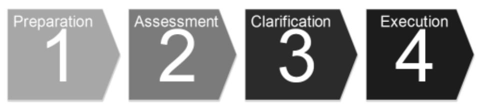

Figure 1: Four Phases of the Process.

In the Preparation phase APTC's main actions included a webinar for education in two different time zones (USA and Asia), a competitive dialogue session with each vendor, and the finalization of the RFP. In creating the RFP for the scope of services the client experienced a few challenges (Verwey, 2015):

1. Users had a substantial amount of expertise on proton therapy equipment which made it difficult for them to release control to the vendors to utilize their expertise and identify the best value.
2. Client's stakeholders felt that although vendor was the expert in the product, they were not expert in how to use the product.
3. The client's researchers and engineers found it difficult to refrain from adding all of their perceived technical requirements and solutions for the equipment.
4. Between the competing vendors there was a large difference in the range and field of expertise, which caused the client discomfort in not providing the full requirements.

The procurement agent was able to reduce the information given to the vendors to the 'Basic requirements' for the product. These basic requirements would reflect the client's strategic thinking on how they expected to use the product. The requirements were broken down into three parts:

1. An aim or goal that APTC wishes to accomplish with the product.
2. A definition, for each aim, defined by 'sought performances'. This provides a map to the client's clinical use of the product.
3. A limited list of parameters was given to the vendors to represent the client's requirements. This set the expectation for certain key performances which the client thought was relevant to meet their "perceived requirements."

An example of this would be as an aim, APTC is to select a supplier able to provide, install and maintain a compact proton therapy system to safely achieve maximum tumor control with minimal side effects. Sought performances include: minimal spot size at shallow depth, minimal beam delivery time, and fast energy switching. Parameters include: the proton therapy equipment can scan a volume of $10x10x10cm^3$ centered around the isocenter with the isocenter at any depth in the range of $5\text{-}15g/cm^2$ water, depositing a dose of 0.7 Gy with a homogeneous dose distribution as specified in the above within a single breath-hold (15 seconds). Additionally, the energy switching time is less than 0.5 seconds for a typical range-change in a treatment field.

The Best Value (BV) approach applied used a multi-criteria selection process that considers the following criteria:

1. Performance Substantiation: Allows vendors to demonstrate that it understands the project and the objectives and that it is going to achieve the latter.
2. Risk Assessment: Allows vendors to show capability to identify, manage and mitigate risks on behalf of the realisation of the project and organisation objectives.
3. Value Added: Allows vendors to show capability to maximize the opportunities that can add value to the project objectives, over and above the tender scope.
4. Price Substantiation: Allows the vendor to make the cost structure transparent and clear and show expertise in engineering choices made in designing equipment.
5. Interview: Allows the vendors key project personnel to demonstrate that the vendor understands and can clearly and simply articulate that they can manage the project and is able to understand the objectives.

Most Economic and Advantageous Tender (MEAT)

In the BV PIPS approach, the following steps are made to identify the BV vendor:

1. Each criteria is weighted (to show order of importance).
2. Each vendor’s submittal is rated on the different criteria.
3. All criteria ratings are then normalized, multiplied by the weightings, and totalled up to identify the relative points for each vendor. All ratings are (1-10, 10 being optimal). The ratings that are used are 10 for showing capability that is supported with metrics, 5 representing that the selection committee inability to verify the level of capability without making a decision, and 1 representing the lowest level of capability. Any 10 or 1 rating required an explanation.
4. The vendor with the largest point total is identified as the Best Value.

The Dutch or Europeans use a Most Economical and Advantageous Tender (MEAT) process. MEAT uses a fictitious price instead of points. Instead of adding points, MEAT subtracts cost when the vendor adds value, and adds cost when the vendor does not add value in any of the criteria areas. When a vendor shows value in a criterion, the weighting and score work together to determine a value in terms of a fictitious price that lowers the vendor’s actual price. It works in the following manner:

1. Each criterion is weighted (to show order of importance).
2. Each vendor's submittal is rated on the different criteria.
3. All criteria ratings are given a value. The ratings are 10, 8, 6, 4, and 2. A 6 rating is neutral and gives no value. A 10 rating gives the total value. An 8 rating gives half of the value. Ratings under 6 are negative values and increases the fictitious price. All ratings are (2-10, 10 being optimal). The ratings that are used are 10 for showing capability that is supported with metrics, 6 representing that the selection committee inability to verify the level of capability without making a decision, and 2 representing the lowest level of capability. Any 10 or 2 rating required an explanation.
4. The vendor with the lowest modified cost is identified as the Best Value. The modified cost is called the fictitious price.

In the MEAT process vendors are selected based upon a fictitious price (actual price minus credit due to performance shown in other performance factors). Therefore, all vendors are prioritized by their fictitious price and the vendor with the lowest fictitious price is selected as the Best Value vendor that will move into the clarification phase. The vendor's fictitious price is calculated as shown:

1. (Vendor price) - (Total addition credits for high ratings in selection criteria) = fictitious vendor price.
2. The selection criteria APTC used include (APTC, 2014a):

The rating system was on a scale that ranges from Poor, Unsatisfactory, Neutral, Good, and Excellent with an associated addition/subtraction to the vendor's submitted price (See Table 1). Meaning a vendor who scored "Excellent" on all of the selection criteria with a submitted price of 90 Million Euros (M EUR) would have a fictitious price of 38.6 M EUR (Amsterdam Proton Therapy Center, 2014a).

Table 1

Scoring Weights

BV Selection Criteria	Poor	Unsatisfactory	Neutral	Good	Excellent
Performance	+24 MEUR	+12 MEUR	0	-12 MEUR	-24 MEUR
Risk	+12 MEUR	+6 MEUR	0	-6 MEUR	-12 MEUR
Value Add	+12 MEUR	+6 MEUR	0	-6 MEUR	-12 MEUR
Price	+3.4 MEUR	+1.7 MEUR	0	-1.7 MEUR	-3.4 MEUR
Interview	The interviews were not scored, but they provide a basis for confirming the scores on of the other four criteria, whether adjusted upwards or downwards.				

Clarification Phase

After the selection is made, one vendor will proceed into the clarification phase. In the clarification phase the selected vendor will be responsible to clarify their proposed scope of services. This clarification includes (Kashiwagi, 2014):

1. A detailed and milestone schedule associated with cost and performance metrics.
2. A list of all foreseen risk with a risk mitigation plan.
3. A detailed scope of services (including what is in and out of scope).
4. Weekly Risk Report (WRR).
5. Performance metrics.

If the selected vendor is unable to fulfill the client's expectations and requirements of the scope of services, the next prioritized vendor will be invited into the clarification phase until a vendor and their plan is found that is suitable to the client. The contractors plan with the client's requirements and required contract terms become the contract. After the clarification phase, the contract is awarded and the vendor will move into the execution phase to deliver the project according to the contractor's accepted plan.

It is important to note that the clarification period is a complete change of paradigm. It uses the following concepts:

1. The client is the biggest source of risk. Once the expert vendor identifies their plan, any deviations to the plan that are clearly identified in the proposed plan, are paid by the client. By utilizing their expertise, the client becomes accountable and mitigates the largest source of risk, themselves.
2. Experts should have a very clear, simple plan that is supported by a detailed plan. The plan identifies the largest potential areas of risk (expert vendor does not control).
3. The client should never make decisions, manage, direct or control the vendor on what should be done during this time. Once this is done, the client assumes all risk, if the vendor just follows their directions.
4. The vendor also exposes themselves to their biggest risk by listening to decisions and MDC from the client. Once they do this, they are in a relationship with their largest source of risk. They will not know it, until they get into a risk in the execution phase.
5. When the vendor plans together with the client, they basically give up all their BV rights and transparency that will make them successful.

The clarification phase is a change of paradigm. Simply, it is the setting up of transparency without relationships. This is the greatest mistake that has been made, and will be made in the future in the BV approach.

Identification of an Innovative Vendor

This was the first time any of the competing vendors with proton cancer care equipment had exposure to the Best Value Approach. In the first educational webinar for the project, there were nine participants, of which only three proceeded to compete for the project. Of the three, two were well known companies within the industry that had already sold their equipment to multiple hospitals. Based upon their machine's history one was perceived to be the cost leader in the industry, while the other vendor was perceived as the industry's quality leader. The third competing vendor was a new company that had not yet built, tested or installed their complete system.

This company, Pro Nova, approached Dr. Kashiwagi (creator of the Best Value Approach, world-wide expert in using metrics and simplification) for assistance in their attempt to win the award. Pro Nova claimed to Dr. Kashiwagi that even though their equipment/systems has not been tested, installed or used, in two years it would be state of the art. After educating and working with the vendor's core team for an entire day, Dr. Kashiwagi, with the assumption that everything he was told was accurate, identified this company as an innovator due to the following observations:

1. The vendor has the capability to implement new equipment and technology to enhance their proton cancer treatment equipment more quickly and continuously.
2. This new equipment and technology substantially increased value and decreased costs of their two competitors.
3. The equipment was easier to use, faster and more accurate, resulting in the capability to treat more patients in the same duration.
4. The equipment was smaller and more easily modifiable.
5. Among the three vendors they differentiated themselves by being research oriented. They were the only one with their own clinical practices and direct access to doctors and patients, with the capability to continuously improve and test their equipment and systems.
6. They were involved in ongoing research efforts to change equipment to be "state of the art."

Due to the indications of a high performing innovator, Isaac Kashiwagi, with assistance from Dr. Dean Kashiwagi, agreed to assist the vendor through the BV selection phase. During the next three months, (9 phone calls and 26 hours) Isaac Kashiwagi educated their project team and assisted in the creation of the submittal documents for the competitive dialogue, the selection phase, and the interviews. The main support was by assisting the vendor:

1. To translate their technical performance metrics into simple metrics that required no technical expertise or thinking to understand.
2. Provide meaningful metrics that identified the performance of their equipment.
3. Understand the vendor's competitive strengths and unique value to the client's requirements beyond providing them their equipment.
4. Prove to the client there is minimal risk in selecting them, even though their equipment has not yet been operationally installed nor tested.

The case study test was to identify if the Best Value (BV) approach was capable of identifying and considering the value of innovation. After identifying that the APTC was utilizing the BV approach to identify a vendor who not only provided the Best Value proton device, but also to identify a vendor who could ensure the greatest opportunity to enhance the delivered proton treatment system, PBSRG wanted to observe the reaction of the system to innovation. The optimal case study would be to maximize the capability of an innovative vendor to show innovation. PBSRG decided to participate in the case study to ensure that the amount of innovation was maximized in the case study test.

PBSRG had the opportunity to maximize the amount of innovation in the test by:

1. Supporting the vendor who did not have an existing proton cancer treatment system.
2. Supporting the vendor who had to compete with a system that did not exist.
3. Help a vendor to use metrics to describe a system as if it existed.
4. Assist a vendor to compete at a future time.
5. Assist a vendor to minimize the perception of risk of not delivering the proton system even though the proton system did not exist, and has not been implemented or used before.

If the vendor does well in the competition, it shows that the BV approach has the capability to identify and utilize expertise and innovation in the case study test.

Success of the Innovative Vendor

This innovative vendor was able to show that they were the Best Value option and were able to overcome their initial challenges by showing that they had minimal risk, were the lowest costing equipment, provided the highest performing equipment and were able to provide the top performance in research and future innovation. This was accomplished by the use of simple, non-technical metrics and dominant facts (Pro Nova, 2015). The vendor addressed risk, was the best value with the lowest cost, had the highest quality, and ability to be the best at being a research group and innovator.

The first step was to show that risk of not delivering would be mitigated. Even though the equipment had not yet been installed in a location, the vendor was able to minimize risk to the client by:

1. Providing an insurance policy that paid for alternative equipment to be installed and covering damages of late delivery if the vendor's equipment was nonfunctional.
2. Showed all major components of their equipment were developed and tested with the only remaining part to be the integration and installation of the entire system.
3. Showed expertise and capability to integrate system components.Showing that a leading research of proton cancer treatment at Oxford has already procured the Pro-Nova equipment.

The vendor is able to reduce the cost of the facility (not even considered by others) that the proton system would be placed in due to a much smaller size and footprint. Due to the vendor's innovative technology and ability to decrease the size of their equipment, the vendor was able to reduce the cost of construction of their facility by 24-42% (range created by price of the facilities of the competitor's equipment). Compared to their competitors which included a cost leader and the other being the quality leader their facility was estimated at €3.7M - €8.2M Euros less expensive.

The vendor has innovated in all the different areas of the proton system. The Proton Therapy Equipment has four main components:

1. Cyclotron: Superconducting magnet technology, where the protons are created.
2. Energy Selection System, which determines where the protons will be directed.
3. Integrated PET/CBCT Scanner and imaging.
4. Nozzle, where proton beam will be released.

Through the submittals in the Best Value process, the vendor was able to show the increased value their innovation had brought in non-technical terms using simple metrics and dominant facts. Their superconducting magnet technology improved their proposed cyclotron which:

1. Decreased weight of the vault to 25 tons. Competing models were estimated at 220 tons and 110.
2. Decreased overall individual vault size to 89 m^2. Competing models are estimated at 118 m^2 and 150m^2.
3. Cost savings on vault construction can range from 24% to 42%. Estimated between €3,651,671 and €8,184,971.

The Energy Selection System was improved due to an independent energy selection system/kicker magnet which:

1. Decreased room-switching time to less than 1 millisecond. Competing models are estimated at 15 and 30 seconds.
2. Enables an improved multi-room workflow.
3. 11 leading physicians and physicists from 8 different proton therapy centers with over 150 combined years' experience were surveyed about the impact having near instantaneous room switching would have on workflow and clinical care. Results show Physicians perceive a 95% increase in value in having this feature versus the industry standard room switch times.

PET/CBCT Scanner and imaging processes were improved. Traditionally these two are separate locations; however, with Pro Nova has integrated both into one piece of equipment which:

1. Allows imaging patient in any treatment position and any gantry position without moving the patient. Can image 5 times faster than traditional gantry based systems.
2. Improves accuracy of treatment by reducing uncertainties and improves workflow efficiency making protons similar to photons.
3. 11 leading physicians and physicists from 8 different proton therapy centers with over 150 combined years' experience were surveyed about the impact having a bed-mounted CBCT that image at isocenter in 100% of bed positions would have on workflow and clinical care. Results indicate that physicians perceive an 80% increase in value in having this feature versus industry standard CBCT imaging capability.
4. These clinicians were also surveyed on the impact of having the ability to evaluate density with CBCT would have on clinical care. Similarly, results indicate that physicians perceive an 80% improvement in their ability to reduce treatment uncertainty.

Nozzle was improved due to Beryllium degrader and achromatic magnets design which:

1. Decreased layer switching time to .5 seconds. Competing models are estimated to take 1 to 4 seconds.
2. Reduces treatment times by 1-3 minutes.
3. Increases # of patients treated by 1-3 per day.
4. 11 leading physicians and physicists from 8 different proton therapy centers with over 150 combined years' experience were surveyed about the benefits of having layer switch times that are 2 to 8 times faster than competitors. Results indicate physicians perceive an 85% increase in value versus industry standard layer switch times.

The vendor was identifying their proposal as a delivering and optimizing cancer treatment care by continual research and development. In addition to the quality of the vendor's equipment, they were able to show their value in being innovative and state of the art. The vendor was not simply a manufacturer of proton therapy equipment but at their core they are a research group that could provide a partnership with APTC in developing and improving their Proton Therapy Center. The vendor is constantly innovating and optimizing cancer treatment tool/practice by integrating advanced technologies faster than any competitor. With their current equipment within the last three years the vendor has integrated the following innovative technology into their equipment:

1. Cyclotron (Superconducting magnet technology), developed internally by the vendor in 3 years. A competing model has taken 5 years and is still not fully developed.
2. Independent energy selection system/kicker magnet and beryllium degrader and achromatic magnet design (in nozzle) was licensed from Indiana University and incorporated into the machine within a 3-year timeframe.
3. Integrated PET/CBCT scanner and imaging, PET was developed by the vendor and CBCT was acquired at the University of Salzburg technology. The vendor has signed agreement to allow distribution of technology solely to Vendor and 5 individual facilities. The vendor was able to incorporate into machine in 1 year.

The vendor's staff has built and owns their own proton treatment center:

1. The vendor currently uses their competitor's equipment in its own operational treatment center. They plan on using their own equipment in August 2015.
2. Compared to its predecessors, the vendor's proton center has treated 32% more patients in the first year.
3. Overall patient satisfaction score is 98%.
4. Using 19 active and pending clinical trials focused on advancing clinical care and improving outcomes.
5. The vendor's clinical team has clinically commissioned and opened a combined 7 proton therapy centers.
6. The vendor will also provide a partnership to a network of their own and other proton therapy research clinics and hospitals they are doing joint research with. For example, an external partner (Oxford University) is planning to utilize vendor's technology to create future state of the art technology and in doing research focused on imaging based innovation and adaptive therapy. Research will begin in 2017 upon completion of vendor's system commissioning. Oxford is recognized for their world leading position in

medical sciences research. Recently recognized as a part of the Research Excellence Framework 2014, as Britain's top research University for their top quality and producing the largest volume of world leading and internationally excellent research.

Selection Matrix of Vendor's Submittals

On May 19th 2015 Pro Nova was identified as the Best Value vendor that would move on to the next phase, clarification. The scores Vendor received are shown in Table 2. The vendor was able to score Excellent (10) on two of the four rated criteria (APTC, 2015).

Table 2

Vendor Scores

Vendor	**A**	**Pro Nova**	**C**
Vendor Price	LOW	HIGH	MED
Substantiation of Performance	6	10	6
Risk Assessment	6	6	4
Value Added	6	10	4
Price Substantiation	6	6	4
Total addition of documents	€ 0	-€ 36,000,000	€ 13,700,000
Prioritization	2	1	3

The visionary procurement officer who headed the entire venture, who had to overcome the naysayers and resistant of the client's experts identified in the beginning that no vendor would get excellent ratings (J. Verwey, personal communication, October 10, 2015). The winning proposal (supported by PBSRG) which had the most innovation, which quantified their innovation capability by using simple metrics that showed dominant value, received two excellent (10/10 ratings) and made the cost a non-issue. The BV system was capable of identifying and utilizing expertise to select the most innovative vendor, overriding the fact that the other two vendors had proposals that were cheaper and less risk when responding to more traditional minimum requirements of providing the equipment.

Conclusion

The case study test shows that the Best Value Approach can identify and utilize innovation. A vendor can compete using innovation in the Best Value (BV) approach. By the results of the procurement it is proposed that:

1. BV process can procure innovation in comparison with traditional solutions.
2. Innovative vendors can be successful when the Best Value process is used to buy innovation.
3. Innovative vendors may have the competitive advantage when the Best Value process is run.

The Amsterdam Proton Therapy Center (APTC) has now selected the Best Value vendor and is seeking approval from their governing boards. This research effort will continually follow the delivery of the technology and the performance of the BV vendor and client. It will also document the performance of the BV process in execution.

References

Åberg, S., & Bengtson, A. (2015). Does CERN procurement result in innovation?. *Innovation: The European Journal of Social Science Research*, 28(3), 360-383.

Amsterdam Proton Therapy Center. (2014a). *Regulations Public Tender Amsterdam Proton Therapy Center* (APTC).

Amsterdam Proton Therapy Center. (2014b). *APTC's Tender: Introduction, Requirements and Aims*.

Amsterdam Proton Therapy Center. (2015). *Announcement of established ranking (pre-award) following the assessment of Best Value documents and interviews of APTC's tender*. Received May 19, 2015.

Black, J. (1997). *Oxford Dictionary of Economics*. Oxford University Press, New York.

Cepilovs, A. (2014). *Public Procurement for Innovation in Small States*. The Case of Latvia. Public Procurement's Place in the World: The Charge Towards Sustainability and Innovation, 93.

Dale-Clough, L. (2015). Public procurement of innovation and local authority procurement: procurement modes and framework conditions in three European cities. *Innovation: The European Journal of Social Science Research,* (ahead-of-print), 1-23.

Edquist, C., Vonortas, N. S., Zabala-Iturriagagoitia, J. M., & Edler, J. (Eds.). (2015). Public Procurement for Innovation. Edward Elgar Publishing.

Georghiou, L., Edler, J., Uyarra, E., & Yeow, J. (2014). Policy instruments for public procurement of innovation: Choice, design and assessment. *Technological Forecasting and Social Change*, 86, 1-12.

Kautsch, M., Lichoń, M., & Whyles, G. (2015). Tools of innovative public procurement in health care in Poland. Innovation: *The European Journal of Social Science Research*, 28(3), 312-323.

Maranville, S (1992), Entrepreneurship in the Business Curriculum, Journal of Education for Business, Vol. 68 No. 1, pp.27-31.

OECD. 2005. The measurement of scientific and technological activities: Guidelines for collecting and interpretinginnovation data: Oslo manual, Third edition, prepared by the Working Party of National Experts on Scientific and Technology Indicators, Paris: OECD.

Rolfstam, M. (2015). Public procurement of innovation for a better world: a consolidation or a new beginning?. *Innovation: The European Journal of Social Science Research*, 28(3), 211-219.

Townsend, W. (2013). INNOVATION AND THE PERCEPTION OF RISK IN THE PUBLIC SECTOR. *International Journal of Organizational Innovation* (Online), 5(3), 21-34. Retrieved from http://login.ezproxy1.lib.asu.edu/login?url=http://search.proquest.com/docview/1419395542?accountid=4485

Vargas-Hernández, J.,G. (2011). MODELING RISK AND INNOVATION MANAGEMENT. Advances in Competitiveness Research,19(3), 45-57. Retrieved from http://login.ezproxy1.lib.asu.edu/login?url=http://search.proquest.com/docview/886578723?accountid=4485

Verwey, J. (2015). Use of Best Value for high-value highly-complex medical equipment (PowerPoint slides). Retrieved http://ksmuniversity.ksm-inc.com/.

Yeow, J., & Edler, J. (2012). *JOURNAL OF PUBLIC PROCUREMENT*, VOLUME 12, ISSUE 4, 472-504 WINTER 2012.