Strategy Research Project

Pacific Pathways as a Proof of Concept

by

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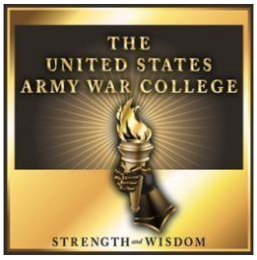

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In 2014 USARPAC began Pacific Pathways describing it as a proof of principle or concept. This paper will examine how well Pacific Pathways functioned as a proof of concept. First, this paper will define specifically how Pacific Pathways was designed to function as a proof of concept. It will then examine how proof of concept and proof of principle experiments are conducted in the private sector and determine what analogies can be made between how those experiments are done and how they are done in the organizational environment. This paper will discuss causal functions and will show how understanding causality is a pre-requisite for learning organizations to actually prove a concept. The paper will then look at Pacific Pathways 14 and examine how well it functioned as a proof of concept and will look at the tools USARPAC and I Corps used to evaluate it. Finally, the paper will conclude with a set of recommendations showing how USARPAC can conduct and evaluate future Pathways using a revised proof of concept model.

Pacific Pathways as a Proof of Concept

> During times of dynamism and transformation, providing ready Army forces and capabilities to the USPACOM commander demands innovation and creativity.
>
> —GEN Vincent K. Brooks[1]

Often, organizations will refer to innovations as a proof of concept or proof of principle. The terms proof of concept and proof of principle, while mainly used to describe product research and development in the software and medical industries, are also found sprinkled within literature on organizational leadership and development. When changing a process within an organization or when trying something new, an organization will initiate that change on a small scale, often describing the change as a proof of principle or proof of concept. In these cases, as in product development, the implication is that the initiated change is believed to work but should be tested before it is adopted to ensure its feasibility. This usage of the concept implies a sense of openness to experimentation and change based on the success or failure of the test. While assumed to be feasible, the conduct of the proof of concept will either confirm or deny the feasibility via established performance measures, and evaluation tools and based on the results of the test will result in either implementation or cancellation of the program or change. Unfortunately, the organizational change literature is largely silent when defining or providing guidelines regarding how a proof of principle or proof of concept should be conducted. This silence has resulted in wide variations in both execution and evaluation of the exercises.

Like the private sector, organizations within the Department of the Army have also used these terms to describe programs of change or innovation, and like the private sector, there are no doctrinal guidelines or industry standards concerning how an organization conducts a proof of concept exercise. Most recently, U.S. Army Pacific (USARPAC) described its exercise structure Pacific Pathways as a proof of principle. This paper will examine how well Pacific Pathways functioned as a proof of principle. First, this paper will define specifically how Pacific Pathways was designed to function as a proof of concept. It will then examine how proof of concept and proof of principle experiments are conducted in the private sector and determine what analogies can be made between how those experiments are done and how they are done in the organizational environment. This paper will discuss causal functions and will show how understanding causality is a pre-requisite for learning organizations to actually prove a concept. The paper will then look at Pacific Pathways 14, will examine how well it functioned as a proof of concept, and will look at the tools USARPAC and I Corps used to evaluate it. Finally, the paper will conclude with a set of recommendations showing how USARPAC, as a learning organization, can conduct and evaluate future Pathways using a revised proof of concept model. While specifically addressing USARPAC, these lessons learned are applicable to any organization that seeks to be innovative and lead organizational changes in a similar manner. Although General Brooks referred to Pathways as a "proof of principle," in the October 2014 edition of Army Magazine,[2] his usage of the term is more analogous to the proof of concept as described by the medical and software development industries. For this reason and to maintain

consistency, this paper will use the more common phrase proof of concept to refer to the Pathways innovation.

Defining Innovation in Pacific Pathways

From the very beginning, USARPAC described Pacific Pathways as an innovation. At the 2014 Association of the U.S. Army Symposium in Washington D.C. General Vincent K. Brooks referred to Pathways as an innovative and experimental approach for USARPAC to participate in exercises in the Pacific which they had already been supporting.[3] Unique to Pathways, however, was how USARPAC would deploy and support those exercises. The Army had supported the three exercises, *Garuda Shield*, *Keris Strike*, and *Orient Shield* in previous years, but had traditionally rotated support for those exercises between different units, deploying them to the exercise via military airlift from bases either in Hawaii, Alaska, or the Continental United States. Unlike previous years, only one Army unit deployed for Pacific Pathways 2014 to conduct these exercises and their deployment was via military sealift.[4] Because of the presence of military sealift, these forces and their equipment spent much more time forward deployed. According to GEN Brooks, by deploying in this manner the Army was able to provide the U.S. Pacific Command a force of 700 soldiers and equipment afloat West of the International Dateline for an extended period and, was therefore available to respond in the event of a crisis in the region.[5]

Another unique attribute to Pacific Pathways was the Command Structure. In previous years, units supporting those exercises did so independently, with a command structure specific to each exercise.[6] USARPAC constructed Pathways 14 with a single command structure with I Corps at Joint Base Lewis-McChord, WA, the 25th Infantry Division in Hawaii, and 2nd Brigade, 2nd Infantry Division leading each exercise at the

exercise location.[7] This single command structure gave Pathways an operational structure unlike previous exercise structures which only applied to the specific exercise. This command structure was more analogous to a deployment or operational command structure.

Finally, Pacific Pathways was the first time these exercises were conducted by a "Regionally Aligned Force" (RAF). Begun in Fiscal Year 2013, the RAF concept provides Total Army forces to a Combatant Command Commanders for Theater Security Cooperation events while building a cultural and regional capability within the conventional force.[8] By deploying in support of Pacific Pathways, the soldiers and units within 2nd Brigade would develop regional expertise and develop partnerships which would be beneficial to USARPAC and ultimately U.S. Pacific Command in the event of a crisis within the region.

Based on the information above, the innovative concept associated with Pathways is that by having one unit conduct three sequential exercises under one command, USARPAC, as the Army Service Component Command, could provide U.S. Pacific Command a tailorable, scalable, and responsive land force package available for operational employment in the event of a crisis while concurrently building regional expertise within participating units. Furthermore, because USARPAC intended to test and learn from this innovation throughout its execution, they designated it as a proof of concept exercise.[9]

Defining the Proof of Concept

Unlike many other testing methodologies, there is no single definition or methodology which describes a proof of concept test. For example, the Food and Drug Administration defines a proof of concept as that point when a developer or researcher

has determined that there is a need for a medical device, and as a result of that identified need, develops a basic concept or idea for the new device.[10] This concept or idea can be as simple as a sketch on a whiteboard or more thoroughly described and detailed design. Once the developer is ready to determine the feasibility by testing it, the developer will produce a proof of concept document. This document, which is essentially a plan for testing, will describe all of the steps required to determine whether or not the concept is workable.[11] If the device shows promise to meet a currently unfulfilled need the developer moves forward with later stage testing.[12] The European Research Council, which the European Union has chartered to promote "investigator driven, or 'bottom-up' frontier research," actually has a program titled Proof of Concept where existing grant holders can receive additional funding to help researchers test projects in very early stages of development.[13] The goal of this program is to facilitate innovation by funding researchers who have developed a concept for an innovation that could have lasting economic or social benefits and that is technically and commercially feasible.[14] Software developers use proof of concept tests as an opportunity to show a customer how a given software, which is still in the design phase, will work and make any changes the customer will desire prior to a complete implementation of the software.[15] Unlike a product in low rate production, the product in a proof of concept is a "prototype" which is developed quickly with minimal testing.[16]

The commonality between each of these cases is that the proof of concept happens before the sponsoring organization is ready for full implementation. These small scale tests will show that an idea is feasible before moving forward with continued testing and implementation. For example, when a pharmaceutical company tested a

new treatment for psoriasis, their proof of concept study involved only 36 participants whereas later tests involved as many as 1306 participants.[17] For the software developer, proof of concept examples range from installed software on a limited number of machines which can be either on or off the network,[18] to “facades” which only show the user interface but do not include the actual software or application behind the interface.[19]

In all cases the proof of concept is conducted in a learning environment. Normally, during the conduct of the proof of concept, the sponsoring organization collects data related to the feasibility of the concept. They then analyze this data and determine what changes are necessary before going forward with implementation or full production. In the medical industry, the FDA provides the pharmaceutical industry with guidance concerning how the industry should use the proof of concept data. For example, in a draft Guidance for Industry regarding the development of an antiviral drug for treatment for Hepatitis C, the FDA directed that the industry use the data collected from proof of concept tests to determine the dosage for use in later trials.[20] In other cases the sponsoring organization may know that the concept is feasible, but elect to continue the proof of concept in order to gain from the potential knowledge it would produce. For example in spite of the fact that the United States chose not to field the Medium Extended Air Defense System (MEADS), the Senate Appropriations Committee recommended funding the proof of concept testing in order to avoid financial liability for early program termination, and in order to benefit from technological advancements that the test offered.[21]

Causality and the Proof of Concept

An understanding of causality is essential to understand the outcome of any experimental event or innovation and the proof of concept is no different. The proof of concept is an experiment where a researcher or developer is attempting to show a relationship between two or more events and use that relationship to demonstrate the feasibility of the concept. For example, when a pharmaceutical company identifies a treatment for an illness, they'll use the proof of concept to show that the treatment effectively treats the targeted illness. The software designer will use the proof of concept to show how the designed software creates the effect desired by the customer. In both cases, there is a presumption of a causal relationship between the events (the issuing of the treatment and the healing or the employment of the software and the productivity). Understanding that causal relationship is essential to ensuring that the relationship is effectual and not merely coincidental.

At the philosophical level the debate surrounding causation has spanned time, from ancient philosophers who believed that understanding causation was central to understanding life, to those of the enlightenment who looked to determine the relationship between different events.[22] At the practical level, these philosophical debates have provided an opportunity to understand how the world functions and ultimately an opportunity to understand how to examine it. To understand causality is to understand the relationship between two events: *X* and *Y.* For the purposes of this essay, causality will be based on David Hume's three principles of causality. Despite the fact that he questioned whether man could, without question, find one single cause, Hume does provide a framework for understanding how to interpret two correlated events. Hume purported that we could observe a series of events and based on the

regularity of their occurrence, infer a causal relationship.[23] That causal relationship was based on three factors: the events must have "constant conjunction," meaning that they are regularly together; they must have "temporal priority" in that the cause *X* must precede the effect *Y*; and lastly, they must be contiguous, meaning that both *X* and *Y* must be adjacent to one another.[24]

To illustrate causality, Hume uses the example of two colliding billiard balls. When we observe the movement which results when billiard ball *A* rolls across a table and strikes billiard ball *B*, we can say that when *A* strikes *B*, the moving ball *A causes* the stationary ball *B* to move.[25] We can prove causality because the events of the resulting movement of ball *B* is regularly conjoined to the event of *A* striking *B*. Additionally, the event of *A* striking *B* always precedes *B's* movement giving it temporal priority. Finally, both events are spatially contiguous since the collision and the movement happen on the same billiard table. Based on those principles, we can express related events in a causal statement. Causality is framed in a causal statement which essentially describes a relationship between events. In its most basic format, a causal statement follows an "if-then" model.[26] Using Hume's model the causal statement for the two billiard ball reads, if ball *A* strikes ball *B*, then ball *B* will move following the collision.

Pacific Pathways as a Proof of Concept

Although organizational innovations may appear different than standard research and development proof of concept tests, organizations can use a proof of concept construct to evaluate the effectiveness of innovative efforts. The principles within both environments remain consistent. In both the research and development and the

organizational environments the proof of concept is a method to test the feasibility and the tested concept should have a causal structure.

The concept for Pacific Pathways easily fits into a causal statement. The *X* is the premise of the single unit conducting multiple sequential exercises under a singular command structure. In the case of Pathways there are two resulting *Ys.* The initial result, Y^1 is that USARPAC is able to provide a PACOM a tailorable, scalable, and responsive land force package available for operational employment in the event of a crisis. The second result, Y^2 is that this operation builds regional expertise within the participating units.

While causal relationships are easy to describe in an organizational environment, they are challenging to prove. In most cases, the simplest way to prove causality is via a scientific experiment which isolates the cause *X* and demonstrates that *Y* does not occur without it. Referred to as the "scientific gold standard" of testing the causality in the medical sciences, researchers use the randomized field test (RFT) as a means to isolate causal relationship.[27] In a RFT, a given population is randomly assigned to either a treatment group where the cause *X* is applied or a control group where no cause is applied and then observed to determine if *Y* results.[28] The experimenter repeats this process, observing the results until a trend can be seen. Perfect causality results when all of the members of the tested group that received the treatment *X* exhibit the outcome *Y* and none of the control group which did not receive the treatment exhibit *Y.*

Unfortunately due to their size and complexity, concepts like Pathways cannot be tested in this manner. For USARPAC to build an experiment which proves causality in this manner, they would effectively have to design several different exercise models

which included sequential and non-sequential exercises. They would then need to test if similar units under similar command structures would experience the same or different outcomes based on the exercise structure. USARPAC would need to run this experiment over several iterations to show that this causal relationship was only present in those units which received the treatment and not present in those which did not. This would serve to eliminate other possible causes which might affect both groups. Furthermore, since one of the expected outputs is that Pathways provides the Commander, U.S. Pacific Command a responsive land force for operational employment, the test would have to include a crisis situation where land forces were required. Since a crisis situation is by nature unexpected, testing this outcome in this manner is unrealistic.

Nothing in this discussion should imply that USARPAC was unable to collect data related to the effectiveness of Pathways as an innovation. Using the underlying assumptions of the exercise as a framework, USARPAC collected data on Pathways from participating units. In a draft assessments annex, USARPAC listed seven underlying assumptions for Pathways and described them as the following: Pathways supports the rebalance to the Pacific; Pathways provides a more responsive means to meet partner nation demand signals; Pathways strengthens alliance partnerships; Pathways better prepares forces for crisis response and exercises Army power projection platforms and improves aerial and sea ports of departure capabilities; Pathways builds and sustains readiness of Joint and Coalition Teams; Pathways builds cost efficiency in exercise program management and OPTEMPO of forces; and Pathways helps set the Land Component in Theater.[29] For some of these assumptions

USARPAC used additional questions to expand their data collection related to each of the associated assumptions.

When viewed against the causal statement for Pathways, these seven assumptions support an analysis of the expected outcomes. Of the seven assumption, four easily correlate with the expected outcomes of Pathways. In the first part of the fourth assumption, that Pathways better prepares forces for crisis response, the correlation is specific as it aligns almost word for word with the first expected outcome within the causal statement. In support of their analysis, USARPAC provided participating units with five follow-up questions intended for use when assessing the capability within this fourth assumption.[30] Unfortunately, of the five questions, four applied only in the event of an actual crisis. Without a crisis, there was no objective way for the participating unit to provide feedback related to this assumption. Like the fourth assumption, the fifth assumption, that Pathways builds and sustains readiness, also directly related to the expected outcome; also similar to the fourth assumption, USARPAC provided amplifying questions to assist in evaluation. In this instance, USARPAC provided six additional questions, five of which were readiness related.[31] Because the Army has a recognized system for evaluating and reporting readiness, these questions do provide measures for evaluating the effect Pathways had on participating units. Of all the assumptions, only the sixth, that Pathways builds cost efficiencies, related to concrete observable data, the total cost of the exercises within the Pathways environment versus the exercise costs under previous constructs.

Data collection for all but the cost of Pathways followed the standard Army After Action Review (AAR) construct. USARPAC directed units participating in Pathways to

collect data throughout the exercise with specific “in stride assessments” conducted following each of the three exercise and conclude with a final AAR following the exercise.[32] For the final Pacific Pathways 14 AAR, I Corps collected the comments on Pathways from all of the participating organizations from the Brigade level up through the Corps. They compiled these submissions in an “issue, discussion, recommendation” format beginning with an introductory section which described the exercises, followed by consolidated feedback related to the Army Warfighting Functions and concluding with comments from participating units.[33]

There are two main issues with using the AAR format for evaluating the effectiveness of a proof of concept. The first issue concerns the agents who collect the data for the AAR. The Pathways AAR is similar to most Army AARs in that the participants of the operation collect the data and provide the feedback. In this format, the AAR is a type of participant observation that although it is helpful for self-learning and discovery, the participants’ natural incentive structure can corrupt the collection of feedback related data. Unknowingly, participants risk introducing a type of confirmation bias into the results as they see what they expected to see when conducting the exercise. A second problem with participant evaluation is the failure to collect the right data. In this instance, because the participant is involved in conducting the exercise, the participant provides feedback related to what could have made their execution more effective. This is similar to the first problem, in that the participant approaches the exercise from the assumption that the exercise is designed to work as intended. When this happens, the participant approaches the exercise with the assumption that anything related to the failure of the exercise to “go as planned” was the result of their inability to

complete a task due to either external or internal factors. For example, several participants in Pathways ’14 commented on the importance of early involvement in the planning process for the exercise.[34] While their early involvement would certainly have improved their ability to complete their tasks related to Pathways, there is no linkage to how that would have either proved or disproved the concept of Pathways.

Recommendation

Despite the challenges associated with conducting a proof of concept in an organizational environment, methods do exist that allow for both data collection and evaluation. First, organizations begin by defining their innovations in a causal statement. Second, organizations need to build an appropriate research model which allows for accurate assessment of change. Third, organizations should establish external semi-independent organizations capable of conducting the evaluation.

The causal structure of the proof of concept provides the framework for both the internal participants who will conduct the proof of concept, and for the external stakeholders who gain to benefit from it. Like a research question, this statement will show what innovation the organization intends to initiate and what outcomes are expected as proof of the innovation’s success. While simple, evaluation of causal structure of the proof of concept starts with an analysis of the logic of the statement in accordance with Hume’s framework. Using Pathways as an example, the conduct of Pathways must be conjoined with, have temporal priority over, and be adjacent to the two expected results of having a responsive force available to the PACOM Commander and creating regional expertise within the participating units. If, for example, the regional expertise preceded the Pathway, then the concept is itself flawed as there cannot be a result which precedes a cause.

Not only does evaluation of the causal statement allow evaluators to identify logical flaws within the tested concept, it also provides evaluators with a structure to define those things which would be equated with failure of the concept. Because the proof of concept is by design a feasibility test, the sponsoring organization assumes that demonstration of the feasibility of the causal statement is the definition of success. Failure, however, is not limited to simply not being feasible. It can also range from the complete contradiction of the concept to inefficiencies within the concept. For example, Clavis Pharma, a Norwegian pharmaceutical company developed a cancer drug delivery system which failed the proof of concept not because it was not feasible, but because it was no more efficient or effective than existing treatments.[35] In that instance, continuing with product development of the system would have resulted in a product that worked but had developmental costs that exceeded the possible financial return. A similar phenomena can occur in organizational environments. The tested concept might be feasible but implementation might be inefficient or not cost effective. When this happens, sponsoring organizations and evaluators for poofs of concept in organizational environments should be open to this possibility and report their findings accordingly. In the example of Pathways, if this innovation does not provide any additional value to participating units as compared to previous methods of conducting these exercises, then the tested concept must be considered disproven or failed.

Having defined the causal structure and an understanding of what would define both success and failure of the proof of concepts, organizations must next build a method of evaluation. While the RFT is the best model for evaluating success or failure in the pharmaceutical industry, it may not be a feasible model for evaluating an

innovation in the organizational environment. Organizations can, however, still use the principles behind it to development process for evaluation. The goal of any evaluation of an organizational change should be to attain a level of objectivity equal to that found in a scientific experiment. Arguments based on scientific experiments are persuasive because they are based on objective observations made within a controlled environment with limited or minimal interference from outside factors.[36] The scientist develops an experiment based on a prediction or expectation and then controls various conditions to demonstrate that the outcome only happens when specific conditions are met.[37] The challenge in the organizational environment is to develop an experiment large enough to test the given concept or hypothesis while controlling elements of the environment to eliminate alternative causes. Prior to beginning the innovation, evaluators should analyze the tested concept to determine these alternative causes. Once these alternative causes are identified, through observation, evaluators can either eliminate results from their findings when they observe the presence of these alternative causes or in those instances when those the conditions can be assumed to be present, evaluators can attempt to control the environment and prevent those alternatives from corrupting the outcome of the evaluation.

Another method for evaluating the causal outcome of Pathways is by the use of baselines. Establishing baselines prior to beginning the proof of concept provides an objective measure of the changes an organization experiences as part of an innovation. Both expected outcomes for the Pathways concept are easily measurable. The easiest outcome to measure is the ability of land forces to respond to contingencies in the Pacific Command Area of Responsibility (AOR). This can be done using both historical

data to show response times to previous contingencies as well as “what if” scenarios to model response times against potential scenarios. Additionally, both models can be used to evaluate the capability of the force package for the crisis. To evaluate this data, USARPAC would analyze the baseline response time of the participating unit prior to beginning the Pathway against the response times during the Pathway. The second outcome, the ability for Pathways to build regional capability is more difficult to measure. A way to baseline this would be to conduct a DOTMLPF analysis of capabilities specific to countries within Pacific Command’s AOR and compare those capabilities against the participating unit before and after the Pathway. Critical to this analysis will be isolating changes which only occurred as a result of the Pathway and not as a result of external factors separate from the Pathway.

In order to correctly evaluate the innovative effect of organizational change, organizations involved will need to adjust their lessons learned model. As discussed previously, the standard Army AAR has limited utility in this environment. Participants will either collect narrative comments which may or may not address the underlying concept or collect raw data which has limited value without an analytical framework. For Pathways, both I Corps and USARPAC collected raw data such as number of shore tons moved, personnel trained, and costs related to the exercise. However, without a causal structure, there is no means to evaluate that data against a given premise.

To evaluate an innovation like Pathways, the sponsoring headquarters should form an independent, distinct organization that has no incentives other than analyzing the innovation against the designed principle.[38] This organization should be a group which directly reports to the sponsor and is connected to the operations of the

organization so that it understands the organization's functions and limitations.[39] As a trusted agent responsible to the sponsor only for evaluation, this team has no incentive or bias when analyzing the results of the innovation. Unlike the AAR process, where participants are both evaluating the principle and their performance of critical tasks, this team has only one focus – evaluate the principle. Additionally, unlike the participants whose evaluation of the proof of concept could be corrupted by internal biases, these evaluators should approach the concept with complete neutrality regarding the success or failure of the concept.

Finally, this evaluation team should have an established battle rhythm which allows for constant feedback and sharing of observations throughout the process. Evaluators should meet at consistent intervals when either the structure of the test changes or following those periods during the evaluation when new data is available to either support or refute the tested concept.[40] Meeting at those periods when data is present which counters the concept allows the organization to determine if it is profitable to continue the test in order to continue to learn from it. Consider the earlier example of the Medium Extended Air Defense System. The US Government elected to continue with that proof of concept due to the additional benefits which it could produce. With any innovation the potential exists that the evaluation team may determine during the middle of the evaluation, that the concept is not feasible but that evaluation should continue due to the lessons the organization is learning. Frequent meeting and evaluation will enable the organization to continue to learn and benefit not just from successful concepts, but also from those concepts which will not continue past the initial exercise.

Conclusion

In his award winning book, *The Fifth Discipline,* Peter Senge describes “learning organizations” as those who do more than merely survive, they “expand their capacity to create their future.”[41] With the Rebalance to the Pacific, the Pathways innovation provides USARPAC an opportunity to create its future. The challenges that USARPAC faces are the same as any innovative organization: how do they quantify their innovation and show how it adds value to the organization? By characterizing Pathways as a proof of concept, USARPAC built a structure which can be used to both describe their innovation and to evaluate its effectiveness. The proof of concept provides USARPAC with the freedom to experiment and evaluate not just Pathways 14, but subsequent Pathways as lessons are learned and later applied. Additionally, Pathways provides the Army an opportunity to learn how to innovate using the proof of concept as a model. The Pathways concept shows how organizations can describe their innovations using a causal structure which can become the basis for building an evaluation framework. This evaluation framework should include independent evaluators who can approach the innovation without bias, can identify the validity of the causal structure, and then by approaching the evaluation using the principles inherent in any experimental structure, evaluate the validity and feasibility of the tested concept. Approaching proofs of concept in this manner will not only verify the feasibility of innovations within learning organizations but will also encourage further innovations as successes move from innovative ideas into established practices.

Endnotes

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