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Teams, AFSO21 and Crowdsourcing:

Collaboration Techniques for Financial Management

By

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Abstract

The Air Force is always changing. The difficulty for an organization as large and geographically separated as the Air Force is to how to communicate those changes to the entire force, especially process changes effecting the daily work routine. A problem solution framework was used to compare crowdsourcing to two tools the Air Force already uses, Process Action Teams and AFSO21 or Air Force Smart Operations for the 21st Century. This study describes two process changes within the Financial Management community that used a Process Action Team approach to implementing those changes. Both changes involved complex processes with organizations taking different approaches to implementing the changes. The study found Process Action Teams have a useful, but limited capability when it comes to implementing a new process across the Air Force. It also found crowdsourcing had some useful attributes, but its largest limitation is cost, especially when compared to AFSO21. In addition, AFSO21 already has the capability to utilize some of the stronger aspects of crowdsourcing. The systems design and development, and the training development costs for AFSO21 have already been incurred and realized. This study recommends an increased promotion of the capabilities and functionality of AFSO21 and a stronger emphasis to use AFSO21 to solve process problems across the Air Force.

Introduction

The Air Force (AF) has always looked for ways to save money and increase efficiency. From the original "Idea" program to the new "Every Dollar Counts" campaign[1], AF leaders know not every good idea comes from experts at the Major Command (MAJCOM) or at the Secretary of the AF (SAF) level. Some process changes are implemented without input from every Wing, and there is no one person who has worked in every MAJCOM and every Combatant Command. Trying to standardize processes across the AF with input from only a fraction of the affected populace may not produce the best solution, especially if the process changes are complex.

On the surface, it may make sense to standardize processes so they are the same at every Wing. It makes sense that a military pay technician at Spangdahlem AB, Germany would process a housing entitlement the same way as a technician at Elmendorf AFB, AK. Standardized processes allow Airmen to move from one base to another and perform the same tasks with no new training requirements.

At the same time, the AF needs to account for the differences between Wings. Every Wing does not have the same mission. With the merger of branches at some bases, like Joint Base Andrews, simple rules like who pays for what gets more complicated. This paper will analyze three collaboration techniques, two of which the AF is using and one new collaboration technique brought about by the technological capabilities of the Internet.

The AF has used a team approach to solving problems for a long time. In the early 90's the AF used Process Action Teams (PAT) to develop and implement the most efficient process. These teams were internal to an organization and looked at refining their processes to decrease waste and increase productivity.[2] In the late 90's, this evolved into the Integrated Product Team

also called the Integrated Product and Process Development Team (IPPD), and included members across disciplines to develop products and their related processes.[3]

Although team size was not mandated, the IPPD handbook stressed the importance of keeping the team to the minimum number of people needed to accomplish the mission and cited a DoD 1995 survey where 50 percent said the best team size was 10 or less and another 25 percent said 20 or less.[4] This small team size, although easier to manage, limits the ideas generated to solve process problems.

The AF published Version 2.1 of the Air Force Smart Operations for the 21st Century (AFSO21) Playbook in May 2008. The CSAF outlined a need for the AF to move to a continuous process improvement (CPI) mindset and the playbook was the long-term design for implementing that philosophical change. The playbook was designed to be a living document and highlighted the potential for innovation from any Airman.

AFSO21 also uses teams to look at processes and develop solutions to increase efficiencies. The teams are built with members from any business discipline the process may touch. The teams are managed by green, yellow, and/or black belt practitioners of CPI. The different belts identify the level of training and certification of the individual in CPI methodologies such as *Lean, Six Sigma, Business Process Reengineering, and The Theory of Constraints.*[5]

Some commercial enterprises are using a term called crowdsourcing to solve process problems.[6] Crowdsourcing is a way to collaborate on-line to solve problems or processes, and uses the power of the internet to efficiently collect suggestions from anyone who wants to participate. The premise of crowdsourcing is the answers received from the "crowd" are at least

as accurate as the answers generated by experts in whatever discipline the problem is trying to solve.[7]

This paper will use a problem solution framework to compare process teams, AFSO21, and crowdsourcing in their ability to efficiently implement process changes and to facilitate coordination between the Headquarters and individual Wings implementing those changes.

This paper will start by describing a couple process changes implemented without input from every Wing level organizations causing some implementation problems and rework. The processes reviewed are the implementation of the Reimbursable Budget Activity (RBA) group and the Schedule of Budgetary Activities (SBA) to comply with the Financial Improvement Audit Readiness (FIAR) requirements. Although both processes described are specific to the Financial Management community, the same problems with implementation and coordination may be applicable to other areas. After outlining the examples, a discussion of the criteria used to compare the alternatives is reviewed.

Each alternative will be analyzed against the criteria described and weighed against the RBA and SBA problems discussed. The conclusion will highlight the primary strengths and weaknesses of each alternative and provide recommendations for improving new process implementation.

Background/description of the problem

Reimbursable Budget Activity Groups

The AF has a large Operational and Maintenance (O&M) reimbursement program, approximately $30M for just the 96th Test Wing at Eglin AFB. Any support the Wing must provide to a tenant, increasing the Wing's cost solely because the tenant is assigned to that

installation is a reimbursement.[8] For example, if a tenant wanted its building cleaned more often than the Wing, the increased cost to the custodial contract would be reimbursed by the tenant.

Prior to fiscal year 2014, reimbursable dollars and direct funding were accounted for within the same Budget Activity Groups (BAs). BAs are two digit codes used to track major programs within the O&M appropriation. For example, BA 01 refers to Operating Forces (normally Wings with aircraft) and BA 03 tracks Training and Recruiting costs.[9]

To make it easier for Higher Headquarters and SAF to look across the AF and better distinguish direct dollars from reimbursements, they implemented reimbursable BAs. BA 01 is exclusively direct dollars associated with Operating Forces, and BA R1 would be reimbursable dollars associated with the same program.

While on the surface this does not seem like a major issue, the workload associated with the accounting processes at Wing level finance offices is tremendous and confusing to many people. An online training program was released in 2017 specifically to address the shortfall in reimbursable accounting comprehension. In order to reconcile every reimbursable cost to a specific tenant, the tenant's share of expenses the Wing pays directly to a vendor must be manually moved to the tenant's line of accounting. In the current accounting system there are "L" records used to record expenses and "M" used to records the reimbursable accounts. Every commodity has a different Element of Expense Investment Code (EEIC) and customers are grouped by Sales Code (SC). When everything is processed correctly, the expenses will equal the billed amounts by EEIC and SC. In other words, every M records will have a corresponding and equal L record by SC and EEIC in the reimbursable BA's.

There are several ways to pay the vendor and record the expenses correctly. The easiest and recommended solution by the experts is to use the tenant's line of accounting on the

obligation document. This means when the vendor is paid he or she is paid using the tenant's money. This requires the vendor to bill the correct line of accounting when the invoice is submitted. It also means the customer should provide enough money to cover the entire contract cost. Incrementally funding a contract means increased work on both the finance and contracting communities. The advantage to the direct cite method is there are no reimbursements. Everything is charged directly to the customer. For a Wing with only one or two tenants and a small reimbursable program, this process works well, because there are only a couple lines of accounting and not a lot of risk for errors.

As an alternative, the contract could cite the Wings line of accounting, but use the reimbursable BA versus a direct BA. Where the direct cite has no reimbursement, this process establishes a reimbursement program and requires the Wing to pay the vendor and then generate a billing transaction to the tenant increasing the workload of the Wing.

The problem with this process is getting the vendor paid correctly in the first place. For example, even for a small base there are at least three lines of accounting on a utility bill: the Wings portion of the bill, the Medical Group because the program is funded out of a different appropriation, and base housing because that program is funded out of a third appropriation.

On a utility bill, the Civil Engineering Group is required to breakdown the bill by customer. In some cases this is semi-automated by having meters on every building. Not every base has meters on every building and in those cases breaking down the bill is a manual process.

Once the bill is broken down, it is certified and sent to the Defense Finance and Accounting Service (DFAS) to generate the actual payment to the vendor. The invoice and certification the commodity was received are manually entered into the payment system. Every time there is a manual entry, the risk of error increases.

For a Wing with many reimbursable tenants like Eglin, the cost to generate contract modifications, both in workload and actual cost is large, so the direct cite process does not work well. The reimbursable guidance highlights the numerous questions the field sent SAF about this additional workload, especially the contract modification workload.[10] The more lines of accounting on a bill increases the risk of error because of the manual data entry, and in Eglin's case, would mean 27 lines of accounting on each utility bill. This means there are 27 opportunities to transpose digits in the individual amounts of the bill and 27 chances of posting a wrong amount to a customer.

The third process is for the Wing to pay the utility bill using its own money and then move the expenses to each tenant's reimbursable line of accounting and then generate a bill to the tenant. The only way to move the expenses is to create a journal voucher and because of the accounting rules a journal voucher cannot be processed until after the vendor is paid.

This adds additional problems for the Wing because of timing. January's utility bill is not generated until February. Because of the accounting rules, expenses cannot be moved until the vendor is paid. Most contract payment terms are net 30, which means the vendor does not get paid until 30 days after a valid invoice and the actual service or merchandise is received. January's utility bill, received in February, will not get paid until March and only then can the journal voucher be processed.

Since the Wing is two months behind in moving expenses, the Wing is cash-flowing the customers expenses. The O&M appropriation is a one year appropriation and expense reconciliation is two months behind, so the process for the Wing to legally account for the last two months of the fiscal years estimated reimbursable expenses is confusing.

Deciding which process was used was determined by each Wing based on the volume of their program and reimbursement accounting expertise at that Wing. When initially implemented the AF lost millions of dollars of purchasing power by not processing the reimbursable expense transactions correctly or timely. Wing level offices needed a way to communicate about the reconciliation issues across the AF to see if other Wings had similar problems or already had a fix to the problem.

Statement of Budgetary Authority

Another process change implemented was caused by the law requiring the AF to generate auditable financial statements called the *Chief Financial Officers Act of 1990*.[11] The DoD had not been required to generate audible financial statements, and the accounting system used by the AF was originally built in the 1960's. The lack of internal controls within the accounting system made the process of developing auditable statements cumbersome. There are many aspects of developing auditable financial statements, but we will only focus on one small report.

One of the first statements to be develop was the Schedule of Budgetary Activity (SBA).[12] This is a subset of the Departments Statement of Budgetary Resources, one of the basic financial statements required by OMB circular A-123. The premise of the SBA audit is to substantiate the amount of money posted to the accounting system is correct and has a clear audit trail. Although not required before the audit, the transaction had to be linked to an individual with proof that person was "authorized" to post the transaction. Even though the requirement to have auditable financial statements started in 1990, testing of the SBA audit did not start until 2014. The audit starts with the funding document.

Each unit receives money on a funding document from its Higher Headquarters. Some are issued in broad accounting terms like a program and commodity, and some are specific, not only identifying the program and commodity but also the actual work center the money is meant to support.

Prior to the audit, each funding document was posted to the accounting records by a finance person based on the individuals experience and training. There was no formalized documentation process to identify an individual as authorized to post these transactions. Most budget shops used an AF Form 1269 (Request for load/change in fund targets) to document the transaction.

Every budget shop had some way to validate the transactions posted to accounting system. Most times the transactions were validated after an "end of day" was run by the individual or their supervisor or the funds control analyst. In addition, everyone in the chain from the division Chief to the Higher Headquarters validated each appropriation was "in balance".[13] If errors were discovered, the transactions were reversed and then posted correctly.

The audits were conducted by a commercial accounting firm, and based on the volume and types of questions generated by the auditors, it was completely unfamiliar with the accounting rules or the limitations of the systems built by the AF. The auditors determined before an individual could post a transaction to the accounting records, he or she had to have a delegation of authority. The individual had to be appointed by a person in a position of authority.[14]

Some wings used a DD Form 577, Signature Card, to document the delegation of authority and to provide a record of signatures of every individual authorized to post budget

authority. Some Wings used a Delegation of Authority (DOA) letter to document the authority and then generated a DD Form 577 to document and substantiate the actual signature.

To meet audit requirements, use of the AF Form 1269 was mandated. In addition, each funding document now had a unique document number delineating whether the authority was direct or reimbursable. Each 1269 also required two electronic signatures: the preparer and approver. The individuals preparing and approving the AF Form 1269 had to be different and required a delegation of authority signed by the proper approval authority before the document was generated.

Errors are corrected by generating a new AF Form 1269 identifying the transaction to be reversed and the correct transaction, as well as, referencing the original AF Form 1269 posted in error. All the documentation associated with each transaction had to be maintained and easily recovered to present to the auditors if asked.

Every transaction posted to the accounting records is an auditable transaction. Initial guidance on what documentation to provide the auditors changed regularly as questions and guidance was generated from the auditors to base level units. To try and make sure the AF had an auditable statement of budgetary resources, the AF began internal testing before the formalized audit.

The next step was to let the auditors generate the transactions to audit in a pre-audit environment. Normally, there is a document of some kind to substantiate a transaction as it moves through the different stages of accounting. For example, a contract establishes an obligation. A receipt of goods, moves the transaction from obligation stage of accounting to the unpaid stage. When payment is made, the voucher substantiates the transactions movement from the unpaid stage of accounting to the paid.

Many questions were generated by the auditors, especially when they looked at individual transactions. For example, the current accounting system will allow an accounting record to be built as long as the data elements are valid. The line of accounting may be invalid. Instead of deleting the record, the system will allow a transaction to post to correct the accounting details without changing the dollar value or the stage of accounting. The system generated a negative transaction to the wrong line of accounting and positive transaction to the new correct line of accounting. When the auditors pulled one side of this corrective transaction it caused a lot of confusion because there was no new contract, or receipt, or voucher to substantiate the transaction.

In addition, each auditable transaction had to be substantiated by a copy of the funding document, the AF Form 1269, with signatures, and a DD Form 577 and DOAs for the preparer and approver of the transaction. All documentation had to be reviewed by Higher Headquarters before submission to the auditors. The AF needed a better way to communicate the changes the auditors required as well as, documenting the idiosyncrasies of aged accounting system like being able to change a bad line of accounting. At the time this paper was written, the AF has partially fielded a new multi-billion dollar accounting system called the Defense Enterprise Accounting and Management Systems (DEAMS) to correct the internal control issues of the legacy system and to generate auditable financial systems.[15]

There will always be process changes requiring implementation with minimal input from the different organizations within the AF. This study is researching three collaboration techniques to determine which could ease the implementation of new processes or process changes. This study will compare process action teams, AFSO21, and crowdsourcing to

determine which of these collaboration applications may have eased the implementation of the RBA or SBA process changes.

Criteria

Three criteria will measure the viability of each alternative. The first criteria measured will be the cost of implementing each alternative. This paper will also compare the ease of implementation to include any specialized training requirements. Examining the expected results of each alternative will be the final criteria measured.

Description of alternatives

Process Action Teams

Two of the alternatives use a team approach to solving problems. In the early 90's the AF used Process action Teams (PATs) to develop the most efficient process. The Reliability Analysis Center developed a handbook to outline the *Total Quality Management (TQM)* approach and team building process selection and focus.[16] In the late 90s, the AF transitioned to an Integrated Product and Process Development (IPPD) team, which included personnel from different disciplines to develop better products and the most efficient processes.[17] The IPPD handbook outlined team size and the team selection process as well as developing roles and responsibilities, setting up ground rules and suggested training for the team members.[18] Even though IPPDs were developed in the 90's their usefulness has not disappeared.

USTRANSCOM uses IPPD in their product research and development to meet its cost and performance objectives.[19] USTRANSCOMI 61-1 defines IPPD as, "A management process that integrates all activities from product conception through production/field support, using a

multi-functional team, to simultaneously optimize the product and its manufacturing and sustainment processes to meet cost and performance objectives."[20]

The Air Force Materiel Command uses Integrated Test Teams (ITT) in the testing of weapons systems.[21] ITT's are varied depending on the test, but include personnel from any organization needed to implement a comprehensive and integrated test strategy.

Air Force Smart Operations 2021

AFSO21 or Air Force Smart Operations for the 21st Century, uses the Practical Problem Solving Method (PPSM), formerly known as the eight step problem solving model with the intent of establish a continuous process improvement environment.[22] AFSO21 has five desired effects: increase productivity, increase critical equipment availability rates, improve response time and agility, sustain safe and reliable operations, and improve energy efficiency.[23] AFSO21 uses PPSM to identify wasteful processes and then develops a plan for implementing the new process.

For example, the 51st Maintenance Group (MXG) used an AFSO21 event to reduce the A-10s maintenance downtime and increase its on-time phase rate to at least 80% within a year.[24] Osan has a very aggressive flying hour program and prior to the AFSO21 event had only 23% of their A-10's complete the phase inspection within the 10 day standard established by 51 FWI 21-165.[25] The team included personnel from 14 different agencies to look at every aspect of the inspection process and used value stream mapping to outline the 520 tasks performed to complete one inspection. Bringing personnel from every organization playing a part in the inspection helped identified more than 400 non-value added tasks and developed a new process for the A-10s phase inspections.[26]

The 30th Logistics Readiness Squadron at Vandenberg AFB, CA used AFSO21 to look at the support agreement process. The support agreement coordination process was taking an excessive amount of time. As they developed countermeasures the team identified 20 non-value added tasks and reduced the coordination time from 284 days to 76.[27]

The 502d Communications Squadron at Joint Base San Antonio, TX carried on an AFSO21 event to review the Secure Internet Protocol Router (SIPR) access process. The team was tasked to streamline the process so granting SIPR access was reduced. The team identified a number of process issues like four different work centers being involved in the process and a lack of a standardized processes across the squadron. The team was able to reduce the time to grant SIPR access from the maximum amount of time of six weeks to an average of five business days.[28] The problem solving methods and collaboration capabilities within the AFSO21 model enable a broader audience to review the changes and determine if useful for their unit.

Crowdsourcing

Crowdsourcing is an on-line collaboration tool some commercial companies have used successfully to solve process problems. One primary difference between crowdsourcing and IPPDs or AFSO21, is crowdsourcing is not a formal team, but rather individuals voluntarily coming together to solve a problem.

To validate crowdsourcing as a problem solving system, problem needs to be defined. Dr. Kevin Dunbar, a Professor of Human Development and Quantitative Methodology at the University of Maryland outlined four components to a problem: first the identification there is a problem, then the goal to solve the problem, the actions taken to achieve the goal, and finally the environment the person trying to solve the problem is working within.[29]

Dr. Brabham, Assistant Professor at the University of Southern California and expert on crowdsourcing outlines why crowdsourcing is a problem solving application. The Internet allows organizations with a problem looking to reach a goal to expand their solver base beyond the limits of their organization.[30]

Crowdsourcing is probably best known for its business applications like *Amazon's* mechanical turk. *Amazon's* mechanical turk is an on-line marketplace for work requiring human intelligence.[31] The idea is for a company needing something done on-line advertises the requirement and rate of pay, and lets anyone sign into the program and decide which if any jobs they want to complete. This can be anything from identifying objects in a photo to transcribing audio recordings to data duplication. Listed below are a few examples of studies using crowdsourcing, highlighting the diversity of its use and corroborating the accuracy of "the crowd".

Praveen Paritosh a senior research scientist at Google and Dr. Gary Marcus a Professor of Psychology and Neural Science at New York University developed a three person game with the intent to prove the relevance of crowdsourcing in developing comprehension tools.[32] Their ultimate goal is to increase machine comprehension.

Paritosh and Marcus designed a comprehension test and used crowdsourcing as the tool for creating the datasets needed for evaluating the test. They developed a game they called the "Iterative Crowdsourcing Comprehension Game" in which a three person team is used to generate a comprehensive set of relevant questions as an outcome to a corresponding document that only a judge and reader have access to.

Their results showed crowdsourcing was a valuable tool for collecting a large amount of data and suggests the game could be tailored for different challenges to increase the analysis of

human comprehension. This data could then be used to increase a machine's intellectual ability to analyze medical, scientific, and technological information more humanlike.

Dr.'s Conley and Tosti-Kharas studied the effectiveness of crowdsourcing to perform content analysis in managerial research.[33] Their research paper focused on the effectiveness of crowdsourcing to perform content analysis in managerial research. They compared crowdsourcing to traditional human coding and then to a computer aided text analysis program.

Conley and Tosti-Kharas used Amazon's Mechanical Turk to conduct the research. Their research revolved around participants describing an event that influenced their career views and then asked "Turkers" to assign codes to the cause of the event; whether the respondent had a support connection, and if the participant would change careers because of the event. They had multiple Turkers rate the same text to compare results and compared those to "expert" ratings to determine the reliability and accuracy of the results. Their research suggested voluntary, non-expert, anonymous workers could apply content codes efficiently and at a low cost with the reliability and accuracy of trained researchers.

The National Research Council conducted a study to combine experts from a variety of industries to recommend designs for developing a way to forecast disruptive technologies.[34] Disruptive technology describes a technology affecting an already established market or a technology or an innovation bringing an established technology to a society that did not have them before.[35] The study suggested combining crowdsourcing with classical approaches of forecasting, like brainstorming by experts and market surveys, could significantly improve the chances of discovering disruptive technologies before they emerge.

The National Research Council conducted a study on the gaps in expertise in geospatial intelligence personnel and how to ensure an adequate supply of that expertise over the next 20

years.[36] The report analyzed the geospatial intelligence workforce in ten areas; one of them being the emerging area of crowdsourcing. The report highlights the capabilities of crowdsourcing in creating information-rich maps and collecting localized human activity. Commercial entities and academia are using crowdsourcing in many different applications across diverse disciplines.

Comparison of Alternatives

Process Action Teams

Whether it is called a PAT, IPPD, or ITT, organizations use teams to complete tasks and refine processes. Teams use the collective knowledge of the team to develop a product or refine a process. The idea is to leverage the synergy of the team by building a well-rounded team with members who have a stake in the product or process.

The cost to put together a small team of experts like a PAT or ITT is relatively small when compared to the overall AF budget. Whether designing a new product or developing a new process, team members may not be in the same location. If the process or problem is bigger than one organization, like the reimbursable BA issue, there is a cost to get the team together. Travel costs like airfare, hotel, and per diem all add to the cost of putting the team together. For example, the GSA published per diem rate for Dayton, Ohio, the Air Force Materiel Command's Headquarters is $97/day for lodging and $59/day for meals and incidentals.[37] For Washington, DC the rate fluctuates depending on the time of year from a low of $172/day for lodging to a high of $242 with $69/day meals and incidentals reimbursement.[38]

Even if the process were limited to one installation, and there were no travel costs, people already have a job: daily tasks assigned to them to the keep the organization functioning. According to the DoD Deputy Comptroller, the FY 17 reimbursable personnel costs for an AF E-

6 is $53.13 per hour, while the personnel costs for an O-3 are $77.42 per hour or $424.07 and $617.97 per day respectively.[39] Time away from their primary duties means someone else must pick up the tasks not being performed. Few tasks can be skipped while someone is gone, but required when the individual returns. Some will argue it is part of their job for individuals working in a test environment to be a member of an ITT and to develop test criteria. The same case could be made for individuals working in product development fields, part of their job is to be a member of an IPPD and to develop new products and the processes needed to manufacture those new products. While that may be true in those two distinct environments, this was not the case in the reimbursable BA and SBA process changes.

Once the process is established either in policy or regulation, the changes have to be publicized to the field and implemented. This could be as easy as publishing a policy letter or could require extensive training. Depending on the complexity of the process change, there may be training costs. The training costs to implement DEAMS include sending a team to each base six months before its conversion to DEAMS. The per diem costs alone are estimated to be at least $4700 per month per person for the Eglin area based on the GSA per diem rates.[40] These costs do not include airfare or rental cars. Also, normal day-to-day processing in the legacy system has to happen concurrently with training on the new system, so there are lost productivity costs with the implementation.

The Defense Collaboration Services (DCS), formally known as Defense Connect Online (DCO), provides a low cost solution to reaching a large audience without the travel costs of a conference or training class. DCS is available on a secure Common Access Card (CAC) enabled website available to all DoD employees.[41] In the case of the reimbursable BA, the Air Force

Accounting and Finance Office held teleconferences with Headquarters and the Comptroller Squadrons testing the implementation to share information.

Coordination between the team members is relatively easy even if all team members are not from the same organization, as long as the right members are brought together. Getting the right mix of skills and personalities is key. The IPPD handbook assigned an entire chapter to team selection, size, and dynamics as well as roles and responsibilities for team meetings and how to develop an agenda.[42] In addition, if the team lead requires members from outside his or her control, coordination and approval from other organizations takes time.

Rewriting a regulation or publishing changes takes a considerable amount of time to coordinate through the team. There is also the requirement to coordinate any regulation changes through other organizations so they have an opportunity to submit suggestions or corrections if the changes conflict current guidance.[43] Table A3.1 in AF Instruction 33-360 provides a starting point for the organizations that may require coordination, but specifically states coordination should occur "with all offices having functional interest/technical expertise, oversight responsibility, statutory/regulatory review requirements, even if they do not appear in the table."[44]

After publicizing the change, there needs to be some way to measure whether the process was effectively implemented and corrected the problem. The IPPD handbook devoted an entire chapter to using a nine-step process for developing metrics to measure the success of the process change.[45]

One limitation of a processing team is being a small team, and not all entities touched by the process change may have had representation. The PAT Handbook suggest team membership should be between 8 and 12 members.[46] The IPPD handbook also recommends no more than 12

people on a team.[47] Restricting the group to 12 people limits the ideas generated to only what can thought of by that small group.

Another limitation of small groups is what is called groupthink. Social psychologist Irving Janis coined the term "groupthink" and described it as a group making faulty decisions because group pressure led to a decrease in "mental efficiency, reality testing and moral judgment."[48] A group is especially vulnerable when team members have a similar background, are insulated from opinions outside the group, and when there are no clear rules for decision making.[49]

Another limitation of small teams is the documentation. The documentation process is only as good as the team. With the reimbursable BA process, a *Reimbursable Guide* was updated and published in Oct 2014 and then revised in July 2015. It was posted to a CAC enabled SharePoint site maintained by SAF.[50]

In his thesis for the Naval Post Graduate School, Mr. Gregg Monk identified three types of Integrated Processing Teams (IPT's) the DoD uses: the overarching IPT (OIPT), the working-level IPT (WIPT), and the program-level IPT (PIPT).[51] The OIPT are led by high level DOD personnel to provide oversight of major defense acquisition programs (Monk, 2002). The WIPT develop strategies for acquisition, cost estimates, logistics management and provide program managers with documentation to resolve issues (Monk, 2002). The PIPT is the team executing the plan and ensuring the products are developed (Monk, 2002).

The IPPD process works well in product development and testing. Using team members from different disciplines to design the best possible product and then develop the most efficient processes to manufacture the product are used by both USTRANSCOM and the Air Force Research Lab.

OIPT's for major acquisitions like the F-35 program, are established with the goal of ensuring each service gets the weapon system best suited for its mission.[52] The Joint Program Office (JPO) has oversight of the entire program to include foreign partners. Within the JPO are WIPT's in areas of Business and Financial Management, Operations, Air System Integration to name a few.[53] Using teams to ensure compatibility within subsystems of a major weapons systems is key to ensuring a viable end-product is developed.

The small team process was the alternative used to implement the reimbursable BA changes. The Air Force Materiel Command tested the process over one fiscal year at three locations: Eglin, Wright Patterson, and a small unit at Tinker AFB. After testing, the initial documentation produced by SAF dictated the mandatory use of reimbursable BA's to the entire Air Force.[54] No metrics were established or implemented to determine if the process changes had the desired effect and it took years after implementation to develop an online training class to bring the field up-to-date.[55] Developing and fielding the training on the new process prior, or at least in conjunction with the process change, would have made the transition smoother. Even the current reimbursable guidance assumes a certain level of expertise.[56] Where the team process works well in product development, it did not work well in implementing a process change across the financial management community of the AF.

AFSO21

Some of the costs associated with an IPT are the same or similar in an AFSO21 event. For example, depending on the process being implemented the team could consist of members from different Wings requiring a central location to meet and outline the problem and basic solution. In this case, there are the same travel costs as the IPT to get the team in one location.

AFSO21 is a structured program and as such, just in time training is required just to be a member of the team. This training requirement could increase the time spent away from the duty section. Training in PPSM is the baseline for all applications of CPI approaches and methodologies. As such, training is provided during accession and Professional Military Education (PME) courses.[57]

For practitioners of CPI, there are different levels of expertise and training identified by a certification of green belt, yellow belt, black belt, or master black belt. The AF has already invested in developing curricula for the different levels of training, and the AETC/CC was directed to ensure CPI training is included in officer, enlisted, and civilian PME.[58] There are still training costs, but the larger cost of developing the curriculum has already been incurred and cannot be recovered.

Just like an IPPD, each member has a primary job and pulling them away from those daily duties incurs a lost productivity cost. Green belt training introduces CPI methodologies and tools, and use of a SAF approved curriculum is mandatory.[59] Tracking the certification and skills currency is maintained through a CAC enabled CPI portal.[60]

CPI events have a more regimented documentation requirement. Not only do the process changes have to be advertised to the field, but the progress of the change is tracked as part of the event. While this is more work for the team, anyone with a CAC can access the CPI portal and review the documentation and progress of the team. As additional information is learned or new ideas are generated, the CPI portal is the centralized point to post the new data.

The costs to implement the change under AFSO21 is similar to the cost under the IPPD alternative. While the centralized portal provides a single point for all AFSO21 events to be posted, depending on the difficulty of the process being changed, it may require more than just a

policy change for the field or new guidance publication to be effectively implemented. For example, for a major systems implementation like DEAMS, a traveling training team provides the best return on investment.

For AFSO21, CPI is a continuous process. CPI is broken into three types of events: Just do it (JDI), rapid improvement events (RIE), and projects or high value initiatives. JDI events are short term events, normally one to two days, used to improve a process like an operating procedure or standards of work and they have limited boundaries.[61] The distinction between the events is the complexity of the problem and time required to analyze the problem and develop a solution. An example of a project or high value initiative would be acquisition of a new weapon system or developing a new organizational structure.

RIE and projects require follow-up to ensure the processes put in place actually work. There are standard training requirements and toolsets, and a common set of reporting templates to capture work in progress and completed projects. One of the strongest elements of AFSO21 is the central repository, known as CPI-MT or Continuous Process Improvement Management Tool.[62] Each event is entered and tracked so the team and leadership can see the progress or add information.

For a project like the reimbursable BA process change, the change effected every organization with a reimbursement program. The SBA requirements affected every Comptroller organization in the AF. Having a centralized on-line venue to collect all aspects of a process change ensures all organizations have access to the same information at the same time. The CPI-MT has an online collaboration ability to allow real time validation of a specific event.[63] The increased capability of the CPI-MT allows for a better end product and more visibility.

Crowdsourcing

Crowdsourcing does not rely on a group of experts but rather on a diverse population with a common interest in solving a problem. Individuals voluntarily work on the problem because they have some intrinsic motivation for getting involved.[64]

Brabham proposes four types of problems uniquely suited for crowdsourcing: broadcast search, peer vetted creative production, distributed human intelligence, and knowledge-discovery and management approach.[65] The broadcast search is used when there is definitive answer to a scientific question such as developing a new chemical compound.[66] The peer vetted creative production type uses the marketplace to suggest product designs which a company uses or rejects based on the positive feedback of its participants.[67] Using crowdsourcing to process data is known as the distributed human intelligence type of problem solving.[68] The knowledge-discovery and management approach assumes there is a wealth of "disorganized knowledge", and needs a venue to uncover and organize that knowledge.[69]

The reimbursable BA and SBA issues are examples of crowdsourcing's knowledge-discovery approach to problem solving. Tapping into the disorganized knowledge may have made the implementation of both process changes smoother with less changes. The key to this alternative is developing a single locale to establish the detailed processing requirements.

The AF does not have a crowdsourcing platform and developing one could be very expensive and time consuming. In November of 2014, the estimate for the development and implementation of DEAMS was $2.2 billion.[70]

The AF could save the systems development cost by using an on-line crowdsourcing company like *Innocentive*. *Innocentive* is a cloud-based crowdsourcing platform where organizations post "challenges" and voluntary "solvers" develop solutions.[71] The system is

designed to provide collaboration capabilities within the organization, but it can also be tailored to invitation only audiences or completely open to the public. The capability to keep the problem solving internal to the AF does not eliminate the problems associated with any classified data, but it does allow for a broad based collaboration for problems including information classified as "For Official Use Only" (FOUO). The cost to use the software platform varies depending on the complexity of the problem and the company's resources used to advertise the problem and collect the solutions.

Forrester Consulting conducted a single company case study for *Innocentive* to provide potential clients an economic impact and potential return on investment perspective.[72] The costs included the fee for startup consulting and training, fees for posting a challenge, and administrative costs. According to the study the average consulting training cost is $50,000, the challenge posting fee averaged $15,000, and administrative costs average $14,472 per year.[73] With only one process problem or challenge posted a year, the average total cost would be almost $80,000. Depending on the complexity of the problem and the company resources used, these costs will fluctuate and every problem posted has an average $15,000 posting fee.

Manpower costs will be incurred whether purchasing access to a commercial site like *Innocentive* or developing an AF owned system. A group monitoring the suggestions or solutions submitted will be necessary to determine viability and ensure there are no legal ramifications. Each career field or business group would need a broad background of experience to validate the potential solutions.

Once a solution is found, each alternative has the same implementation costs to get the changed or new processes to the field. Training costs and the time to get the changes updated and publicized all affect how long it takes to get the changes implemented and working.

Implementing a crowdsourcing alternative would require a lot of positive communication similar to the actions taken by the Chief of Staff in regards to AFSO21. Critics may consider crowdsourcing a buzzword and the latest craze, something to outlive until the next craze comes along. Getting the populace to embrace crowdsourcing as a problem solving platform would be key to its success.

People participate in crowdsourcing for a number of reasons. Many successful crowdsourcing opportunities have a financial gain for the person or persons solving the problem. Companies using Amazon's Turk pay the volunteers for the work conducted. The companies using *Innocentives* challenges pay the solver a fee for providing a workable solution to the challenge posted. Any solver fees would be in addition to the $80,000 average cost of using a commercial crowdsourcing platform.

Money is not the only reason people participate in crowdsourcing. Intrinsic motivators like being able to decide for oneself what problems to try to solve or just challenging themselves to solve a difficult problem are motivation in itself.[74] The AF could offer some financial compensation like it did when the Idea Program was active, but the cost would be in addition to the other fees discussed above.

The power of crowdsourcing comes from a large diverse population and if not enough people participate, the problem will in all likelihood not be solved. At the same time, there is a possibility of getting an excessive number of suggestions. It takes time and expertise to review all the propositions and validate the ones with potential versus suggestions that are impossible to implement.

In addition to the number of suggestion being too large or small, another limitation is the knowledge base of the organization posting the problem. Dr.'s Dahlander and Piezunka argue

many organizations pay more attention to suggestions they are familiar with and less to external contributions outside the normal knowledge base of their organization.[75] Proposals outside the norm of the organizations conventional processing are more likely to be ignored and as such, good ideas may not be seriously considered. In addition, their study suggests if there are too many alternatives, the organization may filter out any suggestions too distant from the organizations normal content and structure.[76]

Crowdsourcing is not the answer to every problem. In an article for *The Journal for Political Philosophy,* Dr. Helene Landemore highlights Iceland's attempt to use crowdsourcing to develop a new constitution.[77] Iceland used a participatory process to allow regular citizens to submit ideas about the constitution. According to her study, part of the reason the process failed was the "institutional hurdles" encountered towards the end of the process, including the new referendum being stalled in Parliament.[78]

Results of Comparison

Traditional process actions teams work well in a product development process, especially if all aspects of the product development team are represented. The key to both the USTRANSCOM's IPPD and AFMC's ITT is the documented structure. Just like the original IPPD Handbook from 1998, both organizations identify milestones for the teams and outline documentation requirements for archiving the team's progress.

Process changes involving every AF base means most, if not all installations, should have a member on the process action team. For the teams to work, the participants need to have a vested interest in the process and be willing to work on improving the process. Finding a willing representative from every component could be challenging, in addition to the cost of getting everyone in one location to work the problem.

Crowdsourcing has the potential to solve process problems, but there is a cost and some risk. Developing a new, truly open system would be costly, both in dollars and time, and the security requirements to ensure classified data was not exposed could be difficult. DEAMS was in development years before it was deployed to Scott AFB in 2008, and as of this writing has not been deployed AF-wide yet.[79]

Using an already established crowdsourcing company would eliminate the development costs, but also limit the process problems that could be posted. Even though companies like *Innocentive* tout the ability to keep the target audience within the organization, any classified processes or problems would require an even tighter audience. This would drive up costs. Even if crowdsourcing excluded all classified process problems, many processes involve "For Official Use Only" data, requiring the audience to be internal AF personnel exclusively.

Most organizations trying crowdsourcing fail to attract enough suggestions from external sources. In Dahlander's and Piezunka's study of almost 24,000 organizations implementing a crowdsourcing tool, only 1% showed a substantial number of suggestions.[80] At an average of $80,000 per problem, the cost of using an on-line crowdsourcing company does not appear cost effective.

Much of the cost of AFSO21 has already been incurred. The basics of CPI have been introduced into all phases of PME, so the initial training development costs are already incurred. The documentation requirements are clearly outlined and standardized. The CPI-Management Tool is already designed and being used. Security concerns with using a commercial crowdsourcing platform are eliminated as the Management Tool is approved for use on the AF Portal and access requires a CAC.

There is still a cost of putting the AFSO21 team together and requires a Commander to appoint an individual. To get the best results, the appointees should be people that have a vested interest in making the process better and preferably a volunteer, someone who wants to solve that specific problem or process.

Recommendation/Conclusion

IPT's work well in a product development environment, but the lack of structure and constrained participation limit the effectiveness of implementing a change across the entire AF. While there are some applications crowdsourcing could be used in the AF, it will not work well for all process problems within the strict limitations of the AF. In addition to the cost, the risk to exposing classified or FOUO data makes using a commercial source hazardous. If DEAMS is any indication, the time and money required to build an AF specific crowdsourcing platform would not yield the results necessary to offset the cost.

The larger implementation costs of AFSO21 have already been incurred. In addition, AFSO21 and the CPI-MT already utilize some of the more positive aspects of crowdsourcing. It is the closest thing to a crowdsourcing system the AF has at the present. It is open to a larger forum than Process Action Teams, utilizing a more diverse audience from which to draw solutions. Also, the management tool has a tracking capability to monitor every stage of the problem solution and implementation.

One of the strongest functions of the Management Tool is the collaboration function already built into the system. The opportunity to share ideas and converse with the team who is working the issue or has recommended a solution is a tremendous functionality. The open collaboration function allows for a broadening of ideas and the development of a better solution.

Keeping the audience to only personnel with CAC access by using the CPI-MT solves the FOUO issues while still expanding the target audience when compared to a Process Action Team.

The one area the AF falls short on with respect to AFSO21 is the dissemination of its strengths and capabilities. Military and Civilian Professional Military Education provide training on CPI techniques, but not enough on the strengths of the Management Tool and AFSO21 as a tool for solving process problems. I recommend the AF continue using AFSO21, but increase the communication across the AF about its potential uses and system capabilities. Until researching data for this paper, I thought I understood what AFSO21 was and how to use it. However, I had never heard of the management tool or its capabilities, or for that matter, even that I was allowed access to the site. One of the reasons crowdsourcing works is the diverse, voluntary audience it reaches. The Management Tool has the same potential functionality if people know it exists.

Being able to search the database to see if another entity has already solved a process I may be struggling with, can save my organization and the AF time and money. The ability to post questions or suggestions to organizations working through a process problem would help to develop the best solution. Maybe if the AF had used AFSO21 as the platform to implement the reimbursable process, the easy access to the collaboration capabilities within the Management Tool would have reduced or eliminated the lost purchasing power the AF incurred. When compared to the limited efficiencies of Process Action Teams, or the costs associated with renting or developing a crowdsourcing platform, the cost of using AFSO21 presents the best return on investment.

NOTES

[1] Deborah Lee James and Larry O. Spencer, Letter to Airmen of the United Sates Air Force, (13 May 2014), http://www.af.mil/Portals/1/documents/SECAF/SecAF%20memo%20to%20Airmen%20on%20Every%20Dollar%20Counts.pdf

[2] Reliability Analysis Center, *State-of-the-Art Report, Process Action Team Handbook, 1992,* (Rome Laboratory, Griffis AFB, NY), 15, http://www.dtic.mil/get-tr-doc/pdf?AD=ADA278301

[3] *DoD Integrated Product and Process Development Handbook,* (Office of the Under Secretary of Defense (Acquisition and Technology), Washington, DC, 1998), Chapter 1, 2

[4] Ibid, Chapter 3, 2

[5] Air Force Smart Operations for the 21st Century (AFO21) Playbook, Version 2.1, (May 2008), H1-H6, http://www.au.af.mil/au/awc/awcgate/af/afd-090327-040_afso21-playbook.pdf

[6] Daren C. Brabham, *Crowdsourcing,* (The MIT Press, Massachusetts Institute of Technology, 2013), 29

[7] James Surowiecki, *The Wisdom of Crowds,* (Anchor Books, A Division of Random House, Inc., First Edition, Aug 2005), 4

[8] Air Force Instruction 65-601, Volume 1, *Budget Guidance and Procedures,* (Incorporating Change 1, 29 July 2015), 87-94

[9] Air Force Manual 65-604, *Appropriation Symbols and Budget Codes,* (1 October 2016), 26-29, *http://static.e-publishing.af.mil/production/1/saf_fm/publication/afman65-604/afman65-604.pdf*

[10] SAF/FMFC AFAFO, *Reimbursement Accounting Guidance & Standard Operating Procedures, Version 3.1,* (1 July 2015), 55-57 & 61, https://cs3.eis.af.mil/sites/OO-FM-MJ-59/AF-FM-AFO/OO-FM-AF/OO-FM-AF-01/AFKN

[11] Financial Statements of Agencies, Title 31, United States Code, Section 3515

[12] FIAR Guidance Supplement: SBA Instructions, (April 2016), 1, http://comptroller.defense.gov/Portals/45/documents/fiar/workproducts/SBA_Instructions.pdf

[13] DoD 7000.14-R, Department of Defense Financial Management Regulations, Volume 14, *Administrative Control of Funds,* (Under Secretary of Defense (Comptroller), May 2015), paragraph 010209, I-15, http://comptroller.defense.gov/FMR/fmrvolumes.aspx

[14] Ibid, paragraph 010205J, I-6

[15] Amber Corrin, *Air Force awards $73M to Finish Off DEAMS Work*, (Federal Times, 23 September 2015), http://www.federaltimes.com/story/government/it/2015/09/23/air-force-awards-73m-financial-management-contract/72693134/

[16] Reliability Analysis Center, *State-of-the-Art Report, Process Action Team Handbook, 1992*, (Rome Laboratory, Griffis AFB, NY), 16-20 and 33-36, http://www.dtic.mil/get-tr-doc/pdf?AD=ADA278301

[17] *DoD Integrated Product and Process Development Handbook*, (Office of the Under Secretary of Defense (Acquisition and Technology), Washington, DC, 1998), paragraph 1.1, 2

[18] Ibid, chapter 3, 1-16

[19] USTRANSCOM Instruction 61-1, *Research, Development, Test, and Evaluation (RDT&E) Program*, (18 February 2016), paragraph 3.8.4, 8, & attachment 5, 28-30

[20] Ibid, A5.2, 28

[21] Air Force Materiel Command Supplement dated 29 December 2016 to Air Force Instruction 99-103 dated 16 October 2014, *Capabilities-Based Test and Evaluation*, paragraph 1.4

[22] AFI 38-401,*Continuous Process Improvement*, (15 April 2016), paragraph 3.1, 9

[23] Air Force Smart Operations for the 21st Century (AFSO21) Playbook, Version 2.1, (May 2008), paragraph 2.3, A-2, www.au.af.mil/au/awc/awcgate/af/afd-090327-040_afso21-playbook.pdf

[24] TSgt Brian Richard Liveoak, *AFSO21 Event for Osan's A-10 Phase Dock*, Exceptional Release, (Logistics Officers Association, Winter 2014), 22, http://www.northropgrumman.com/MediaResources/MediaKits/GlobalLandForcesModernization/Documents/loa-exceptional-release-winter-20141.pdf

[25] Ibid, 21

[26] Ibid, 23

[27] Air Force Portal Home Page, https://cs.eis.af.mil/sites/10944/cpi/SitePages/home.aspx

[28] Ibid

[29] Kevin Dunbar, *Problem Solving*, eds. W. Bechtel and G. Graham, in (A Companion to Cognitive Science), London, England, 1998, 2

[30] Daren C. Brabham, *Crowdsourcing*, (The MIT Press, Massachusetts Institute of technology, 2013), 18

[31] Amazon Mechanical Turk, Artificial Artificial Intelligence, accessed 14 Apr 2017, https://www.mturk.com/mturk/welcome

[32] Praveen Paritosh and Gary Marcus, *Towards a Comprehensive Challenge, Using Crowdsourcing as a Tool,* (AI Magazine, Spring 2016), 23-30

[33] Caryn Conley and Jennifer Tosti-Kharas, *Crowdsourcing Content Analysis for Managerial Research,* (Management Decision, Vol 52, No. 4, 2014), 675-688

[34] National Research Council of the National Academies, *Persistent Forecasting of Disruptive Technologies – Report 2,* (The National Academy Press, Washington, D.C., 2010), 2

[35] Ibid, 2

[36] National Research Council of the National Academies, *Future U.S. Workforce for Geospatial Intelligence,* (The National Academy Press, Washington, D.C., 2013), 1

[37] U.S. General Services Administration, Per Diem Rates, Per Diem Look-Up, accessed 14 Apr 2017, https://www.gsa.gov/portal/category/100120

[38] Ibid

[39] John P. Roth, *FY 2017 Department of Defense (DoD) Military Personnel Composite Standard Pay and Reimbursable Rates,* (Office of the Under Secretary of Defense (Comptroller), 9 Mar 2016), Tab K-5, http://comptroller.defense.gov/reports.html

[40] U.S. General Services Administration, Per Diem Rates, Per Diem Look-Up, accessed 14 Apr 2017, https://www.gsa.gov/portal/category/100120

[41] Defense Collaboration Services, Accessed 14 Apr 2017, http://www.disa.mil/dcs

[42] *DoD Integrated Product and Process Development Handbook*, (Office of the Under Secretary of Defense (Acquisition and Technology), Washington, DC, 1998), chapter 3, 1-16

[43] Air Force Instruction 33-360, *Publications and Forms Management,* (I December 2015), paragraph 3.3, 33

[44] Ibid, paragraph 7.1, 72-73

[45] *DoD Integrated Product and Process Development Handbook*, (Office of the Under Secretary of Defense (Acquisition and Technology), Washington, DC, 1998), chapter 4, 1-7

[46] Reliability Analysis Center, *State-of-the-Art Report, Process Action Team Handbook, 1992,* (Rome Laboratory, Griffis AFB, NY), 33, http://www.dtic.mil/get-tr-doc/pdf?AD=ADA278301

[47] *DoD Integrated Product and Process Development Handbook*, (Office of the Under Secretary of Defense (Acquisition and Technology), Washington, DC, 1998), paragraph 3.1.1, 2

[48] Irving L. Janis, *Victims of Groupthink.* (New York: Houghton Mifflin, 1972), 9

[49] Psychologists for Social Responsibility, access 14 Apr 2017, http://www.psysr.org/about/pubs_resources/groupthink%20overview.htm

[50] CAC restricted SharePoint site for Secretary of the Air Force, Air Force Accounting and Finance Office, https://cs3.eis.af.mil/sites/OO-FM-MJ-59/AF-FM-AFO/OO-FM-AF/OO-FM-AF-01/AFKN

[51] Gregg B. Monk, *Integrated Product Team Effectiveness in the Department of Defense,* (Naval Post Graduate School, Monterey, Ca., March 2002), Table 1, 19

[52] The F-35 Lightning II, public website, accessed 14 Apr 2017, http://www.jsf.mil/

[53] Ibid

[54] CAC restricted SharePoint site for Secretary of the Air Force, Air Force Accounting and Finance Office, https://cs3.eis.af.mil/sites/OO-FM-MJ-59/AF-FM-AFO/OO-FM-AF/OO-FM-AF-01/AFKN

[55] *MISSION POSSIBLE: REIMBURSEMENTS,* Feb 2017, https://fm.adls.af.mil

[56] CAC restricted SharePoint site for Secretary of the Air Force, Air Force Accounting and Finance Office, 14, https://cs3.eis.af.mil/sites/OO-FM-MJ-59/AF-FM-AFO/OO-FM-AF/OO-FM-AF-01/AFKN

[57] AFI 38-401,*Continuous Process Improvement*, (15 April 2016), paragraph 3.1.1, 9

[58] Ibid, paragraph 2.7, 5-6

[59] Ibid, paragraph 3.3, 9

[60] Ibid, paragraph 4.3.1, 12

[61] Air Force Smart Operations for the 21st Century (AFO21) Playbook, Version 2.1, (May 2008), K-1, http://www.au.af.mil/au/awc/awcgate/af/afd-090327-040_afso21-playbook.pdf

[62] Ibid, E-3

[63] Captain Dan Henderson, *AFSO21 Continuous Process Improvement Management Tool,* (Air Force Journal of Logistics, Volume XXXII, Number 2), 32

[64] Kevin J. Boudreau and Karim R. Lakhani, *Using the Crowd as an Innovation Partner,* (Harvard Businnes Review, April 2013), https://hbr.org/2013/04/using-the-crowd-as-an-innovation-partner

[65] Daren C. Brabham, *Crowdsourcing,* (The MIT Press, Massachusetts Institute of technology, 2013), 44

[66] Ibid, table 2.1, 45

[67] Ibid, table 2.1, 45

[68] Ibid, table 2.1, 45

[69] Ibid, table 2.1, 45

[70] Kevin McCaney, *Air Force Nears Finish Line on Massive ERP Project,* (Defense Systems, 4 November 2014), https://defensesystems.com/Articles/2014/11/04/Air-Force-Accenture-DEAMS-final-phase.aspx

[71] *Innocentive homepage,* accessed 14 Apr 2017, https://www.innocentive.com/about-us/

[72] Michele Bishop, *The Total Economic Impact of Innocentive Challenges,* (Forrester Consulting, Cambridge MA, May 2009), 3

[73] Ibid, 10-11

[74] Daren C. Brabham, *Crowdsourcing,* (The MIT Press, Massachusetts Institute of technology, 2013), 66

[75] Henning Piezunka and Linus Dahlander, *Distant Search, Narrow Attention: How Crowding Alters Organizations; Filtering of Suggestions in Crowdsourcing,* (Academy of Management Journal, Vol 58, No. 3, 2015), 860

[76] Ibid, 873

[77] Helene Landemore, *Inclusive Constitution –Making: The Icelandic Experiment,* (The Journal of Political Philosophy, Volume 23, Number 2, 2015), 166-191

[78] Ibid, 167

[79] DEAMS, Defense Enterprise Accounting and Management System, *Financial Information at your Fingertips,* (DEAMS Functional Management Office, Fairview Heights, IL), access 14 Apr 2017, http://www.fmsi.biz/DODTrust/Documents/About_DEAMS_02-07.pdf

[80] Henning Piezunka and Linus Dahlander, *Open to suggestions: How organizations elicit suggestions through proactive and reactive attention,* (Research Policy, June 2014), 818

Bibliography

Air Force Instruction 38-401,*Continuous Process Improvement*, (15 April 2016)

Air Force Manual 65-604, *Appropriation Symbols and Budget Codes*, (1 October 2016), http://static.e-publishing.af.mil/production/1/saf_fm/publication/afman65-604/afman65-604.pdf

Air Force Materiel Command Supplement dated 209 December 2016 to Air Force Instruction 99-103 dated 16 October 2014, *Capabilities-Based Test and Evaluation*

Air Force Portal Home Page, https://cs.eis.af.mil/sites/10944/cpi/SitePages/home.aspx

Air Force Smart Operations for the 21st Century (AFO21) Playbook, Version 2.1, (May 2008), http://www.au.af.mil/au/awc/awcgate/af/afd-090327-040_afso21-playbook.pdf

Amazon Mechanical Turk, Artificial Artificial Intelligence, accessed 14 Apr 2017, https://www.mturk.com/mturk/welcome

Bishop, Michele, *The Total Economic Impact of Innocentive Challenges*, (Forrester Consulting, Cambridge MA, May 2009)

Boudreau, Kevin J. and Karim R. Lakhani, *Using the Crowd as an Innovation Partner*, (Harvard Business Review), April 2013, https://hbr.org/2013/04/using-the-crowd-as-an-innovation-partner

Brabham, Darin C., *Crowdsourcing*, The MIT Press, Massachusetts Institute of technology, 2013

CAC restricted SharePoint site for Secretary of the Air Force, Air Force Accounting and Finance Office, https://cs3.eis.af.mil/sites/OO-FM-MJ-59/AF-FM-AFO/OO-FM-AF/OO-FM-AF-01/AFKN

Conley, Caryn and Jennifer Tosti-Kharas, *Crowdsourcing Content Analysis for Managerial Research*, Management Decision, Vol 52, No. 4, 2014

Corrin, Amber, *Air Force awards $73M to Finish Off DEAMS Work*, Federal Times, (23 September 2015), http://www.federaltimes.com/story/government/it/2015/09/23/air-force-awards-73m-financial-management-contract/72693134/

DEAMS, Defense Enterprise Accounting and Management System, *Financial Information at your Fingertips*, (DEAMS Functional Management Office, Fairview Heights, IL), access 14 Apr 2017, http://www.fmsi.biz/DODTrust/Documents/About_DEAMS_02-07.pdf

Defense Collaboration Services, Accessed 14 Apr 2017, http://www.disa.mil/dcs

DoD 7000.14-R, Department of Defense Financial Management Regulations, Volume 14, *Administrative Control of Funds*, Under Secretary of Defense (Comptroller), May 2015, http://comptroller.defense.gov/FMR/fmrvolumes.aspx

DoD Integrated Product and Process Development Handbook, (Office of the Under Secretary of Defense (Acquisition and Technology), Washington, DC, 1998)

Dunbar, Kevin, *Problem Solving*, eds. W. Bechtel and G. Graham, in (A Companion to Cognitive Science), London, England, 1998

FIAR Guidance Supplement: SBA Instructions, (April 2016), http://comptroller.defense.gov/Portals/45/documents/fiar/workproducts/SBA_Instructions.pdf

Financial Statements of Agencies, Title 31, United States Code, Section 3515

Henderson, Dan, *AFSO21 Continuous Process Improvement Management Tool*, (Air Force Journal of Logistics, Volume XXXII, Number 2)

Innocentive homepage, accessed 14 Apr 2017, https://www.innocentive.com/about-us/

James, Deborah Lee and Larry O. Spencer, Letter to Airmen of the United Sates Air Force, (13 May 2014), http://www.af.mil/Portals/1/documents/SECAF/SecAF%20memo%20to%20Airmen%20on%20Every%20Dollar%20Counts.pdf

Landemore, Helene *Inclusive Constitution –Making: The Icelandic Experiment*, The Journal of Political Philosophy, Volume 23, Number 2 (2015)

Liveoak, Brian Richard, *AFSO21 Event for Osan's A-10 Phase Dock*, Exceptional Release, (Logistics Officers Association, Winter 2014), http://www.northropgrumman.com/MediaResources/MediaKits/GlobalLandForcesModernization/Documents/loa-exceptional-release-winter-20141.pdf

McCaney, Kevin, *Air Force Nears Finish Line on Massive ERP Project*, (Defense Systems), 4 November 2014, https://defensesystems.com/Articles/2014/11/04/Air-Force-Accenture-DEAMS-final-phase.aspx

MISSION POSSIBLE: REIMBURSEMENTS, Feb 2017, https://fm.adls.af.mil

Monk, Gregg B., *Integrated Product Team Effectiveness in the Department of Defense*, (Naval Post Graduate School, Monterey, Ca., March 2002)

National Research Council of the National Academies, *Future U.S. Workforce for Geospatial Intelligence*, (The National Academy Press, Washington, D.C., 2013)

National Research Council of the National Academies, *Persistent Forecasting of Disruptive Technologies – Report 2*, (The National Academy Press, Washington, D.C., 2010)

Paritosh, Praveen and Gary Marcus, *Towards a Comprehensive Challenge, Using Crowdsourcing as a Tool*, AI Magazine, Spring 2016

Piezunka, Henning and Linus Dahlander, *Distant Search, Narrow Attention: How Crowding Alters Organizations; Filtering of Suggestions in Crowdsourcing,* Academy of Management Journal, Vol 58, No. 3, 2015

Piezunka, Henning and Linus Dahlander, *Open to suggestions: How organizations elicit suggestions through proactive and reactive attention,* Research Policy, June 2014

Psychologists for Social Responsibility, access 14 Apr 2017, http://www.psysr.org/about/pubs_resources/groupthink%20overview.htm

Reliability Analysis Center, *State-of-the-Art Report, Process Action Team Handbook, 1992,* Rome Laboratory, Griffis AFB, NY, http://www.dtic.mil/get-tr-doc/pdf?AD=ADA278301

Roth, John P., *FY 2017 Department of Defense (DoD) Military Personnel Composite Standard Pay and Reimbursable Rates,* (Office of the Under Secretary of Defense (Comptroller)), 9 Mar 2016, http://comptroller.defense.gov/reports.html

SAF/FMFC AFAFO, *Reimbursement Accounting Guidance & Standard Operating Procedures, Version 3.1,* (1 July 2015), https://cs3.eis.af.mil/sites/OO-FM-MJ-59/AF-FM-AFO/OO-FM-AF/OO-FM-AF-01/AFKN

The F-35 Lightning II, public website, accessed 14 Apr 2017, http://www.jsf.mil/

Thompson, Mark, *Placing Blame at any Cost,* Time, 24 Jun 2001), http://content.time.com/time/magazine/article/0,9171,135113,00.html

U.S. General Services Administration, Per Diem Rates, Per Diem Look-Up, accessed 14 Apr 2017, https://www.gsa.gov/portal/category/100120

USTRANSCOM Instruction 61-1, *Research, Development, Test, and Evaluation (RDT&E) Program,* (18 February 2016)