DISTRIBUTED OPERATIONS in Response to COVID-19: ASSESSING WORKFORCE PERCEPTIONS OF PRODUCTIVITY AND SUCCESS
During the midst of the Coronavirus 2019 (COVID-19) pandemic, a large Navy Working Capital Funded government laboratory transitioned from a traditional on-site/physical daily operational presence to a distributed, virtual maximum telework posture. The direction given in March 2020 was that unless performance of a specific approved tasking was required at the physical workplace, the laboratory workforce was to telework from a safe location while practicing social distancing. To this extent, a majority of the organization’s workforce continued performing the duties associated with their programs and projects in a virtual and secure distributed environment. This new norm certainly raised questions and considerations related to the effectiveness of the workforce while under maximum telework. As a result, two surveys were conducted to assess the perceived work-effectiveness of the organization. The perceived work-effectiveness was assessed at the operational (work unit) level, focusing on project impacts of telework, and from the macro-organizational perspective. The first survey was conducted on a project that was 2 weeks into this virtual maximum telework environment. The second survey was performed one layer above the project at the division level, thereby extending the aperture of the data. Both surveys provided a great deal of information and insight on how project teams perceived work performance and effectiveness during telework. The purpose of the study was to understand the impact of distributed telework in workforce productivity and project success as well as assess workforce perceptions on the effects of telework.
Background

Naval Information Warfare Center (NIWC) Pacific is a critical component in the U.S. Department of the Navy (DoN) family for performing research, development, test, and evaluation. Additionally, NIWC Pacific provides deployment and sustainment of command, control, communications, computers, intelligence, surveillance, and reconnaissance systems; cyber systems; and space systems that support Warfighters around the world (NIWC Pacific, n.d.).

NIWC Pacific has a presence in California, Hawaii, Guam, and Japan. The workforce consists of about 5,000 highly educated (200+ PhD/JD, and over 1,500 MS degrees) diverse professionals in core domains focused in the areas of science and technology, engineering, acquisition, and program/project management. The NIWC workforce in San Diego, California, is complemented by one of the largest concentrations of active-duty military personnel stationed at a laboratory, which helps NIWC Pacific address operational challenges during war, peace, humanitarian, and world crisis events.

DoD agencies are often criticized (Pomerleau, 2016) as slow and inefficient in adapting to change and transforming in nontactical campaigns (e.g., policy and culture). While this may be true in some cases, this was not the case during the COVID-19 pandemic crisis. In previous years, NIWC Pacific utilized the Department of Navy telework instruction in complementing the predominant on-site work schedule (Space & Naval Warfare Systems Command, personal communication, July 22, 2015). Although an organization where on-site operations were the norm and utilization of telework was at a minimum, NIWC Pacific quickly established a maximum telework order where the vast majority of personnel transitioned from their on-site work environment to their virtual home office while practicing guidelines that helped the workforce remain safe from the pandemic. Within 96 hours, the workforce was embedded in flexible, geographically distributed, maximum telework operations from the comfort and safety of their homes.
Within 1 week after the maximum telework order was issued, NIWC Pacific leadership estimated continuity of operations status was more than 90% offsite, while remaining mission-essential personnel continued working onsite. However, under maximum telework operations, many wondered whether or not NIWC Pacific would still be able to maintain its ability to support Warfighters while the workforce was adapting to, and operating in, a distributed environment. In studying how effective the current workforce was operating, NIWC Pacific leadership wanted two questions answered. First, how has maximum telework affected workforce productivity? Second, how has maximum telework affected project success?

**Research Framework**

In support of this study, a research framework was put in place (Figure 1) to illustrate and conceptualize the structure of the research plan. The framework provided a structure to address the basis of the problem and the approach for accomplishing the research (Maxwell, 2012). In this framework, survey questions were developed by identifying key themes and concepts central to the core research questions. A set of objectives was then defined along with the survey questions that address these themes and objectives. Data were then collected and synthesized to verify whether the framework addressed the problem statement.

This framework was utilized during the two phases of the research study along with the underlying methodologies for collecting and analyzing the data. The first phase of the research focused on a single project, while the second phase focused on multiple projects.
Research Framework—Phase 1
(Single Project)

Two weeks into maximum telework, the sample project considered how the team was operating in their distributed (off-site) teleworking environment. The project consisted of 140+ personnel where a small percentage of the project workforce was previously (i.e., pre-pandemic) operating in a distributed manner across the continental United States. However, there remained questions regarding productivity and success of the project, as a whole, since entering the state of maximum telework. As a result, this project was selected to be the first sample for this research in identifying the effectiveness of the project workforce while under maximum telework. Specifically, how has maximum telework affected workforce productivity and how has maximum telework affected project success?

In assessing the workforce in this study, objectives were first identified to determine what constituted workforce productivity and project success. Subsequently, a set of questions was developed to address the objectives and sent to the project workforce via email, which explained the survey and gave a web link to the questions. The survey was selected for data collection because it was a fast and effective method to collect information at low cost, with good sample representatives, standardized stimulus, and precise results (Nayak & Narayan, 2019). Survey questions included multiple-choice and open-ended. The respondents had 48 hours to respond to the survey questions.

The survey results came back in two forms—scaled multiple-choice answers and free-form text data. The scaled multiple-choice answers were categorized and analyzed based on groupings by their scaled answers (McLeod,
However, the free-form text data required an additional method for analysis. That method used a form of coding. In the traditional approach of coding, someone or a group of people will read through the collected free-form text data and use their judgment to identify some main categories that are common among the results of a specific question (Elliott, 2018). The researchers in this study utilized a similar approach with respect to text coding. After the data were coded, the number of occurrences of the category subject were grouped, and popular groupings were elevated for review.

These were the survey questions:

1. What is your position/role?
2. On a scale of 1 (much less) to 5 (much more), how productive are you today under maximum telework compared to a month ago when most personnel were onsite daily?
3. On a scale of 1 (much less) to 5 (much more), how successful do you feel your project is today under maximum telework compared to a month ago when most personnel were onsite daily?
4. What has been the most positive thing about maximum telework?
5. What could be done to make maximum telework more positive and/or productive?
6. What has surprised you the most about maximum telework?
7. What should the new normal look like for the project team once maximum telework ends?

The major limitation of this portion of the research is that it focused on a single project, and those results may or may not apply to other acquisition projects. However, the second portion of the research (described later in this article) mitigated this limitation by surveying multiple projects. Researchers identified a number of additional limitations as beyond their control, but such limitations did not pose any issues during this study. However, it warrants defining the limitations as they may affect future studies in the same area.
The first limitation was the number of participants, which consisted of 140 project personnel, composed of both government workers and contractors. The average survey response rate needed to garner statistically significant findings is about 33% (Lindemann, 2019). Since this study garnered responses from 54% of the workforce, the sample data were more than sufficient to analyze for validity. The second limitation of this study related to the scope of the workforce, which was deployed to only one specific project. Finally, the third limitation was the personnel makeup of the project, which consists of mostly engineers with minimum administrative or general/clerical specialists.

The survey guaranteed anonymous responses in order to instill some level of trust and psychological safety (Zayed, n.d.), thereby encouraging the workforce to provide information that was as accurate as possible in response to the questions. In addition, the survey requested no specific, personally identifiable information that could be referenced back to a specific individual.

<table>
<thead>
<tr>
<th>FIGURE 2. PRODUCTIVITY UNDER MAXIMUM TELEWORK</th>
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<td>Answer Choices</td>
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<td>1 - Much Less Productive</td>
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<td>2 - Somewhat Productive</td>
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<td>3 - As Productive</td>
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<td>4 - More Productive</td>
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<td>5 - Much More Productive</td>
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<tr>
<td>Total</td>
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<th>FIGURE 3. PROJECT SUCCESS UNDER MAXIMUM TELEWORK</th>
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<tr>
<td>Answer Choices</td>
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<tr>
<td>1 - Much Less Successful</td>
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<td>2 - Somewhat Successful</td>
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<td>3 - As Successful</td>
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<td>4 - More Successful</td>
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<td>5 - Much More Successful</td>
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<tr>
<td>Total</td>
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Findings—Phase 1 (Single Project)

Once the survey closed, the researchers collected the data and analyzed the results. These were the summarized results for each question:

1. The project workforce roles consisted of software developers, cloud engineers, cyber engineers, test engineers, systems engineers, product leads, information technology specialists, systems administrators, project managers, and systems architects. As expected, the project operated as a highly technical team with diverse roles supported by technical leads and project management.

2. The response to this question about productivity was encouraging (Figure 2), with 97% of the team reporting they were as productive, more productive, or much more productive under maximum telework than during the previous operating conditions where most people were in the physical office each workday. A small number of people (3%) reported they were somewhat productive, while no one reported that they felt less productive than under previous operating conditions. Overall, the workforce said that they were productive under maximum telework.

3. Regarding success, 84% of the team responded that the project was as successful, more successful, or much more successful under maximum telework as compared to previous operating conditions where most people were in the physical office each workday (Figure 3). A small number of the project workforce (16%) responded that the project was somewhat successful, while no one responded that the project was much less successful than under previous operating conditions. Overall, the project workforce said that the project was operating successfully under maximum telework.
4. This question asked what the project workforce perceived as the most positive thing about telework. The consensus was that maximum telework created tangible benefits for them. The following summarized the specific results based on both professional and personal benefits.

- Increased communication, collaboration, and teaming engagement
- Increased focus with the ability to manage schedule and priorities
- Eliminated wasted physical travel between home, work, and face-to-face meetings.
- Increased sleep/rest, health, and work-life balance
- Eliminated work distractions (water cooler chatter, drive-by office visits, parking issues)
- Validated the ability to work with modern technology

5. When asked what they thought could be done to make maximum telework more positive and/or productive, the respondents expressed a need for better tools to collaborate in order to get their jobs done as well as opportunities to improve administrative processes.

- Better information technology infrastructure to support project operations
  - Better communication and collaboration tools for sharing information that is reliable (e.g., Chime, WebEx, etc.)
  - Access to internal administrative websites from telework locations
  - Better access to lab resources (i.e., virtual machines and shared network)
  - Better and additional hardware and peripherals for teleworkers at teleworking site

The majority of responses indicated that some level of distributed telework should be included as part of the redefinition of normal operations.
• Better concept of operations for teleworking
• Establishing core meeting times, teleconference etiquette, and well-defined meeting agendas

6. This question asked the project workforce what surprised them the most about maximum telework. The majority of the team felt that maximum telework increased and streamlined communication among the whole organization. The respondents also felt increased productivity due to minimum in-office “distractions.”

• Perceived increase in communication between team members as well as productivity, effectiveness, efficiency, and promptitude
• Ability to perform work using available tools
• Impact on productivity and efficiency from diminished or nonexistent commuting time between work and meetings
• In-office distractions, often the cause of less productivity and wasted time, reduced to a minimum

7. This question asked the project workforce what they desired to be the “new normal” once maximum telework ends. The majority of responses indicated that some level of distributed telework should be included as part of the redefinition of normal operations.

• Open to full telework with planned face-to-face meetings on a regular basis
• Flex spaces available to reserve for communal work, meetings, or for just getting out of the house
The project respondents reported that they were productive in performing their jobs in support of the project while operating in a distributed, maximum telework environment. While the survey reported a number of improvements, the respondents suggested the provision of better communication and collaboration tools. Overall, they responded that project success was continuing without any major problems in satisfying the workforce tasking while meeting their schedule. Also, a number of surprises emerged that affected their personal lives in the form of less stress and more productivity due to reduced commuting time, fewer in-office distractions, and a perceived, more positive balance of work and life.

The defense acquisition community is an area that is certainly concerned with satisfying the cost, schedule, and performance of projects and programs (DAU, 2010). This study showed that, given a difficult situation and the need to transition to a different environment to continue the existing support of the Warfighters, the workforce associated with this single project was able to quickly overcome the challenges and adapt to their new, modified normal.

While phase one of this study targeted a single project, the researchers agreed that expanding the study to multiple projects and the diverse support and leadership roles would help confirm whether or not distributed operations in the form of maximum telework is an effective means to support the Warfighters.

The outcome of this study helped answer some initial questions on workforce productivity and project success. More importantly, it helped focus management on insights provided by the individuals on a specific technical project in three core areas. First, it helped verify that individuals believed they were being at least as productive as they were prior to maximum telework. Second, the individuals also believed that nothing impeded the project’s successful continuation during maximum telework. Also, the workforce shared their thoughts on the positive aspects, enhancements required, and surprises related to maximum telework. Lastly, the workforce provided feedback on what the “new normal” should be once the pandemic has subsided.
Since the outcome of the project survey provided useful information for action by NIWC leadership, the researchers decided to expand the maximum telework study to a specific division where multiple projects are involved in order to include diverse technical, managerial, and administrative roles.

**Research Framework—Phase 2 (Multiple Projects)**

Four weeks into maximum telework and after the phase one study for the project workforce survey was completed and analyzed, the researchers wanted to expand the scope of the survey to multiple projects within a division. At NIWC, a division is composed of diverse leadership and support positions, enabling the execution of multiple projects (NIWC, 2020). While phase one of this study targeted a single project, the researchers agreed that expanding the study to multiple projects and the diverse support and leadership roles would help confirm whether or not distributed operations in the form of maximum telework is an effective means to support the Warfighters. Therefore, the same research questions were posed to the division organization with multiple projects, concerning how productive the workforce is and how successful the projects are while under maximum telework.

In assessing the division workforce in this study, phase two used the same methodology employed in phase one. The data were acquired through the use of survey questions given to the division workforce via an email that explained the survey provided a web link to the questions. This survey easily and efficiently collected data across a broader scope of the division workforce. As in phase one, the questions required both multiple choice and open-ended text answers.

Once the data were collected, the multiple-choice answers were categorized and analyzed based on groupings of their scaled answers. Similarly, coding was applied to the free-form text data. This methodology matched that of phase one of the study.
These were the survey questions:

1. Select the area you support the most.
2. What is your position/role?
3. On a scale of 1 (never) to 5 (daily), how often do you interface with classified materials and/or systems?
4. On a scale of 1 (much less) to 5 (much more), how productive are you today under maximum telework compared to a month ago when most personnel were onsite daily?
5. On a scale of 1 (much less) to 5 (much more), how successful do you feel your project is today under maximum telework compared to a month ago when most personnel were onsite daily?
6. What has been the most positive thing about maximum telework?
7. What could be done to make maximum telework more positive and/or productive?
8. What has surprised you the most about maximum telework?
9. What should the new normal look like for your project team once maximum telework ends?

A number of identified limitations were beyond the control of the researchers, but they did not pose an issue during this phase. However, defining these limitations is warranted because they may affect future studies in the same area. The first limitation was the number of participants during the division survey, which was sent to 136 government employees. As mentioned in the previous phase, the average survey response rate is at about 33%. In this study, 32% of the division workforce participated in the survey. The second limitation was the scope of the participants. In this specific project study, the survey was deployed only to one specific division with many projects. The third was the personnel makeup of the division, which consisted of technical leaders, management leaders, and administrative support staff.
The questions were sent out as an anonymous survey in order to instill some level of trust with no retribution, thereby encouraging the workforce to provide accurate information in response to the survey. In addition, no specific, personally identifiable information was requested that could be referenced back to a particular individual.

**FIGURE 4. HANDLING OF CLASSIFIED MATERIALS**

<table>
<thead>
<tr>
<th>Answer Choices</th>
<th>Responses</th>
</tr>
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<tbody>
<tr>
<td>1 - Never</td>
<td>48.84% 21</td>
</tr>
<tr>
<td>2 - Rarely</td>
<td>39.53% 17</td>
</tr>
<tr>
<td>3 - Monthly</td>
<td>4.65% 2</td>
</tr>
<tr>
<td>4 - Weekly</td>
<td>2.33% 1</td>
</tr>
<tr>
<td>5 - Daily</td>
<td>4.65% 2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>43</strong></td>
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</tbody>
</table>

**FIGURE 5. DIVISION PRODUCTIVITY UNDER MAXIMUM TELEWORK**

<table>
<thead>
<tr>
<th>Answer Choices</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - Much Less Productive</td>
<td>0.00% 0</td>
</tr>
<tr>
<td>2 - Somewhat Productive</td>
<td>6.98% 3</td>
</tr>
<tr>
<td>3 - As Productive</td>
<td>48.84% 21</td>
</tr>
<tr>
<td>4 - More Productive</td>
<td>27.91% 12</td>
</tr>
<tr>
<td>5 - Much More Productive</td>
<td>16.28% 7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>43</strong></td>
</tr>
</tbody>
</table>

**FIGURE 6. DIVISION SUCCESS UNDER MAXIMUM TELEWORK**

<table>
<thead>
<tr>
<th>Answer Choices</th>
<th>Responses</th>
</tr>
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<tbody>
<tr>
<td>1 - Much Less Successful</td>
<td>0.00% 0</td>
</tr>
<tr>
<td>2 - Somewhat Successful</td>
<td>6.98% 3</td>
</tr>
<tr>
<td>3 - As Successful</td>
<td>67.44% 29</td>
</tr>
<tr>
<td>4 - More Successful</td>
<td>20.93% 9</td>
</tr>
<tr>
<td>5 - Much More Successful</td>
<td>4.65% 2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>43</strong></td>
</tr>
</tbody>
</table>
Findings—Phase 2 (Multiple Projects)

Once the project workforce survey closed, the researchers collected and analyzed the results. The survey was summarized in each of the sections.

1. The researchers were requested by division management to collect the various project titles associated with the results. To help further the privacy and anonymity of the survey respondents, the specific results of this portion of the survey will not be published. However, from this data we learned that team members assigned to 13 of 16 projects participated in the survey.

2. The roles were similar compared to the project survey, including software developers, cloud engineers, cyber engineers, test engineers, systems engineers, product leads, information technology specialists, systems administrators, project managers, and systems architects. In addition, administrative assistants, supervisors, scientists, software engineers, web developers, and administrative staff participated in the survey, including division, contracts, and financial management. As expected, the division survey provided a broader scope on the roles in the collected data.

3. In understanding the makeup of the division’s handling of classified materials, the researchers were interested in determining whether handling of classified material has a direct correlation to telework effectiveness. The survey showed that 88% never or rarely accessed classified materials. On some regular basis, only about 12% accessed classified materials on a daily (4.7%), weekly (2.6%), and monthly (4.7%) schedule. In summary, most of the surveyed workforce did not handle classified materials on a day-to-day basis, and therefore they were able to operate in a distributed environment during maximum telework, with minimal need for individuals to visit their office for the purpose of accessing classified materials (Figure 4).
4. This question focused on team productivity while distributed away from the office in maximum telework. The survey showed that about 93% of the project workforce responded that they are productive, more productive, or much more productive under maximum telework than under the previous operating conditions, where most people were in the physical office every workday. This is slightly lower than the percentage recorded for the first phase of the study, which focused on a single project. Also, a small number of survey participants (7%) responded that they were somewhat productive, and no one indicated they were much less productive than under the previous operating conditions (Figure 5).

5. Responding to this question, 93% of the team said that the project was as successful, more successful, or much more successful when distributed under maximum telework than under the previous operating environment, where most people were in the physical office every workday. This is slightly higher than recorded for the first survey, which focused on a single project. A small number of people (7%) responded that they were somewhat successful, and no one responded that they were much less successful than under the previous operating environment. Overall, the data showed that people believed their project continued to be successful while operating as distributed under maximum telework (Figure 6).

6. This question asked the division workforce what they perceived as the most positive thing about telework. Similar to the first survey, people believed that maximum telework has created favorable benefits for them. The following summarized the results based on both professional and personal benefits.

- Increased collaboration and productivity
- Increased sleep, rest, health, and work-life balance

In understanding the makeup of the division’s handling of classified materials, the researchers were interested in determining whether handling of classified material has a direct correlation to telework effectiveness.
• Decreased distractions and interruptions (e.g., water cooler chatter, drive-by office visits, parking issues, etc.)
• Eliminated wasted physical travel between home, work, and face-to-face meetings

7. This question asked the division workforce what they thought could make maximum telework more positive and/or productive. The respondents requested better collaborative tools to get their jobs done as well as opportunities to improve administrative policies and processes.

• Better information technology infrastructure to support project operations
  ○ Need better collaboration tools
  ○ Need space and equipment at home or maximum telework location
  ○ Better access to private networks and internal resources

• Better concept of operations for teleworking
  ○ Defined teleworking policies
  ○ Less status updates to supervisor

8. This question asked the division workforce what surprised them the most about maximum telework. The majority of the team responded that maximum telework increased and streamlined communication among the whole organization. The respondents also felt that work-life balance increased with less stress due to less commute and no office distractions.

• Increased communication
• Increased life-work balance
• Less additional stress due to no commute, no parking issues, and no distractions
• Limited information technology and collaborative tools to support telework
• Adaptability by personnel

9. This question asked the division workforce what they perceived to be the “new normal” once maximum telework ends. The majority of the response was in favor of instituting distributed telework as part of the new normal.
• Back to normal in an office setting
• Increased telework with office visits
• Maximum telework with minimum to no office visits
• Better communication regardless of telework

As previously stated, the defense acquisition community has been concerned with ensuring the DoD workforce is able to satisfy the cost, schedule, and performance of national security and defense projects and programs. During phase one of this study, we showed that given a difficult situation and the necessity to quickly transition to a different environment, a project workforce was able to overcome challenges quickly to support the Warfighters. In phase two of this study, a division was sampled, which revealed positive perceptions associated with the workforce and their ability to complete multiple projects on behalf of the Warfighters during maximum telework (Loubier, 2017). Both samples suggest that Warfighter support does not decline during periods of distributed operations in the form of maximum telework.

The phase two survey provided additional data and insight that reflects on the division’s ability to support the Warfighters during maximum telework. The extension of the study to the division workforce complemented phase one in that, given a challenging situation and the necessity to transition to a maximum telework environment, the division workforce, which was associated with multiple projects and division leadership, was able to support the Warfighters effectively. Thus, both phases of this study will be utilized by the organization in developing and determining the plan for the “new normal” once the immediate, short-term pandemic crisis has subsided.
Suggestions for Future Research

This study can be replicated with the same survey methodology and a variety of subjects and participants. The survey allows for the flexibility and ease to deploy quickly to other organizations needing immediate answers on the impacts a new operating environment has on their workforce productivity and project success. It can also be applied to other situations in an attempt to determine whether roles, age groups, or cultures influence factors associated with perceived workforce productivity and/or project success during distributed operations.

Based on this research, study of the following future research topics may help build on this body of knowledge:

- Impact of supporting a classified project or program, with the workforce performing some level of telework
- Age and gender factors in the workforce and performance in a teleworking environment
- Assessing impacts and perceptions by trade/function (i.e., management vs. technician, administrative personnel, etc.)
- Measuring productivity of teleworkers by organization management in relating to performance assessments
- Research beyond NIWC Pacific, including other systems center commands and acquisition organizations, both technical and administrative, to expand a broader study
- Decision-making process by leadership under uncertainty, risk, and stress during a pandemic

Overwhelmingly, the project workforce responded that they were at least as productive and their projects were at least as successful during maximum telework as compared to the previous operating environment, where most personnel were in the physical office every workday.
Conclusions

In conclusion, the surveys sent to the various project teams and management staff provided insightful data for understanding the effects that operating in a distributed, maximum telework environment had on the personnel supporting the NIWC Pacific organization. It provided key information on the effects that teleworking had on workforce productivity and overall project success. Overwhelmingly, the project workforce responded that they were at least as productive and their projects were at least as successful during maximum telework as compared to the previous operating environment, where most personnel were in the physical office every workday. In fact, most responded that they were more productive and their projects were more successful under maximum telework. Also, a great deal of insight was related to distributed operations such as increased communication by the team and improved work-life balance. Revealingly, the team responded that they were less productive under the previous, nonteleworking environment due to dealing with the logistics of commuting, parking, and office distractions. Ultimately, the sampled workforce is interested in seeing some level of telework factored into the new definition of normal operating environment. They also responded that further investment in collaborative information technology infrastructure will aid in their effectiveness and overall project success (Lopez, 2020). Without a study such as this, NIWC leadership could have viewed the distributed telework environment as a degraded state that should be avoided. Now, they view telework as an enabler that should be embraced on a regular basis.
References


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