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ORGANIZATIONAL ADOPTION OF NEW TECHNOLOGIES: BEST PRACTICES FOR SMACNA CONTRACTORS

2021

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EXECUTIVE SUMMARY

Sheet metal and HVAC contractors are eager to adopt new technology, processes, and business strategies. Yet the implementation of organizational change – defined as an intentional, company-level adoption of new practices, technologies, or management approaches – can be extremely difficult. Research in the field of Organizational Behavior cite reference has in fact found that nearly 70% of organizational change efforts fail to achieve their intended objectives.

Through a national survey and interviews of SMACNA contractors, the top 8 most effective technology implementation management practices for organizational adoption of new technologies were identified. Additionally, the most common user reactions to the implementations during the implementation were uncovered.

A total of **71 technology/change implementations** were collected from SMACNA contractors, with 77% achieving successful or good adoption levels.

Types of Technology/Change Implementation Included:

- Electronic Time-Keeping Software
- Field Productivity Tracking Software
- Prefabrication
- Project Management Software
- BIM
- Change in Market
- Estimating Software
- Accounting Software
- Document Management
- ERP System
- Equipment Standardization
- Fabrication Process

Successful initiatives have **45% more users with positive reactions** at two key points in the implementation timeline: (1) a few months after implementation and (2) at the midpoint/middle of implementation.

The top 8 practices of successful technology implementations were identified in this study. These practices should be closely followed to gain positive users' reactions and overall adoption. These practices were identified as (in order of importance, with the top 4 showing a statistically significant relationship to successful adoption):

1. Effective Change Agents to Guide the Effort
2. Enough Resources
3. Realistic Timescale for Technology Implementation
4. Adjusted Workload
5. Clear Action Steps for Carrying Out the Implementation
6. Communicating the Personal Benefits to Each Employee
7. Measuring Quantifiable Performance Benchmarks
8. Senior Leadership Commitment

Results of this study are anticipated to guide other SMACNA contractors into positioning themselves as "Early Adopters" who are better able to achieve successful – and therefore more profitable – outcomes when implementing new technologies. SMACNA contractors may be seeking to take on some or multiple of these new technologies/change initiatives, making this report a useful tool for lessons learned and forming a strategic approach to implementation.

INTRODUCTION

In today's rapidly evolving construction market, the ability to adopt new practices is a core competency for contractors who wish to remain ahead of their competition. Sheet metal and HVAC contractors are faced with many organizational change opportunities, including prefabrication, mobile and paperless technologies, payroll automation, new software packages (estimating, project management, accounting, etc.), alternate project delivery systems, expanding into new market segments, and management team realignments.

Yet adoption of these new technology opportunities is inconsistent across the sheet metal and HVAC contracting industry, which raises a fundamental research question: ***Why are some companies able to adopt new technologies while other companies are less successful?***

Sheet metal and HVAC contractors must have a clear understanding of change management practices that have been proven to result in successful new technology implementation as well as the common reactions to change. This study conducted a national survey and follow up interviews to identify the most effective technology implementation practices recommended by SMACNA contractors as well as common change reactions. Results are anticipated to guide other SMACNA contractors into positioning themselves as "Early Adopters" who are better able to achieve successful – and therefore more profitable – outcomes when implementing new technologies.

BACKGROUND

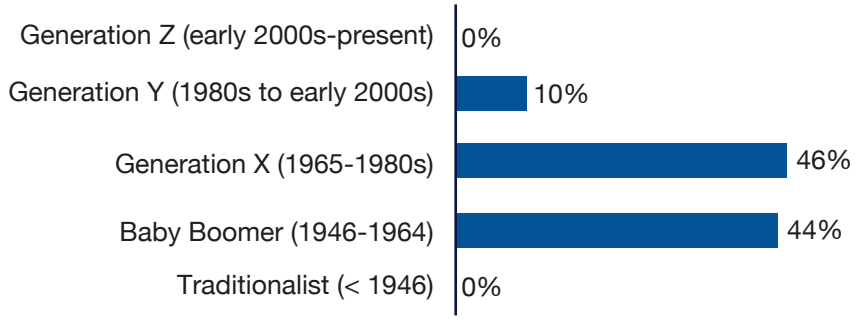
The study consisted of two parts: First, a nation-wide survey of SMACNA contractors to identify specific change management practices that are proven to result in successful new technology adoption. Second, interviews with SMACNA contractors were conducted to collect information to validate the survey results and provide better industry-specific context.

Contractor Background

The study collected 64 survey responses from SMACNA contractors nationally. The survey was designed such that each response represented a single, company-level organizational change initiative implemented by a SMACNA contractor. The data sample accounted for a wide variety of organizational change initiatives, including changes related to new technology, software, management structures, equipment/fleet, and business processes, and supply chains, as well as moving to entirely new markets. While all SMACNA contractor members were invited to participate, the survey sought detailed information about an organizational change within the past 15 years, so likely not all respondents could provide this information.

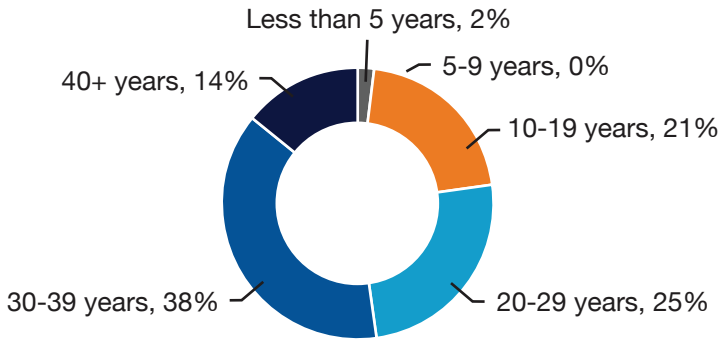
The sample consisted of experienced sheet metal and HVAC contracting professionals. Nearly all respondents had a generational affiliation with Baby Boomers and Generation X. Millennials (Generation Y) only represented 10% of the data set (*Fig. 1*).

Figure 1: Generational Affiliation of Respondents



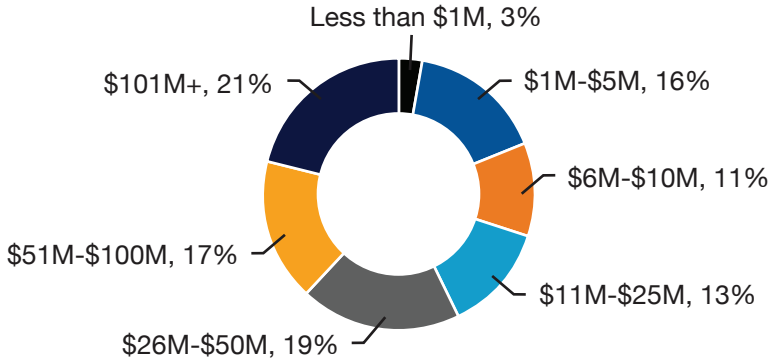
The largest percentage of respondents had 30-39 years of experience, and over 50% had over 30 years of experience (*Fig. 2*).

Figure 2: Years of Professional Experience



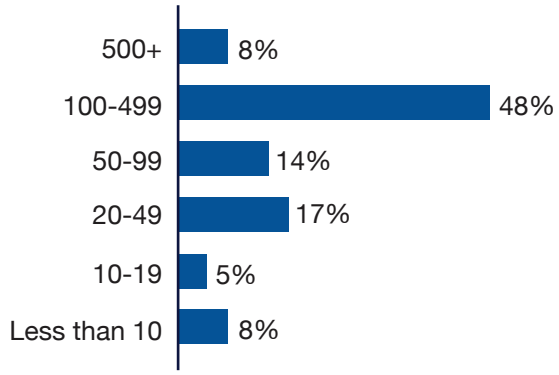
Companies represented in the survey data sample were of different sizes, split fairly evenly by total sales per year (*Fig. 3*).

Figure 3: Total Sales Per Year



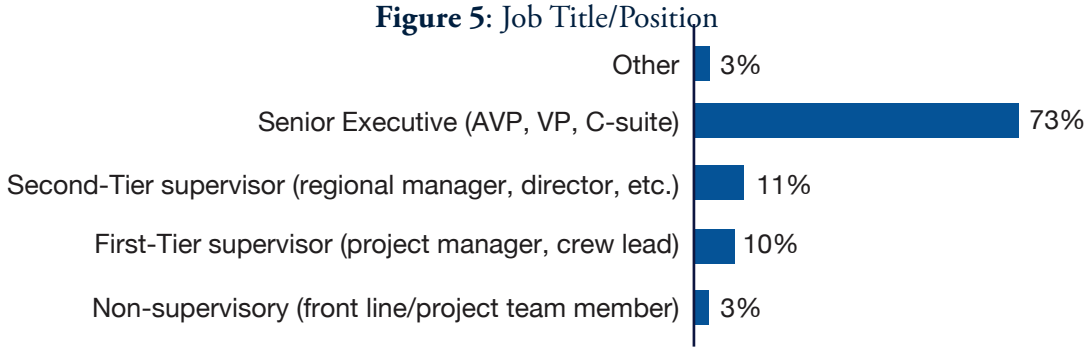
Most surveyed companies had between 100 and 499 employees (*Fig. 4*).

Figure 4: Number of Employees



Respondents were primarily senior executives (73%). However, responses were also received from second-tier supervisory (11%) and first-tier supervisory (10%) (*Fig. 5*).

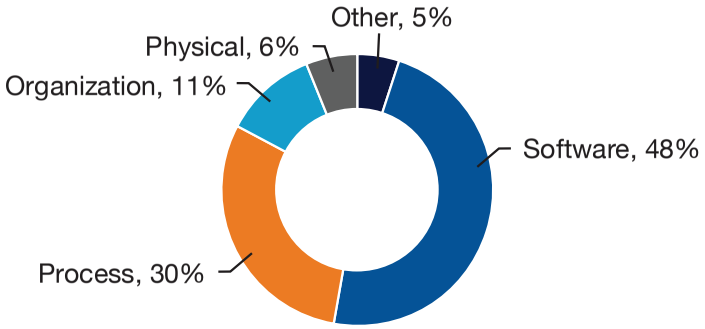
Figure 5: Job Title/Position



NEW TECHNOLOGY/INITIATIVES MEASURED

New technology/change initiatives are sometimes understood to just be technology or software implementations. To the contrary, change initiatives can take on many forms. Respondents reported 71 different organizational change events, suggesting that companies often take on multiple change initiatives at the same time. These change events were grouped by general "type" and specific change. Types were identified, from most common to least, as: software (48%); process – manufacturing or business process (30%); organization – changing a line of business, opening a new division, restructuring, etc. (11%); physical (6%) – moving locations or a new piece of equipment; and other (5%) (*Fig. 6*).

Figure 6: Initiative Type



There were commonalities among the various specific changes, with time-keeping and productivity software being the top 2 most common specific changes. During the interviews, many of these specific changes were mentioned by personnel as having been implemented at their company as well – with some being more recent than others. Further, many of the software type implementations were mentioned to have triggered other process type of changes within companies.

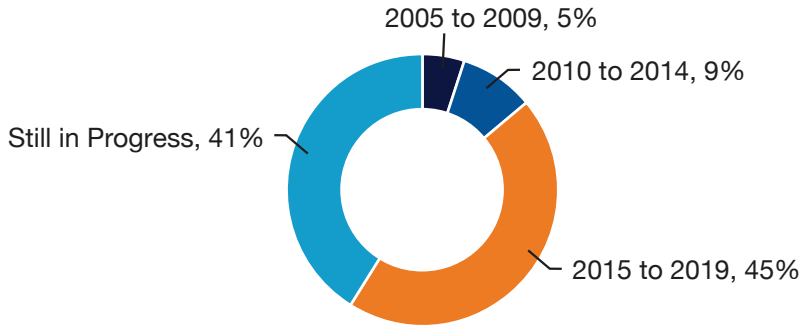
For example, productivity software tended to trigger the need to use tablets in the field and electronic time-keeping, which provided data for the productivity software. The removal of paper-based field records and implementation of tablets or other electronic means in the field is quite a significant change and impacts nearly all field personnel, while the implementation of the productivity software itself was used primarily by office personnel.

Top 10 Changes	All Changes Mentioned	
Time-keeping Software	Time-keeping	Strategic
Productivity Software	Productivity	Acquisition
Pre-fab	Pre-fab	New division
Project Management Software	Project Management Software	PlanGrid
BIM	BIM	Work focus
Re-org	Re-org	Traction tools
ERP	ERP	Move
Process	Process	Software
Revit	Revit	Google
Procore	Procore	Service software
	Doc management	Certification
	CNC Tool	Raken
	Accounting	Payroll
	Estimating software	Tracking product deliveries
	Database	Making a New Product
	Robotic layout	Autodesk
	Office space	

Timeline

While the respondents undertook a variety of change types, 86% of these initiatives were undertaken in the past 5 years (*Fig. 7*). With the majority of these initiatives being more recent, it ensures that the lessons learned and key takeaways in this report are very relevant to SMACNA contractors.

Figure 7: Initiative Completion Year



Respondent Background

Individuals who responded to this survey played key roles and involvement in implementing the new technologies as part of the change implementation team (41%) or an executive/sponsor (43%), ensuring the data and lessons learned in this report are relevant. Further, most of them were involved since the beginning of the implementation (86%).

Figure 8: Respondent's Role in Initiative

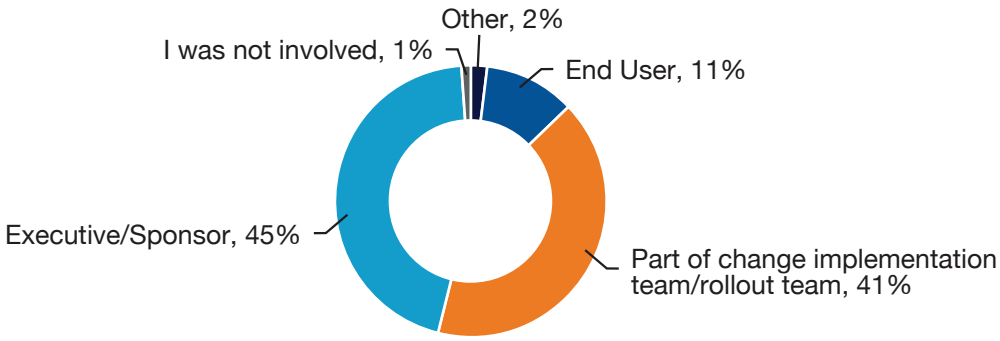
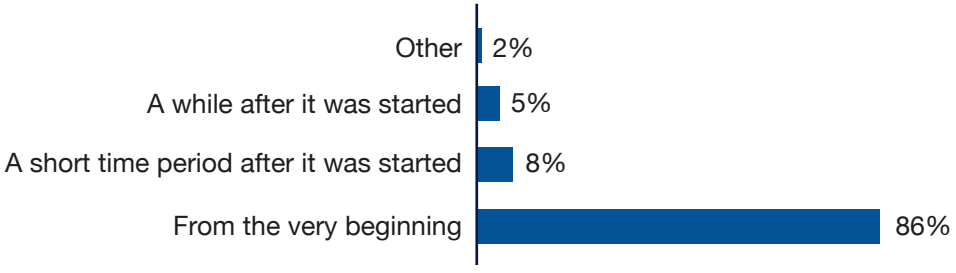


Figure 9: When Respondent Became Involved in Initiative



RESEARCH FINDINGS: TOP PRACTICES OF SUCCESSFUL TECHNOLOGY IMPLEMENTATIONS

A combination of results from the national survey and contractor interviews identified the top 8 technology implementation practices for SMACNA contractors. The survey was used to rank the top practices in order of effectiveness. Interviews were then leveraged to provide in-depth understanding of how contractors can implement these practices.

Measuring the Success of the Technology/Change Implementations

The national survey asked SMACNA contractors to identify a recent organizational change effort their company had implemented and that had a substantial impact on their personal workgroup. The survey asked each contractor to rate the success (or lack thereof) with which the change effort was adopted within their company. The level of successful change adoption was measured in three ways:

1. ***Was the change adopted as intended?***
2. ***Did the change achieve the beneficial impacts and performance gains that were intended?***
3. ***Was the change sustained long-term within the company's operations?***

Responses to these questions were compiled into a single measure of technology/change adoption. This measure was then used to rank the responses based upon overall adoption. The following are the results:

- Fully Successful or Near Full Success – met all 3 success criteria (32% of the collected cases)
- Good Adoption (45% of the collected cases)
- Partial or No Adoption (23% of the collected cases)

The Top 8 Organizational Technology Implementation Management Practices

The national survey also asked respondents to rate their company's effectiveness at carrying out various technology implementation practices. Correlation analysis was used to determine which practices had the strongest associations with successful change adoption. A rank-order list of the top practices is shown in the table below:

Rank	Tech Implementation Management Practice	Correlation
1	Effective Change Agents	.495*
2	Enough Resources	.369*
3	Realistic Timescale	.319*
4	Adjusted Workload	.209*
5	Clear Understanding of Personal Benefit	.196
6	Measure Performance Benchmarks	.193
7	Senior Leadership Commitment	.160
8	Clear Action Steps	.149

**Statistically significant at the 95% Confidence Interval*

The following pages provide an explanation of each change management practice for technology implementations.

#1) Effective Change Agents to Guide the Effort

The top-ranked practice, according to SMACNA contractors, was the effectiveness of the change agents who were responsible for leading the change effort. Change agents are defined as the "champions" or "leaders" of an organizational change effort. Typically change agents are most effective when they are: (a) positioned in key roles within the company (at the operations-level rather than senior executives), (b) highly respected by their peers and subordinate staff, (c) passionate and enthusiastic about the change, (d) accountable to implement the change as part of their true work responsibilities (rather than simply being a "side project").

#2) Enough Resources

Resource constraints are common in everyday business and projects – technology implementations efforts are no exception. SMACNA contractors stressed the need for the organization to provide enough financial, physical, and/or contractor related resources to properly implement the new technology. The mentality of undertaking a change and underestimating the needed resources is to be avoided. Companies must not "short change" on the needed resources to undergo a change effort.

#3) Realistic Timescale For Technology Implementation

It was not uncommon for larger implementation efforts to require multiple years before they were fully adopted. This is critical for senior leaders to understand. Expecting a rapid technology implementation is unrealistic and short sighted. Instead, contractors are better served to maintain a long-term, strategic perspective that organizational change is a learning process for the company, its leadership, and its staff. Contractors are recommended to be patient during the middle of implementation and to adopt the attitude that "We are striving to be better today than we were yesterday, better this month than last month, and better this year than last year."

#4) Adjusted Workload

Adjusted workload pertains both to the personnel that are undergoing the change effort as well as the team member(s) that support them through the change process (typically change agents). Change typically necessitates a time period where the change itself (i.e. process, tool, etc.) is initially more time-consuming than the previous or current ways of carrying out the existing tool, process, etc. Users need time to properly perform the new way before they better grasp the steps, requiring some of their existing workload to be shifted to allow for more time. Additionally, change agents' workloads need adjusting to account for the additional time they spend coaching others.

#5) Communicating the Personal Benefits to Each Employee

It is important for each individual employee to understand how the technology implementation will impact them personally, in their specific role within the company. Several common questions must be addressed to alleviate employee concerns. First, employees should be assured that the change will not have drastic negative impacts (increased work, loss of status, rupture of relationships, or even potential layoffs). Second, the positive benefits should be explained in detail. Finally, the "soft-side" of change should be considered to answer emotionally-based concerns and confidence (Can we do this? Can I do this? Etc.).

#6) Measuring Quantifiable Performance Benchmarks

Part of the planning process for technology implementation is to identify the specific performance metrics the company is trying to improve. During the implementation phases, measuring performance benchmarks are beneficial in several ways. First, and most straightforward, is that performance benchmarks quantify whether the change is truly being successful (time, money, resources). Second, benchmarks can be showcased across the company to build interest. Third, benchmarks are actually an important part of the "hearts and minds" aspect of organizational change; that is, benchmarks can prove to employees that their job is being impacted in a positive manner.

#7) Senior Leadership Commitment

Although the company's Change Agents should be in charge of day-to-day implementation of the technology (at the operational level), the role of senior leadership is still critical. Senior leaders wear multiple hats during a change. They must be clearly visible in their unwavering support for the change, otherwise employees may not feel the need to follow through. Senior leaders hold the keys for providing resources and they must "walk the talk" during implementation.

Additionally, senior leaders must maintain the company's focus on the overall change objectives and not allow individual departments, teams, or personnel to "bog down" other units.

#8) Clear Action Steps For Carrying Out The Implementation

In any technology initiative, employees obviously must be trained in how to succeed in the company's new environment. Training is most effective when delivered at two levels. First, up-front training is needed to provide basic development of new skills (i.e. providing general computer training to older employees prior to implementing mobile jobsite applications). However, up-front training is not sufficient. Companies must follow up with on-the-job training to truly show employees how to carry out the change within their day-to-day job functions. When employees are unsure how to implement a change, they will commonly revert to traditional practices. Company leadership sometimes interprets this as employee resistance to change, when in reality it may indicate inadequate training.

RESEARCH FINDINGS: TOP USER REACTIONS AT KEY POINTS DURING THE IMPLEMENTATION TIMELINE

Companies that are currently undergoing or looking to undertake new technology implementations or change efforts can gain from understanding end users' top reactions to the change – and develop strategies to address common reactions as part of an overall strategic change management plan. Resistive behavior, for example, are common and can be addressed through a proactive strategic plan.

This research uncovered seven (7) common reactions to technology implementation as follows:

1. Actively Supporting – Participation in initiative-related events, uses the new tool/process accurately, verbally supports the new initiative.
2. Passively Accepting and Cooperating – Participation in initiative-related events, does not support the new initiative in a noticeable way.
3. Reluctantly Complying – Participation in initiative-related events, incomplete use of the new tool/process.
4. Avoiding (openly not participating) – Agreeing verbally but not following through, delaying, procrastinating.
5. Ignoring (covertly not participating) – Avoiding training, changing back to traditional practices during implementation.
6. Undermining (covertly opposing) – Spreading negative opinions/rumors, appealing to fear in resistance, hiding or withholding useful information while implementation.
7. Obstructing (opening fighting) – Openly blocking, undermining implementation, verbally opposing, finding fault with implementation.

The key points during the implementation timeline considered were:

- After the first few months (start/initial reaction)
- At midpoint/middle of the change
- At the conclusion of the change

When reviewing the common reactions to technology/change implementation at the key points of the timeline, the focus is on how reactions may change or shift over time (rather than on a specific measure at a specific point in time). The goal of most change initiatives is to gradually shift reactions on the negative end (i.e. Obstructing/Undermining) to the positive end (i.e. Actively Supporting/Cooperating) over time.

The key findings of this analysis are presented below, for the full analysis and graphs, please *see Appendix A*.

Key Findings:

- Over time, positive reactions see the largest gains for both successful and partial/no adoption initiatives.
- Successful initiatives have 45% more users with positive reactions at both time periods: a few months after implementation and at the midpoint/middle.
- Over time, negative reactions fade for successful initiatives, only with Ignoring at 10%.
- For partial/no adoption initiatives, Obstructors do not change much, while other negative reactions somewhat lessen.

Strategic Tips:

- Create a strategic change management plan that addresses the following: how the organization will communicate, measure, and respond to users' feedback regarding the technology implementation.
- Plan for negative reactions with your strategic change management plan (i.e. Ignoring, Obstructing, Undermining, and/or avoiding behaviors), do not get discouraged by these reactions. Successful change initiatives can see these negative reactions diminish, while partial/no adoption initiatives do not see these negative reactions lessen.
- While the success of the change effort is critical to sustaining the change, there will generally be larger amounts of negative reactions a few months after implementation and a decrease in negative reactions at the midpoint/middle.
- Ignoring (covertly not participating) may not change substantially. Passively Accepting and Cooperating will have the largest gains.
- When encountering those that can be classified as Underminers (covertly opposing) and Obstructors (openly fighting), approach them with an open mind – seek to understand their viewpoint as they may be the most challenging to shift their perspectives. Approaching them at the beginning of the change initiative, with the goal of understanding and humility, may better enable the change process to positively impact their reactions.
- Be consistent with the top change management practices throughout implementation (not just at the beginning), as we see the shifts happen at the midpoint in time: negative gets shifted to more positive reactions, causing an increase in positive reactions.
- If not addressed at the beginning (as mentioned in the previous section), Obstructors and Underminers can persist and potentially grow.

CONCLUSION & RESEARCH IMPLICATIONS

As SMACNA contractors have shown, change initiatives can take on all types, from implementing electronic time-keeping to opening up a new business division. Just as the progression of implementing a tool, process, system, or shift in an organization's structure is dynamic, so too are the reactions of the end users to that implementation. This report is intended to add some predictability and ease the uncertainty of SMACNA contractors looking to implement new technologies within their organization.

Overall, successful technology implementations incorporates key technology implementation management practices and sees more positive reactions at the end-user level. The top 8 technology implementation management practices should be closely followed, as success measures indicate those initiatives that closely follow these practices see greater success (in terms of being adopted as intended, achieving intended benefit/performance gains, and being sustained long-term) as well as more positive user reactions at key points in the implementation timeline.

Of the top 8 technology implementation management practices, there were 4 that were prioritized: effective change agents, adequate resources, realistic timescale, and adjusted workload. These 4 key practices should be deeply reinforced and planned for in an overall strategic change management plan.

There are specific practices that are proven to help SMACNA contractors implement new technologies more effectively. Each of the top 8 technology implementation management practices identified within this study represent ***learnable*** skills, meaning that they can be taught in a manner that assists contractors to apply these practices effectively within their own organizations. The research findings and lessons learned from the interviewed contractors provide a useful resource for future companies to understand how to apply these technology implementation management practices effectively for various types of new technology implementations.

Resistance to change is unavoidable but can be managed. Successful/good adoption initiatives see less resistance overall and see it diminish, compared to partial/no adoption initiatives. Instead, partial/no adoption initiatives see somewhat constant resistance. When resistance is uncovered, hopefully towards the beginning of implementation, it is best to acknowledge it and seek to understand the source(s) as they may remain constant throughout implementation. Moreover, an overall strategic change management plan is needed, as with any initiative, to guide the effort and should include ways to address resistance.

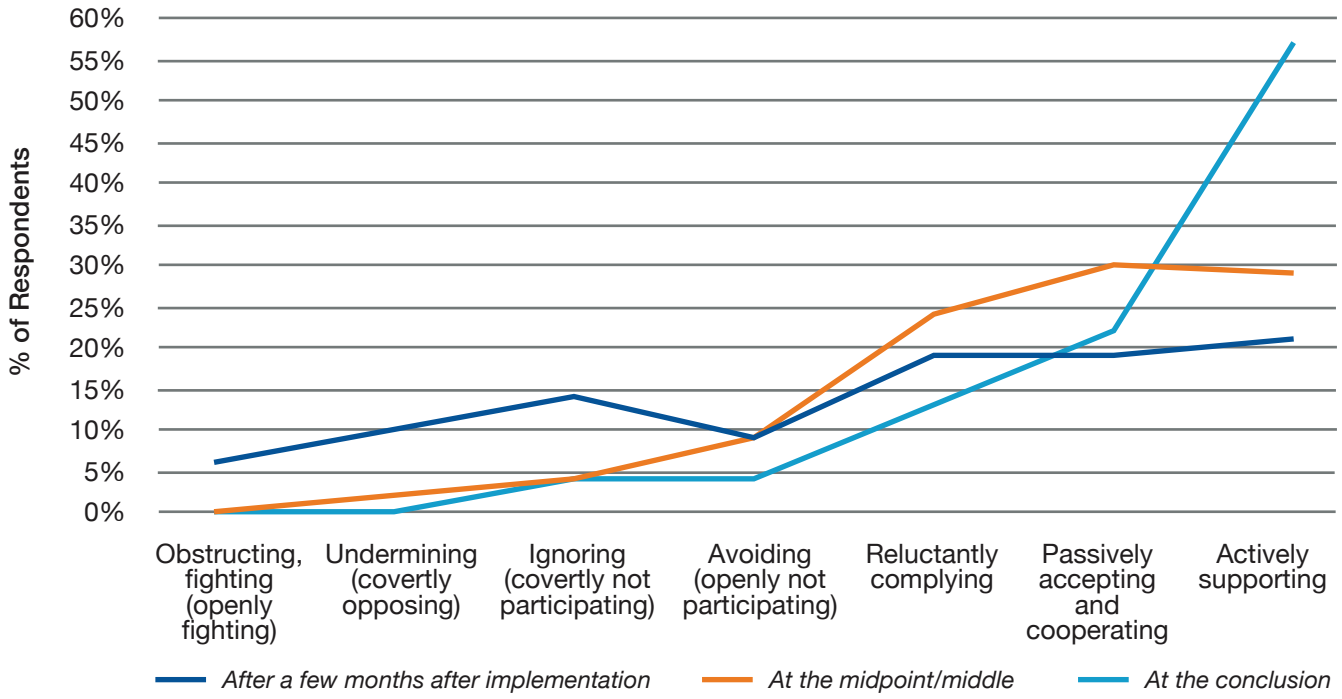
Future research is needed to further advance the HVAC/sheet metal industry and SMACNA contractor membership's change adoption success rate. During the interviews, the desire to understand how companies structure their personnel around implementing technologies, such as the establishment of a "technology office" within a company was of interest from multiple contractors (what are the associated benefits, roles, etc.). Another area of future research interest was around establishing a SMACNA template and samples of strategic change management plans, especially for contractors looking to implement a specific technology, such as electronic time-keeping. During the interviews, it was also mentioned that SMACNA contractors would benefit from sharing implementation/roll out lessons learned for specific changes and assessing the company's overall readiness to change to a specific type of software, such as Revit/other BIM software.

The timing of this research during the COVID-19 pandemic proved challenging, as the survey was released in the midst of the pandemic, SMACNA contractors likely had competing priorities and less time and/or desire to respond to the survey request. It is significant to note that, while the pandemic forced an unprecedented scale of technological and organizational change across many companies (such as the usage of video-conferencing software, remote working, etc.), this also occupied a great deal of SMACNA contractors' time and attention. Future research about forced/pandemic-related organizational changes that occurred during this time would enhance this research and provide insights into rapid/forced technology and organizational change.

APPENDIX A – DETAILS OF TOP USER REACTIONS AT KEY POINTS DURING THE IMPLEMENTATION TIMELINE

Overall, the shift of users' reactions can be seen (*Fig. 10*), from the decrease on the negative end of reactions: a few months after implementation (40%), to at the midpoint (16%), and at the conclusion (7%). On the other side of the reaction spectrum, an increase on the positive end of reactions (60%, 84%, and 93%, respectively). Overall, the largest gain in single reactions from the beginning to the conclusion occurred in the reaction "actively supporting" (increased by 170%).

Figure 10: Most Common Reaction at Key Change Points

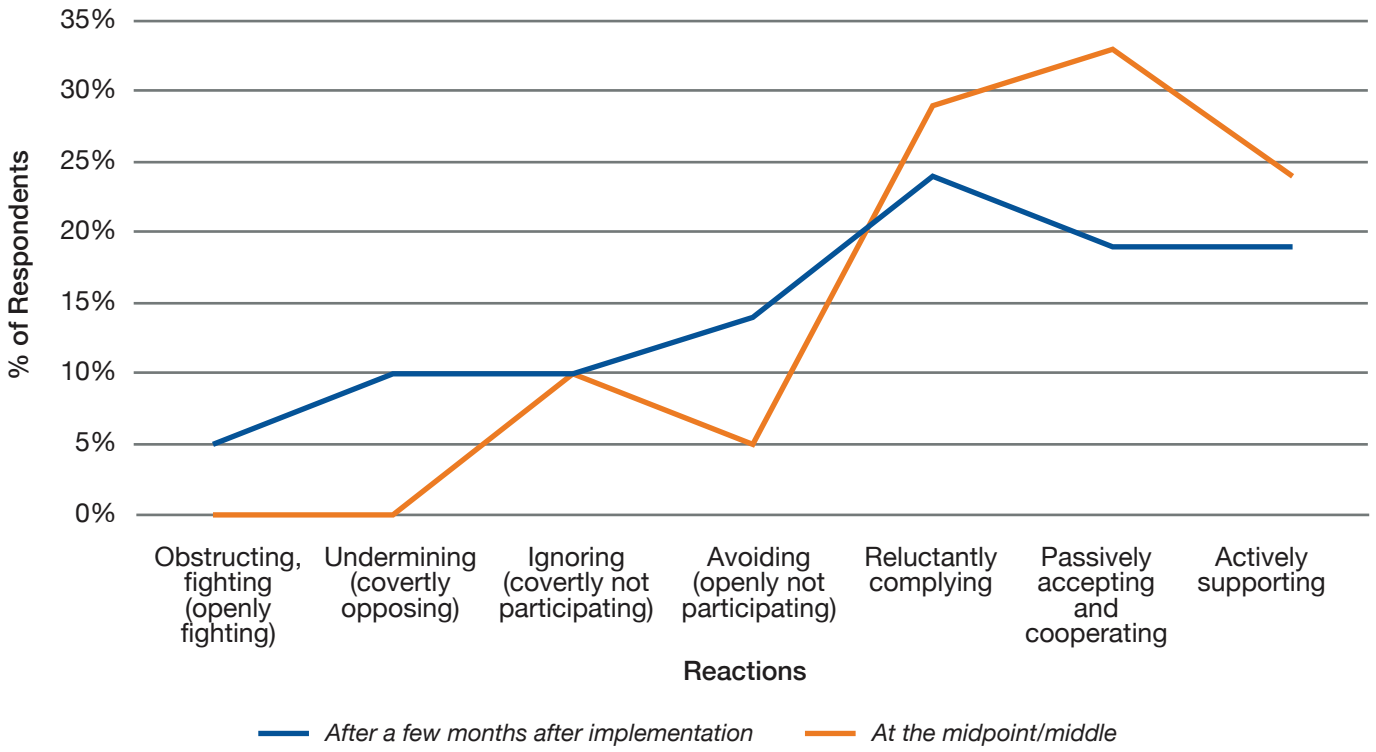


Reviewing these same reactions and key points in the timeline, but comparing change events by their success measure (fully successful or near full success/adoption, and partial or no adoption) reveals some interesting trends (*Fig. 11*). Regardless of the success measure, we see the following:

1. Change generally happens over time.
2. The amount of users with negative reactions at the beginning shifts to more positive reactions over time.

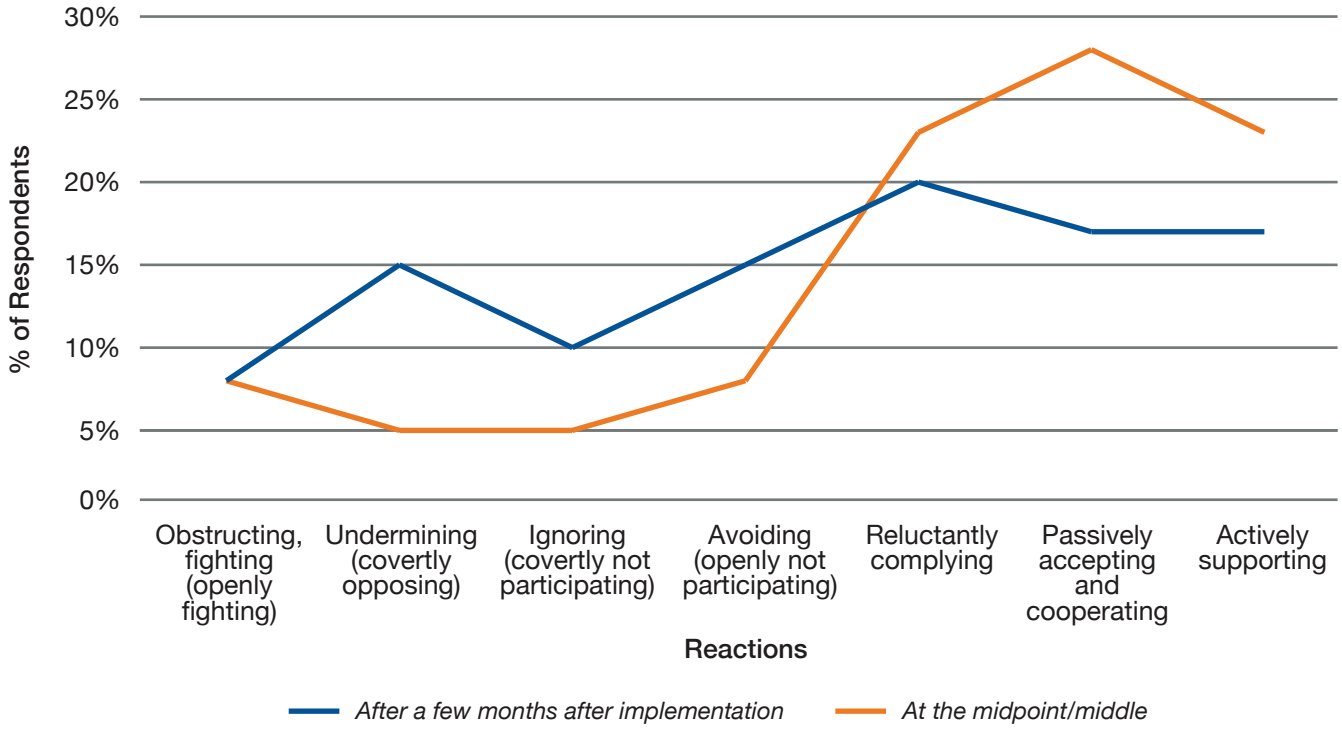
Thus, it is important to capture measures along that timeline and have a more time-based perspective of change – it is generally not immediate, and adoption of the changes takes time for users to have positive reactions/experiences.

Figure 11: Most Common Reaction at Key Change Points
(**Successful Adoption Projects**)



Over time, negative reactions (Obstructing, Undermining, and Ignoring) fade for successful initiatives, with only Ignoring at 10%.

Figure 12: Most Common Reaction at Key Change Points
(**Partial or No Adoption**)



Looking at partial or no adoption change initiatives, we can gain further insights (*Fig. 12*). Over time, positive reactions (Actively Supporting, Passively Accepting, and Reluctantly Complying) sees the largest gains for both successful and partial/no adoption initiatives. Successful initiatives have 45% more users with positive reactions at both a few months after implementation and at the midpoint/middle.

Overall, the users' reactions from SMACNA contractor change initiatives are more accepting. Previous research has shown that some users (~30%) may not fully adopt the changes, whereas SMACNA contractors experience 15%-20%.

Key Findings:

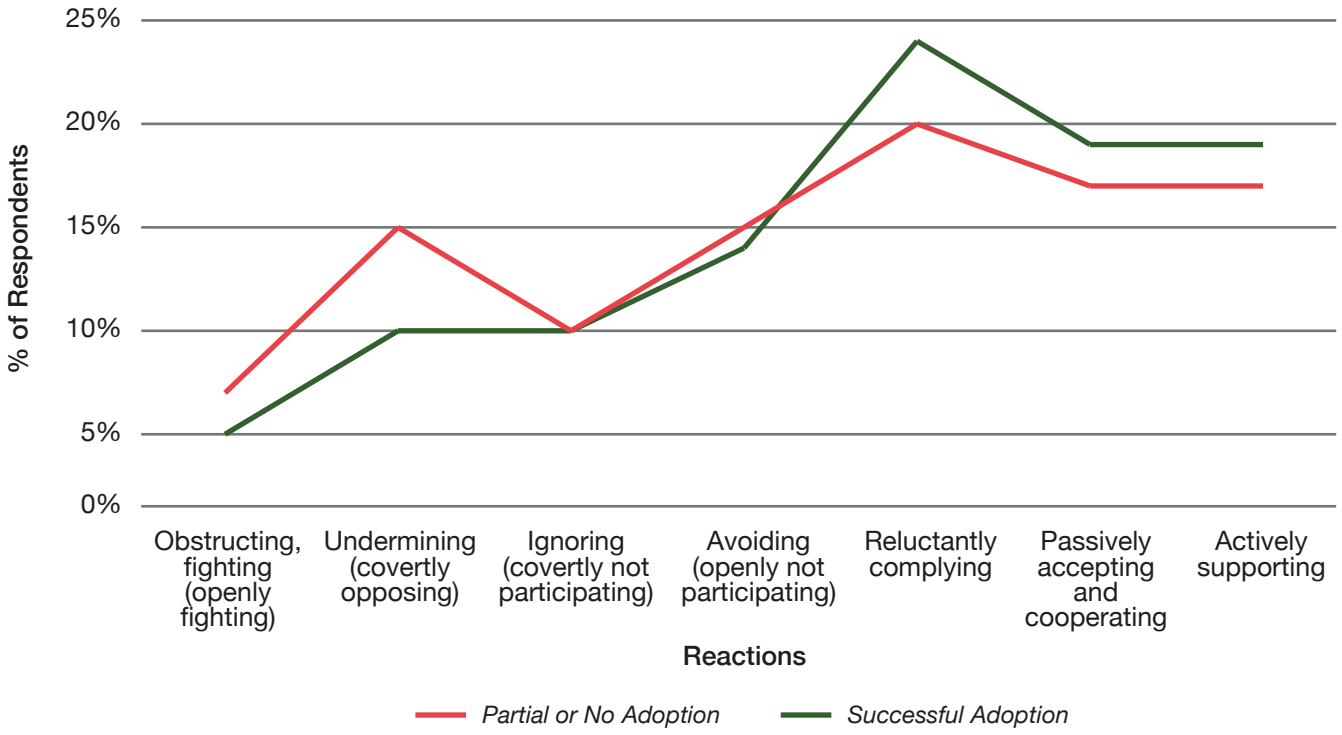
- Over time, positive reactions see the largest gains for both successful and partial/no adoption initiatives.
- Successful initiatives have 45% more users with positive reactions at both time periods: a few months after implementation and at the midpoint/middle.
- Over time, negative reactions fade for successful initiatives, only with Ignoring at 10%.
- For partial/no adoption initiatives, Obstructors do not change much, while other negative reactions somewhat lessen.

Strategic Tips:

- The top technology implementation management practices of successful change initiatives should be closely followed to gain positive users' reactions and overall adoption.
- Plan for negative reactions with your strategic change management plan (i.e. Ignoring, Obstructing, Undermining, and/or avoiding behaviors), do not get discouraged by these reactions. Successful change initiatives can see these negative reactions diminish, while partial/no adoption initiatives do not see these negative reactions lessen.
- While the success of the change effort is critical to sustaining the change, there will generally be larger amounts of negative reactions a few months after implementation and a decrease in negative reactions at the midpoint/middle.
- Ignoring (covertly not participating) may not change substantially. Passively Accepting and Cooperating will have the largest gains.

When compared, successful initiatives show differences in user behaviors even just a few months after implementation when compared to partial or no adoption initiatives (*Fig. 13*).

Figure 13: Most Common Reactions
A Few Months After Implementation



Key Findings:

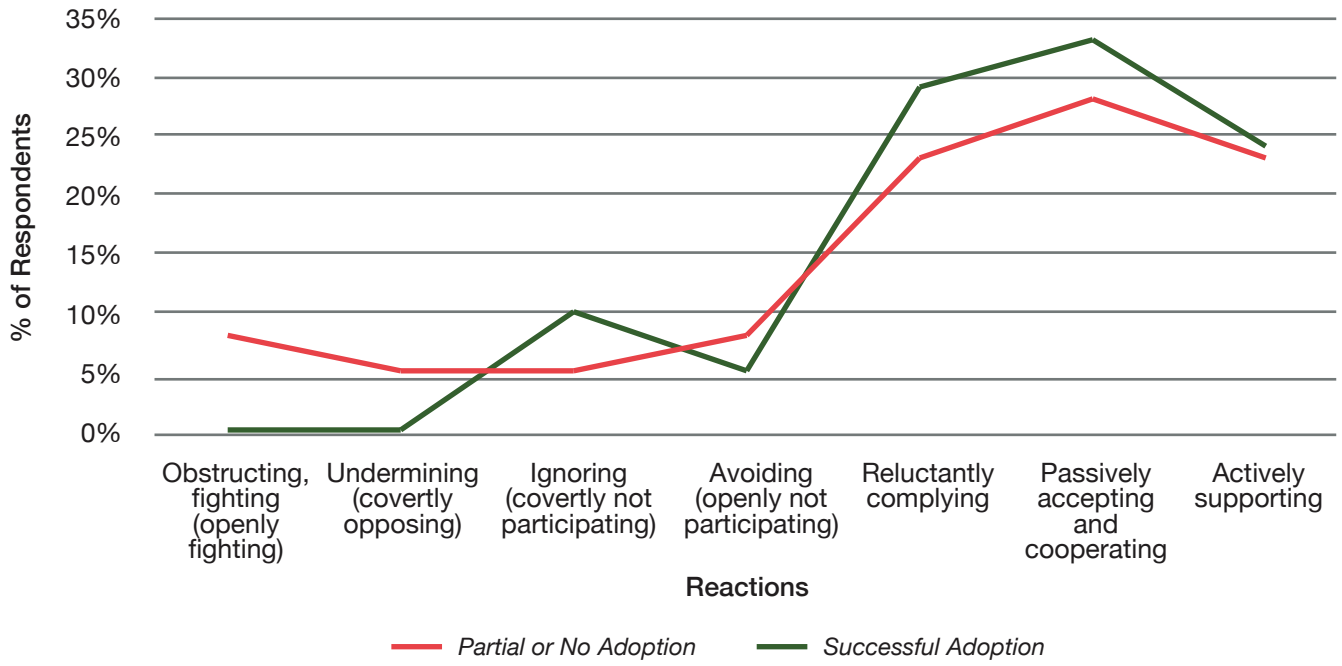
- Active Supporters and Passive Acceptors is about the same for successful & partial/no adoption.
- Ignoring and avoiding is about the same for successful & partial/no adoption.
- Key difference makers are Underminers (covertly opposing) and Obstructors (openly fighting), with the total delta being 15-20% of the population.

Strategic Tips:

- When encountering those that can be classified as Underminers (covertly opposing) and Obstructors (openly fighting), approach them with an open mind – seek to understand their viewpoint as they may be the most challenging to shift their perspectives. Approaching them at the beginning of the technology initiative, with the goal of understanding and humility, may better enable the change process to positively impact their reactions.
- The top practices for successful change initiatives have an impact even in the early months of the change initiative.

We see both a large shift at the midpoint of implementation and larger gaps between partial/no adoption initiatives and successful initiatives (*Fig. 14*). Obstructors and Underminers diminish and Passively Accepting and Actively Supporting increase for successful initiatives. For partial/no adoption initiatives, Obstructors and Ignorers have not changed much – posing a risk to the success of the initiative.

Figure 14: Most Common Reactions
At the Midpoint of Change



Key Findings:

- Active Supporters and Passive Acceptors have increased from the beginning to the middle time period for success & partial adoption.
- Ignoring and Avoiding is about the same for success & partial adoption.
- Underminers (covertly opposing) and Obstructors (openly fighting) have shifted to more positive reactions for success & partial adoption.

Strategic Tips:

- Be consistent with the top technology implementation management practices throughout implementation (not just at the beginning), as we see the shifts happen at the midpoint in time: negative gets shifted to more positive reactions, causing an increase in positive reactions.
- If not addressed at the beginning (as mentioned in the previous section), Obstructors and Underminers can persist and potentially grow.

COMPANY ADOPTION SUCCESS

Trends across company size (number of employees and total yearly sales) and successful technology implementation were investigated – no trends were uncovered (*Fig 15* & *16*).

Figure 15: Adoption Success by Number of Employees

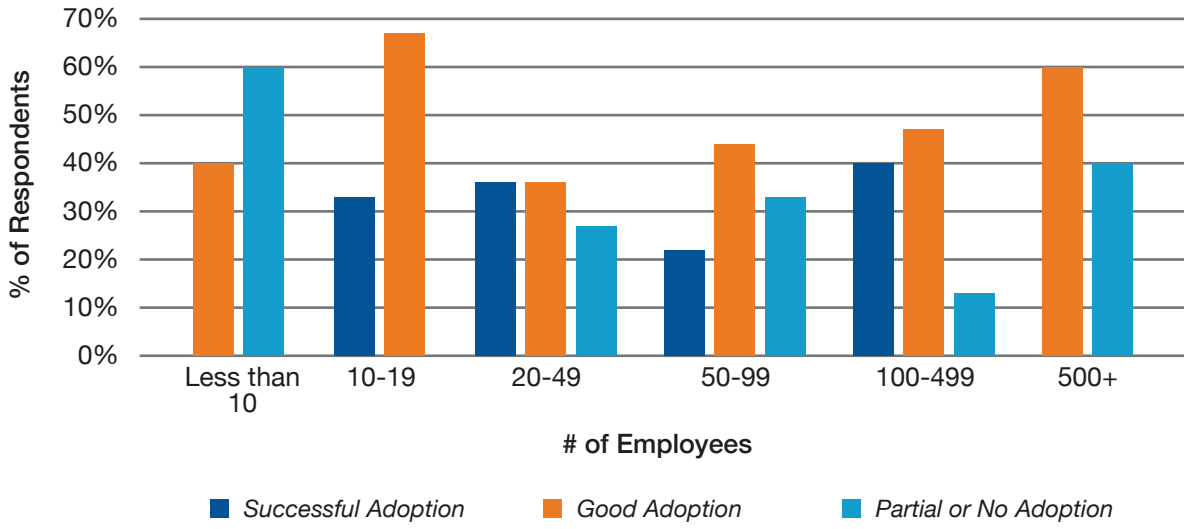


Figure 16: Adoption Success by Total Sales