APPENDIX A- Nature of Team-Building and After-Action Review (AAR)

Conventional team-building interventions typically leverage exercises, games and other activities as a means by which to "provide individuals closely involved with the task with the strategies and information needed to solve their own problems" (Lacerenza et al., 2018: 523). Accordingly, these activities typically focus on helping members clarify their respective roles, as well as on facilitating goal setting, and enhancing problem solving and interpersonal relationships (Lacerenza et al., 2018). A meta-analysis by Klein, DiazGranados, Salas, Le, Burke, Lyons, & Goodwin (2009) found team-building to yield significant, positive effects on a variety of team states (e.g., trust) and processes (e.g., coordination) typically associated with team performance, but not on team performance itself.

An after-action review (AAR) is a "systematic technique that turns a recent event into a learning opportunity through a combination of task feedback, reflection and discussion" (Arthur & Winfred, 2021: 1008). As a team process intervention, it is framed around a post-action debriefing (see, e.g., Allen, Letiecq, Roberto, Rosenblatt, & Wieling, 2018; Ellis & Davidi, 2005; Lacerenza et al., 2018; Vashdi et al., 2013) that typically aims to identify performance strengths and weaknesses associated with an immediately-concluded team action, mission or event, and to draw insights from such a review for future performance (Keiser & Arthur Jr, 2021; Konradt, Schippers, Garbers, & Steenfatt, 2016; Villado & Arthur, 2013). It places an emphasis on self and peer feedback, as well as on identifying behavioral parameters needing change, and planning out and implementing such change (Keiser & Arthur Jr, 2021; Swift & West, 1998; Villado & Arthur, 2013). AARs have been demonstrated to yield significant improvements in team performance, innovation and employee well-being in various work contexts (Keiser & Arthur Jr, 2021; Chen, Schippers, Garbers, & Steenfatt, 2018; Couper, Salman, Soar, Finn, & Perkins, 2013). Although learning-focused, as a team development intervention, AARs are distinct from DT in several ways. First, they focus on self-appraisal within the team (West, 1996), rather than on the kind of broad feedback from external stakeholders central to DT. Second, AARs tend to focus on events that occurred in an immediately preceding performance episode (Tannebaum & Cerasoli, 2013; Vashdi et al., 2013; Chen et al., 2018) rather than on some core team problem or challenge that may have had varying manifestations across multiple events in the past, or alternatively, may only manifest in the future. Accordingly, in contrast to DT which requires a deep level of engagement, focusing on iteratively developing and testing observation-driven working hypotheses and rotating between the concrete and abstract, AARs focus on an immediate past event with the intent of isolating and resolving concrete issues that emerged as part of a specific action (Keiser & Arthur, 2021; Villado & Arthur, 2013).

APPENDIX B - Training Protocols for Design Thinking and After-action Review (AAR)

DESIGN THINKING INTERVENTION

Training of design-thinking teams was structured around Liedtka and Ogilvie (2011)'s key questions (i.e., what is, what if, what wows, and what works) and tools to do so (e.g., interviewing, brainstorming, journey mapping, prototyping, mind mapping, and value-chain analyses). In particular, we generated a protocol including the five following steps:

Step1 **What is? Identifying the problem and its scope** (e.g., if the problem is team-based, department-based, or organization-based) and the stakeholders. Trainer provided the following criteria for each team in the DT condition to identify the problem.

Key criteria	Applicable to design thinking	Not applicable to design thinking
Problem with internal/external customers	Problem resolution can effectively help internal/external customers.	Neither the problem itself nor the solution is about people.
Relationship between problem issues and team members	1. Problems cannot be solved by expertise alone, but require the strength of the whole team. 2. The problem solution is related to each member's performance.	1. The knowledge and expertise required for the problem solution is unique and not linked to individual team member. 2. The problem solution is not related to individual performance.
How uncertain is the problem?	There are many unknowns so that past experience and evidence are not enough to support the solution of the problem.	There is little uncertainty.
How complex is the problem cycle?	1. There are many interconnections and dependencies, and it's hard to know where to start. 2. The resolution cycle is about 2-3 months.	1. The solution path is too clear, and there has been successful solution experience in the past. 2. The problem is too complicated and the solution cycle is too long.
Information needed for problem resolution	Existing data and information are not enough.	Sufficient data are available to resolve.
Relationship between the identified problem and department's key results	Tightly integrated. The resolution of projects can effectively support departmental key results.	Not closely related.

At step 1, trainers required each team to draw from the discussion to answer the following questions:

Questions asked
Why is this problem important? --describing key results of the problem
What are the expected results? --describing how the problem will be resolved
Which obstacles does the problem solution have? --which constraints would the team have to solve the problem?
How should we approach the problem? --Which approach could the team adopt to solve the problem?
Who are the stakeholders of the problem? --Identify which party should be addressed? • Stakeholder 1, those for whom the new solution serves, or those who would use the new solution. They are regarded as users of the new solution. • Stakeholder 2, those who could help us to solve the problem. They may be the team members themselves, colleagues in other departments, or people who can make decisions in the company.

Step 2 **What is? Reframing the problem**

Team members were asked to: "Share the information gathered at step1 and continue the discussion. Focus on the users of the potential solution (stakeholder 1) and analyze their real needs or “pain points”. Be open and curious, don’t be defensive and don’t interrupt the narrative of the person involved, so you can gain a deeper understanding of their feelings and thoughts". Team members discussed and filled in the information request form as follows, and then gathered information before the next meeting, or even invited the stakeholders to join the next meeting.

Information request form		
Which information do you need?	From whom? From which department?	How to get the information?
		Interview☐ observation☐ documents☐
		Interview☐ observation☐ documents☐
		Interview☐ observation☐ documents☐

Team members were encouraged to use customer journey mapping which is a tool for identifying customer needs through design thinking. It is appropriate to use customer mapping at stage 2 to describe and distinguish customer experiences. A journey map is a detailed visualization that shows how a user-based persona is acting and feeling throughout the process of using a particular product.

Team members were also encouraged to understand "what is" by observing and/or interviewing stakeholders, trying to understand their needs. Experiences of users investigated were listed one by one so that a summary and comparison could be made. Since most people don't know what

they really need, only when their needs are listed together, compared and analyzed, can the most core needs be captured and used as "opportunities" and "breakthroughs".

Step 3 **"What if"? - New possibilities for growth are generated**
Teams were asked to brainstorm ideas and develop concepts.
Four criteria were set up for brainstorming:
(1) Emancipate the mind, be whimsical and unrestrained, and speak freely;
(2) No commenting on other people's ideas during the meeting or judging after the meeting;
(3) Use a large number of ideas to ensure high-quality and more good ideas and don't worry about the quality of the content of the ideas;
(4) Encourage borrowing and building upon other people's ideas.

Step 4**"What wows?"- Assumptions are tested and prototypes are created and refined.**
Team members were asked to: "Create testable models of the ideas generated above in order to test the assumptions you made regarding their suitability. The prototype should be incomplete to invite users to interact with and improve it. Engage stakeholders in the development of new concepts from the rough prototypes you created. Have them tell you everything that is wrong with the idea".

Step 5 **"What works?"- Users are identified and the solution is shaped into something that can be trialed.**
Team members were asked to: "Obtain feedback from stakeholders, execute learning launches and design the on-ramp (how the solution will be offered to users). Experiment with a refined prototype where users are both interviewed and, most importantly, their actions are observed. Brainstorm solutions to the parts that failed during the previous step, revise the concept, refine key assumptions, create a higher fidelity prototype, develop ways to engage users in co-creation, let the users try it again and then gain new, final insight".

CHECKLIST FOR A DESIGN THINKING MEETING

Team identifying number_____

Date_____ Start time_____ End time_____

Who is leading today's discussion? _____ (please write down his/her name)

How many team members were present? _____ How many were absent?_____

What is the topic of discussion today? _____

--How many times have you discussed this topic before? _____

In today's session, were the following steps followed?

Step1 "choose a problem and discuss the scope of the potential problem"

(Please discuss "Why is this problem important? What are the obstacles to solving this problem? Which issues should and should not be included in this problem? What should we do to solve this problem? Who are the stakeholders of this problem?")

Yes□ No□

If you choose "Yes", please summarize what you discussed.

_____

Step2 "Redefine the problem" (What is)

(Please compare characteristics, needs, and experiences, identify core needs, and redefine the problem as "How to implement/satisfy the needs of stakeholders by……?")

Yes□ No□

If you choose "Yes", please summarize what you discussed.

_____

Step3 Consider possible solutions to the problem (What if)

(Brainstorm as many ideas as possible on the redefined question "How to achieve/satisfy the needs of ...."; use mind maps to connect and categorize these ideas to find the "best" ones)

Yes□ No□

If you choose "Yes", please summarize what you have discussed.

_____

Step4 Form of the prototype of the plan (What woos)

(Based on the most "brilliant" ideas from step 3, form a prototype of the plan, which does not have to be complete, but should have certain details so that it can be evaluated or tested)

Yes□ No□

If you choose "Yes", please summarize what you have discussed.

_____

Step 5 Accept feedback and make the plan work (What works)

(Hand over the prototype of the proposal to the stakeholders, listen to their opinions, get feedback and form new ideas for improving the proposal)

Yes□ No□

If you choose "Yes", please summarize what you have discussed.

_____

AFTER-ACTION REVIEW (AAR) INTERVENTION

We refer to a procedure applied by Chen et al. (2018) for team reflexivity in a similar organizational context (i.e. manufacturing organizations). The procedure was originally created on the basis of an After-action debriefing model (Ellis & Davidi, 2005; Vashdi et al., 2013; Keiser & Arthur 2021). As in Chen et al., (2018) the team AAR process used in the current study was structured and self- (not facilitator-) led, conditions identified as preferable in Keiser and Arthur's (2021) meta-analysis. Team members were told to review events that occurred in the last few days and then "focus on whatever number of issues or events they wished as long as these issues had to do with any of the following: team processes and cooperation, work hazards, product quality, and work and reporting processes" (Chen et al., 2018: 448).

Per the AAR protocol applied in the current study, teams were required to:

a) Review recent team objectives (e.g., last week, last month, or last quarter);
b) Discuss what went well in the last few working days, what facilitated meeting the team's objectives and what enabled adopting steps proposed in earlier reflexivity sessions;
c) Discuss what did not go well or proceed according to plan, and why some team objectives may not have been met and steps left un-adopted;
d) Identify steps that might be taken to improve outcomes in the next few days, determining who on the team needs to do what in order to ensure the adoption of these steps, and agree upon measures that might be used to assess the degree to which the team has progressed;
e) Summarize the lessons learned in the reflexivity session.

CHECKLIST FOR AN AAR

Team identifying number:
Date:_____ Start time: _____ End time: _____
1. Who led today's session?_____(Please write down the name of the leader)
2. How many team members: Attended? _____ Participated in discussion? _____
3. Please indicate whether the following were addressed today:

- Review objectives (the goals that were set for the day, week, or month) Yes□ No□
- What went well? What facilitated meeting the objectives? Yes□ No□
- What didn't go well? Why were some objective not met? Yes□ No□
- What can be improved for next time?
  - ✓ Who needs to do what when to generate improvement? Yes□ No□
  - ✓ How will we know if improvement is generated? Yes□ No□
- Summary of the lessons learnt Yes□ No□

4. Major issues discussed:

- Were follow up tasks allocated to various team members to handle? Yes□ No□
- Were issues discussed at earlier meetings followed up in this meeting? Yes□ No□
  If yes, please record the issues

_____

TEAM-BUILDING INTERVENTION

CHECKLIST FOR TEAM-BUILDING

Team identifying number_____

Date_____ Start time_____ End time_____

Who led today's discussion? _____
How many team members were present? _____ How many are absent?_____
What is the aim of the game? _____
Please summarize what team members learned from the game?

_____
_____
_____

APPENDIX C – Psychometric Details of Scales Used in the Study

Variable	Measure	# of Items	Alpha	Sample item	Scoring
Team learning climate	Maruping, & Magni (2012)	3	T0 .70 T1 .76	"My team makes its lessons learned available to all members."	1-strongly disagree to 5-strongly agree
Team TMS specialization	Lewis (2003)	4	T0 .79 T1 .83	"Different team members are responsible for expertise in different areas."	1-strongly disagree to 5-strongly agree
Team innovation	De Dreu & West (2001)	3	T1 .96 T2 .95	"Team members often produce new services, methods, or procedures."	1-strongly disagree to 5-strongly agree
Team performance	Barrick et al., (1998)	8	T1 .89 T2 .91	"Quality of work of our team."	1-well below the comparative teams to 5-well above the comparative teams
Task complexity	Hackman, & Oldham (1974)	3	T0 .72	"The job requires me to use a number of complex or high-level skills."	1-Very inaccurate 2-Mostly inaccurate 3-Slightly inaccurate 4-Uncertain 5-Slightly accurate 6-Mostly accurate 7-Very accurate

APPENDIX D – Analysis Code Used in the Study

PART1: the syntax for the mediation model (Models 1-2 and Models 5-7)

```
TITLE: analysis code for Models 1-2 and Models 5-7
DATA: FILE IS data.csv; ! insert data file here
variable: names are ID cluster d1   d2 size
variety learning_0m accuracy_0m
learning_1m accuracy_1m
perfor_1m innov_1m
perfor_2m innov_2m
efficiency_2m efficiency_1m ;
! all observed variables
! d1: AAR vs. design thinking (Dummy 1)
! d2: Team Building vs. design thinking (Dummy 2)
! variety: task complexity
! learning: Team learning climate
! accuracy: Team TMS Specialization
! perfor: team performance
! innov: team innovation
! efficiency: team efficiency

USEVARIABLES ARE d1-d2 cluster size
innov_1m innov_2m
perfor_1m perfor_2m
accuracy_0m accuracy_1m
learning_0m learning_1m
efficiency_2m efficiency_1m ;
! indicates variables to use in the model

CLUSTER = cluster; ! defines variable indicating group membership

BETWEEN = d1-d2 size
innov_1m innov_2m
perfor_1m perfor_2m
accuracy_0m accuracy_1m
learning_0m learning_1m
efficiency_2m efficiency_1m;

ANALYSIS: TYPE = TWOLEVEL RANDOM;

MODEL: ! portion where model is specified
%WITHIN% ! lower level of the model is not specified
```

```
%BETWEEN% ! higher level of the model
    perfor_2m on perfor_1m@1;
    dperfor by perfor_2m@1;
    dperfor on perfor_1m;
    perfor_2m@0; [perfor_2m@0];
    dperfor perfor_1m on d1 d2 size;

    innov_2m on innov_1m@1;
    dinnov by innov_2m@1;
    dinnov on innov_1m;
    innov_2m@0; [innov_2m@0];
    dinnov innov_1m on d1 d2 size;

    efficiency_2m on efficiency_1m@1;
    defficiency_2m by efficiency_2m@1;
    defficiency_2m on efficiency_1m;
    efficiency_2m@0; [efficiency_2m@0];
    defficiency_2m efficiency_1m on d1 d2 size;

    learning_1m on learning_0m@1;
    dlearning by learning_1m@1;
    dlearning on learning_0m;
    learning_1m@0; [learning_1m@0];
    dlearning on
    d1 (a1)
    d2 (a2)
    size;

    learning_0m on d1 d2 size;

    accuracy_1m on accuracy_0m@1;
    daccuracy by accuracy_1m@1;
    daccuracy on accuracy_0m;
    accuracy_1m@0; [accuracy_1m@0];
    daccuracy on
    d1 (b1)
    d2 (b2)
    size;
    accuracy_0m on d1 d2 size;
```

dinnov dperfor defficiency_2m on
dlearning daccuracy;

[dperfor *];
[dinnov *];
[dlearning *];
[defficiency_2m *];
[daccuracy *];

model constraints:
new (d1, d2);
d1=a1-a2;
d2=b1-b2;

OUTPUT:
SAMPSTAT; TECH3;

PART2: the syntax for the moderated mediation model (Models 3-4 and Models 5-7)

TITLE: analysis code for Models 3-4 and Models 5-7
DATA: FILE IS data.csv; ! insert data file here
variable: names are ID cluster d1 d2 size
variety learning_0m accuracy_0m
learning_1m accuracy_1m
perfor_1m innov_1m
perfor_2m innov_2m
efficiency_2m efficiency_1m ;
! all observed variables
! d1: AAR vs. design thinking (Dummy 1)
! d2: Team Building vs. design thinking (Dummy 2)
! variety: task complexity
! learning: Team learning climate
! accuracy: Team TMS Specialization
! perfor: team performance
! innov: team innovation
! efficiency: team efficiency

USEVARIABLES ARE d1-d2 cluster size
innov_1m innov_2m
perfor_1m perfor_2m
accuracy_0m accuracy_1m
learning_0m learning_1m

```
efficiency_2m efficiency_1m
variety var1 var2;
! indicates variables to use in the model

CLUSTER = cluster; ! defines variable indicating group membership

BETWEEN = d1-d2 size
innov_1m innov_2m
perfor_1m perfor_2m
accuracy_0m accuracy_1m
learning_0m learning_1m
efficiency_2m efficiency_1m
variety var1 var2;

DEFINE:
CENTER variety (GRANDMEAN);
var1=d1 * variety;
var2=d2 * variety;

ANALYSIS: TYPE = TWOLEVEL RANDOM;
MODEL: ! portion where model is specified
%WITHIN% ! lower level of the model is not specified

%BETWEEN% ! higher level of the model

   perfor_2m on perfor_1m@1;
   dperfor by perfor_2m@1;
   dperfor on perfor_1m;
   perfor_2m@0; [perfor_2m@0];
   dperfor perfor_1m on d1 d2 size;

   innov_2m on innov_1m@1;
   dinnov by innov_2m@1;
   dinnov on innov_1m;
   innov_2m@0; [innov_2m@0];
   dinnov innov_1m on d1 d2 size;

   efficiency_2m on efficiency_1m@1;
   defficiency_2m by efficiency_2m@1;
   defficiency_2m on efficiency_1m;
   efficiency_2m@0; [efficiency_2m@0];
```

```
defficiency_2m efficiency_1m on d1 d2 size;

learning_1m on learning_0m@1;
dlearning by learning_1m@1;
dlearning on learning_0m;
learning_1m@0; [learning_1m@0];
dlearning on
d1 (a1)
d2 (a2)
size variety
var1 (a3)
var2 (a4);

learning_0m on d1 d2 size variety var1 var2;

accuracy_1m on accuracy_0m@1;
daccuracy by accuracy_1m@1;
daccuracy on accuracy_0m;
accuracy_1m@0; [accuracy_1m@0];
daccuracy on
d1 (b1)
d2 (b2)
size variety
var1 (b3)
var2 (b4);

accuracy_0m on d1 d2 size variety var1 var2;

  dinnov dperfor defficiency_2m on dlearning daccuracy;

[dperfor *];
[dinnov *];
[dlearning *];
[defficiency_2m *];
[daccuracy *];

OUTPUT:
SAMPSTAT; TECH3;
```