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**The effect of team-member knowledge, skills and abilities (KSAs)
and a common learning experience on sourcing teamwork
effectiveness**

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Abstract

Purpose – A lack of sourcing-specific team research prevents a full understanding of sourcing teamwork effectiveness. Moreover, the limited PSM team literature often tends to focus on an aggregate group level. The paper makes a step towards adopting an individual actor perspective on teamwork effectiveness with an emphasis on the context of sourcing, explicating the effects of team-member knowledge, skills, and abilities (KSAs), and examining how these relationships are moderated by a common learning experience of strategic sourcing masterclass.

Design/methodology/approach – Based on a cross-sectional survey, this study analyses a sample of 90 sourcing team-members from a global aerospace manufacturing company (GAMC) using hierarchical regression analysis.

Findings – The results suggest that four of the five KSAs positively and significantly affect sourcing teamwork effectiveness; the exception was collaborative problem-solving. Masterclass learning outcomes were found to positively moderate the effects of these KSAs on sourcing teamwork effectiveness, again exclusive of the collaborative problem-solving KSA.

Research limitations/implications – Cross-sectional design focused only on the aerospace sector may affect generalizability. Further, longitudinal research designs would capture the effects of the common learning experience over an extended period.

Practical implications – Sourcing team-members could be selected based on having KSAs which significantly affect teamwork effectiveness. Training and development for sourcing teams should combine guided reflexivity and cross-training to deliver learning outcomes that create similar team mental models.

Originality/value – Study provides an individual team-member perspective on the functioning of sourcing teams that is absent in the extant research. It contributes to the very limited research base on skills in PSM.

Keywords: Teamwork knowledge, skills, abilities (KSAs), Sourcing teamwork effectiveness; Team mental models.

1. Introduction

A key theme emerging from the SCM literature is that purchasing performance is significantly influenced by the extent to which a firm has achieved both cross-functional integration in the execution of its purchasing process and effective coordination of processes (Foerstl et al., 2013). In recent years, firms have shown an increased interest in using team structures as a means of facilitating such integrated and coordinated working within purchasing and across functional boundaries (Enz and Lambert, 2012; Handfield et al., 2009).

While teamwork effectiveness has been studied extensively (Stevens and Campion, 1999; Van-Mierlo and Kleingeld, 2010), empirical research about the factors influencing the effectiveness of sourcing teams is still relatively limited in scope and scale. It has been observed that this matters as team studies in other settings provide only limited guidance for sourcing team management such are the differences in contexts and performance requirements (LePine et al., 2008). Specifically, it has been noted a combination of cross-functional team composition and geographically dispersed and part-time membership largely characterizes the context of sourcing teams, whereas teams in other settings are often co-located, have full-time dedicated members, and reside in one function or business unit (Trent, 1998). Given these characteristics, sourcing teams must often deal with the conflicting interests and misaligned goals of different functional stakeholders (Franke and Foerstl, 2020b), with these problems compounded by having to rely on others outside the team to implement their decisions (Marshall et al., 2015). In this context, this study aims to address the paucity of sourcing-specific team research and explicate the drivers of sourcing team effectiveness.

Moreover, the literature currently tends to focus upon the sourcing team as an aggregate organizational construct rather than examining the characteristics and behaviours of individual actors within teams (Franke and Foerstl, 2020a; Schorsch et al., 2017; Schulze et al., 2019). While this is an understandable emphasis given the need to achieve a manageable analysis of

complex multi-level phenomena in (purchasing and supply management) PSM, it does prevent a full understanding of how sourcing decisions are made. As such, this study aims to provide an individual team-member perspective on teamwork effectiveness in the context of sourcing. Specifically, we focus on the five categories of teamwork knowledge, skills and abilities (KSAs) that are identified in the seminal work by Stevens and Campion (1994) as the individual-level competencies needed for team members to work together effectively. This study addresses the following question using survey evidence from sourcing team members in a global aerospace manufacturing company (GAMC): “how do individual team-member KSAs impact on sourcing teamwork effectiveness?”. We explore how the potential conflicting interests and misaligned goals of different functional stakeholders in sourcing teams can be resolved by inter-personal and self-management KSAs. This contrasts with the general team literature that overlooks the sourcing context and earlier sourcing team studies where the focus was on the team or organizational level of analysis (Driedonks et al., 2010, 2014; Meschnig and Kaufmann, 2015).

The paper also examines the possibility that the relationships of KSAs with sourcing teamwork effectiveness might be strengthened where team members have had a common learning experience. Specifically, it reports cross-sectional survey evidence about the transfer of learning from intensive training and development events called strategic sourcing masterclasses, which were run by GAMC for its sourcing teams. Masterclass participants completed the survey at least three months after their attendance to allow time for proper reflection on and accountability for the transfer of masterclass learning outcomes to teamwork practice (Saks and Burke, 2012). We ask: “what effect do the masterclass learning outcomes have on the relationships between team-member KSAs and sourcing teamwork effectiveness?”.

The masterclasses were designed to bring together sourcing team members from different functions to learn how to use a decision-making framework covering all stages of the procurement process, supported by a body of knowledge about key hazards in strategic sourcing. The team effectiveness literature suggests that these kinds of shared learning are important for the formation of team mental models (Mohammed et al., 2010), a basis on which team members can describe, explain, and predict events in their environment and thereby select actions that are consistent with those of their teammates (Mathieu et al., 2000). This does not mean that team members all have the same mental model. Rather, each team member has their own model, with team effectiveness depending on the extent to which these models are like one another (Mathieu et al., 2005). The masterclasses also provided a guided reflexivity intervention, a structured opportunity for team members to discuss and reflect on their activities and strategies (Gurtner et al., 2007), and had cross-training features that facilitate a better understanding of the roles and responsibilities of others in a team (Cannon-Bowers et al., 1998). These characteristics have been found to increase the similarity of team members' mental models (Marks et al., 2002), and so we suggest it is likely that the masterclasses will enhance the KSAs–teamwork effectiveness associations.

The paper proceeds as follows. Section 2 discusses theoretical foundations and describes the conceptual framework. In Section 3, we present the methods, followed by a set of complementary analyses in Section 4. We then channel our results into a discussion of findings in Section 5. Finally, we conclude with the implications of the study findings and research limitations, offering directions for future research opportunities.

2. Conceptual framework and hypotheses development

2.1 Drivers of sourcing teamwork effectiveness

It is argued that for a team to be effective, it must successfully perform both task-work and teamwork (Burke et al., 2003). While task-work refers to the specific work-related functions a team needs to undertake to achieve its goals (Wildman et al., 2012), teamwork refers to the shared behaviours, attitudes, and cognitions necessary for team members to undertake their work-related activities (Morgan et al., 1994). Our focus in this paper is on sourcing teamwork effectiveness rather than task-work effectiveness.

Despite the wealth of literature on factors influencing teamwork effectiveness in other settings such as service organizations, HR management, and new product development (Salas et al., 2015), existing research does not provide explicit guidance on sourcing teams such as the differences in contexts and work practices (Driedonks et al., 2014). Research on teams carrying out tasks such as service delivery and customer relationship marketing (Troy et al., 2008) shows that they often operate within one function or have full-time members. In the same vein, Franke and Foerstl's (2020a, p. 8) review of the general team literature notes that 'most available team studies are intra-functional or intra-departmental instead of cross-functional.' By contrast, research on sourcing teams recognises that they typically have a cross-functional composition (Swink and Schoenherr, 2015) and a part-time or temporary membership (Foerstl et al. 2013) and they are not often co-located (Enz and Lambert, 2012), which may in turn necessitate virtual work practices.

Moreover, prior sourcing research has not considered the full range of factors influencing teamwork effectiveness identified by Salas et al. (2015). Notable gaps in the sourcing-specific context concern: the influence of individual team-member KSAs on teamwork effectiveness, and the impact of shared team cognition or similar team mental models on effectiveness. This paper aims to address these gaps. First, we postulate that KSAs have a positive relationship with sourcing teamwork effectiveness, because they enable team members to address the potential cross-functional conflicts and misaligned goals that are a consequence of the

composition and characteristics of sourcing teams. Second, the study posits that the masterclass learning outcomes strengthen the relationships between team-member KSAs and sourcing teamwork effectiveness, because this common learning experience facilitates the formation of shared team cognition that enables team members to better coordinate their activities.

2.2 Individual team-member KSAs

Our framework was inspired by the work of Stevens and Campion (1994) that identified the team-member KSAs crucial for teamwork effectiveness. The KSAs were grouped into two domains. In the first, interpersonal KSAs comprising conflict resolution, collaborative problem solving, and communication, relate to the ability of team members to ‘maintain healthy working relationships and to react to others with respect for ideas, emotions, and differing viewpoints’ (Stevens and Campion, 1994, p. 506). In the second, self-management KSAs including goal setting and performance management and planning and task coordination, refer to the ability of team members (empowered to be self-managing) to have ‘significant control over the direction and execution of the team’s tasks’ (Stevens and Campion, 1994, p. 514), as against simply being able to work well with others. The distinction between these two domains stands on the idea that team effectiveness depends on its members’ ability to both direct their actions to perform the assigned tasks effectively and to manage their relations appropriately.

The extant literature has stressed the key role of KSAs for team effectiveness owing to the underlying characteristics integrated with an individual’s knowledge, skills, and abilities that are causally associated with superior team performance (Hartenian, 2003; Aguado et al., 2014). KSAs, however, may play a crucial role in sourcing teams because they enhance team members’ interpersonal and self-management competencies to better deal with issues such as cross-functionality, geographically dispersed and temporary membership, and virtual work practices that are common in the sourcing context. The discussion that follows focuses on the roles of these KSAs in sourcing teamwork effectiveness.

Conflict resolution

A cross-functional sourcing team, by definition, comprises members with different occupational backgrounds and work experiences. This demographic diversity causes team members to possess different perspectives and values that lead, in turn, to different priorities and preferences in decision-making (Horwitz and Horwitz, 2007). For example, in a sourcing team, engineers and purchasing managers might have different priorities regarding organisational requirements, leading to conflict as an inevitable consequence of team functioning (Pratt et al., 2006).

Such conflict, however, can often constitute a process of exchanging knowledge and opinions, leading to creativity and innovation (Franke and Foerstl, 2018) and greater team acceptance of any ultimate decision (Behfar et al., 2008). It may also act as a pressure valve, allowing unspoken resentments to be addressed (Stevens and Campion, 1994). The key is for a team to contain individuals able to prevent conflicts from escalating to destructive levels by identifying both the sources of conflict and suitable conflict resolution activities (Behfar et al., 2008). Accordingly, potential conflicts that are likely to occur among sourcing team members due to their different functional objectives and priorities, can be addressed if a sourcing team contains members possessing such conflict resolution KSAs. Moreover, conflicts may arise from external stakeholders who view the purchasing function as of limited strategic importance (Carr and Pearson, 2002) and therefore having conflict resolution KSAs within sourcing teams is crucial for greater effectiveness. That is, the team will be better able both to produce high quality work and promote that work with stakeholders outside the sourcing team. Thus, we hypothesize:

H1: Conflict resolution KSAs positively affect sourcing teamwork effectiveness.

Collaborative problem-solving

Within cross-functional sourcing teams, there are potential advantages to solving problems collaboratively given the diverse functional composition. For example, different perspectives are brought to bear on the problem, increasing the likelihood of a creative solution and reducing the likelihood of an ineffective solution (Laughlin, 2011). The availability of relevant information and the knowledge required for effective solutions may also be increased. Moreover, the inclusion of multiple team members in problem solving increases the likelihood of team acceptance of the solution and commitment to its implementation (Stevens and Campion, 1994).

However, even where collaborative problem-solving is warranted, the literature identifies two potential obstacles to the effectiveness of this approach. First groupthink (Janis, 1982), where a desire for team harmony interferes with proper critical discussion, and second social pressure on individual team members to conform to the majority view even if their own different perspective might contribute (Martin and Hewstone, 2008). In both cases, decision outcomes are likely to be poorer unless team members can use appropriate techniques, such as brainstorming and reflexivity, to overcome these obstacles (De-Dreu, 2006). Given that collaborative problem-solving may encounter significant obstacles, a key to sourcing teamwork effectiveness is having individuals within the team who possess collaborative problem solving KSAs, i.e. are able to identify those problems that require a collaborative approach and know how to address potential obstacles. Thus, we propose:

H2: Collaborative problem-solving KSAs positively affect sourcing teamwork effectiveness.

Communication

As sourcing is a boundary-spanning cross-functional activity, communication KSAs are likely to be a key driver of sourcing teamwork effectiveness. While sourcing team members need internal communication to share information with each other, they also rely on external

communication to gather information from external stakeholders across functional boundaries to carry out the assigned tasks and to manage follow-up activities. The importance of communication KSAs is further specified by the fact that sourcing team members are often not physically co-located and are required to work through virtual team mechanisms (Trent, 1998).

Communication KSAs are also relevant to sourcing teamwork effectiveness in other ways. First, for complex decisions involving multiple actors, decentralized communication channels are associated with a faster, more accurate and more extensive distribution of information among team members and external stakeholders (Grund, 2012). Second, the communication style of effective teams is open, informal, relaxed, and supportive. This style engenders trust and ensures team members are willing to bring all important and relevant issues before the team in a timely fashion (Webster and Wong, 2008). Effective communication also requires team members to engage in small talk and ritual greetings. These communication behaviours are seen as crucial for effective team functioning in the sourcing context, because they strengthen inter-personal relationships by acknowledging the presence and value of others (Pullin, 2010). Accordingly, if sourcing team members possess KSAs to enable them to communicate in the ways discussed above it is argued that the team will be more effective in terms of the quality and accuracy of its work practices and its ability to gain the support of stakeholders elsewhere in the organization:

H3: Communication KSAs positively affect sourcing teamwork effectiveness.

Goal setting and performance management

Having a clearly defined goal is critical to teamwork effectiveness (Van-Mierlo and Kleingeld, 2010). The goal of a sourcing team is typically to find, select, contract with, and manage suppliers within different business units across the organization (Johnson et al., 2002). Therefore, goal setting is critical to superior sourcing team effectiveness. It has also been

shown that an appropriate level of goal difficulty is important for team effectiveness (Weldon and Weingart, 1993). Finally, goal acceptance among team members, something which can be difficult in cross-functional teams, is important for effective performance (Van-Mierlo and Kleingeld, 2010). There is often a tension in sourcing teams between the functional and individual goals of different team members and the collective goals of the team, which may be contested and therefore less well defined. A key KSA, therefore, is for sourcing team members to be able to work together across functional boundaries to establish clear, appropriately challenging, and accepted team goals.

Moreover, sourcing team members are often assigned on a part-time basis, and a risk here is that members may prioritize other responsibilities outside the team, which in turn influences the level of effort that is brought to a team's task. Part-time membership can therefore hinder sourcing team effectiveness. A complementary KSA is then the ability of team members to monitor and evaluate their performance against the team's accepted goals. On-going performance self-evaluation and feedback is important to identifying any failings and to enable the team to take necessary corrective action. Monitoring of individual team-member performance and the link with teamwork effectiveness is also needed to mitigate the risk of free-riding (Weldon and Weingart, 1993). Thus, we hypothesize:

H4: Goal setting and performance management KSAs positively affect sourcing teamwork effectiveness.

Planning and task coordination

The ability to plan and coordinate tasks and information has been identified as an important driver of teamwork effectiveness (Fisher, 2014). The literature suggests that in a sourcing team context there is typically a high level of task interdependence between members because the alignment of purchasing activities with an organization's objectives requires cross-functional

integration and coordination between business units (Handfield et al., 2009). A key KSA, therefore, is for sourcing team members from different functions or business units to be able to recognise task interdependencies and to coordinate their activities. Planning and coordination of the tasks done by different functional representatives is thus critical to sourcing teamwork effectiveness.

A further related insight is that a lack of tasks and roles clarity is likely to result in delays and inaccuracy in the team's activities and outputs (Campion et al., 1996). Another key KSA, then, is for sourcing team members to carefully allocate tasks and set clear expectations. Where sourcing team members possess such planning and task coordination KSAs it can be argued that the team will be more effective in its operational efficiency and ability to meet its targets:

H5: Planning and task coordination KSAs positively affect sourcing teamwork effectiveness.

2.3 Masterclass learning outcomes

Our study posits that the relationships between the team-member KSAs and sourcing teamwork effectiveness are moderated by the learning outcomes from strategic sourcing masterclasses. The masterclasses were designed to bring together sourcing team members from different functions to learn how to use a decision-making framework covering all stages of the procurement process, supported by a body of knowledge about key hazards in strategic sourcing. These kinds of shared learning are important for the formation of team mental models, core coordination mechanisms that make teamwork possible (Mohammed et al., 2010). The moderating effect of masterclass learning outcomes is thus based on the role of shared cognition for good coordination and high performance in teams (Edwards et al., 2006; Lim and Klein, 2006).

The sourcing masterclasses were training and development events, delivered off-site from GAMC for members of its cross-functional sourcing teams. They allowed participants to

discuss the roles and responsibilities of different sourcing team members, reflect on their own strategies and activities, and identify changes that might lead to improved teamwork effectiveness (Mathieu et al., 2005). Such features offered by the masterclasses can attenuate the downsides of cross-functionality, such as team stress (Driedonks et al. 2014), by enhancing cohesiveness. We expect that participation by team members in the sourcing masterclasses leads to a similar understanding and shared knowledge about several dimensions of team interaction: roles and responsibilities, role interdependencies and interaction patterns, and information flows (Mathieu et al., 2000). Sourcing masterclasses were intended to provide what has been called a guided reflexivity intervention (Gurtner et al., 2007), a structured and facilitated opportunity for team members to discuss and reflect critically on their collective activities and strategies. They also provided cross-training features, which are intended to develop inter-positional knowledge or a better understanding of the roles and responsibilities of other team members (Cannon-Bowers et al., 1998; Volpe et al., 1996). Based on these guided reflexivity and cross-training features, it is expected that the sourcing masterclasses will increase the similarity of team members' mental models (Gurtner et al., 2007; Marks et al., 2002). Moreover, we expect that these similar team mental models enable sourcing team members to better coordinate their activities and cope with complex and dynamic task conditions (Mathieu et al., 2000), and will therefore enhance the relationships between team-member KSAs and teamwork effectiveness. Therefore:

H6a-e: The masterclass learning outcomes moderate the relationships between individual team-member KSAs and sourcing teamwork effectiveness.

The conceptual model is presented in Figure 1.

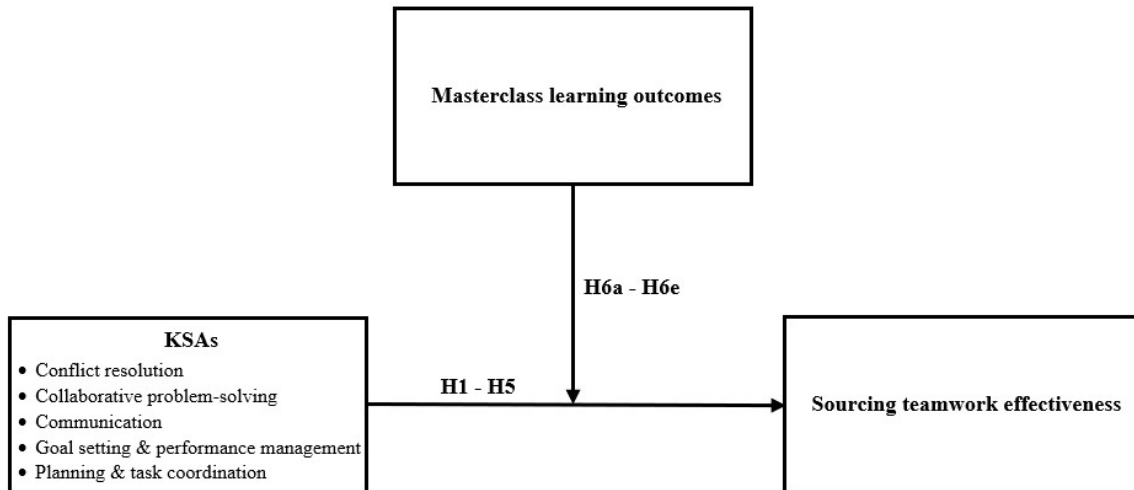


Figure 1: Conceptual model

3. Methods

3.1 Survey and measures design

The measures employed in the survey were largely established pre-existing scales except for the moderator items, which were developed and validated from the literature. For the independent variables, we adopted the scales developed by Stevens and Campion (1999) and utilized additional items found in Aguado et al. (2014). For the dependent variable, we adapted eight items from the scales developed by Driedonks et al. (2014).

For the moderating variable, the survey contained five items to measure the masterclass learning outcomes along three dimensions of team mental models identified by Mathieu et al. (2000): knowledge about roles and responsibilities, knowledge about role interdependencies and interaction patterns, and knowledge about communication channels. These items draw on suggestions from prior research that guided reflexivity interventions (Gurtner et al., 2007) and cross-training (Cannon-Bowers et al., 1998) are expected to increase the similarity of team mental models (Marks et al., 2002). Table A1 presents the constructs and measures.

3.2 Data collection

Before the questionnaire was distributed, ethical approval was sought and given by the authors' institution. A survey pre-test was then performed on two academics with relevant knowledge and expertise and seven experienced GAMC managers with an appropriate mix of functional roles and seniority levels to ensure face validity. This process led to some rewording in the questionnaire to make it clearer and easier to understand.

A total of 237 GAMC managers, the population of sourcing team members who were required by the company to attend one of fifteen masterclasses, were sent an invitation email, with a follow-up reminder email sent two weeks later. Each masterclass was typically attended by members of two or three sourcing teams, each with between 5 and 7 members.

A total of 108 questionnaires were returned, but 18 of these were excluded from the dataset because they were incomplete, resulting in 90 usable responses. Although the sample size is relatively small from a statistical perspective, the response rate of 38% is acceptable (Baruch and Holtom, 2008) and the sample is representative enough of the population of masterclass attendees. Table 1 displays the sample characteristics. To the best of our knowledge, not many empirical studies have made inquiry in the aerospace sector with respect to sourcing teams given the limited accessibility (Williams et al., 2020).

Table 1. Sample demographics

Sample characteristics	
Sample size	90 sourcing team members
Function	61% procurement; 29% engineering; 10% other function
Business unit	23% compressors; 10% turbines; 10% controls; 13% structures and transmissions; 13% installations; 13% rotatives; 6% materials; 12% other unit
Tenure in current post	11% less than 1 year; 46% 1-3 years; 23% 3-5 years; 12% 5-10 years; 8% more than 10 years.

3.3 Data assessment

Non-response bias was assessed as we distributed the survey invitations in two waves, 47% early respondents and 53% late respondents. We tested for significant differences between respondents with a strong learning attitude whose participation was more immediate (early respondents who answered before the reminder) and respondents whose participation required additional urging (late respondents who answered after the reminder). To this end, we conducted a comparison of the means of all variables for the two groups using one-way ANOVA (Clotney and Grawe, 2014). This resulted in non-significant differences at the 0.05 level, suggesting that non-response bias was not an issue and respondents' questionnaires represent an unbiased sample. Further, common method bias was assessed using two approaches. We first performed Harman's single-factor test, in which an un-rotated exploratory factor analysis showed no sign of a single-factor accounting for most of the variance (<20.9%), suggesting that common method bias is not a substantial concern (Podsakoff et al., 2003). Second, we conducted the marker-variable analysis, using the lowest bi-variate correlation between all variables as the marker-variable (Lindell and Whitney, 2001). We employed "the number of years in current role" as the marker-variable, as it is theoretically not associated with at least one variable (Craighead et al., 2011). A comparison of the original and adjusted correlations showed that all correlations remained significant after adjustment, suggesting that our data do not suffer from common method bias (Malhotra et al., 2006).

Additionally, we conducted a two-group (procurement and non-procurement samples) invariance test to ensure measurement equivalence (Knoppen et al., 2015). To this end, we performed a multi-group confirmatory factor analysis MGCFAs in LISREL 8.80, assessing configural and metric invariance (Steenkamp and Baumgartner, 1998). First, configural invariance was tested, exhibiting good fit to the data: $\chi^2 = 672.2$, $df = 543$, $\chi^2/df = 1.238$, $TLI = 0.909$, $CFI = 0.922$, $RMSEA = 0.057$, which supports configural invariance. A metric

invariance test was then performed, exhibiting satisfactory goodness-of-fit properties: $\chi^2 = 696.8$, $df = 561$, $\chi^2/df = 1.242$, $TLI = 0.906$, $CFI = 0.915$, $RMSEA = 0.054$. A χ^2 -difference test was also conducted, which was insignificant ($\Delta\chi^2 = 24.6$, $\Delta df = 18$, $p > 0.05$), thus supporting full metric invariance.

3.4 Measurement assessment

To assess the measurement validity, an exploratory factor analysis (EFA) was conducted using principal components and Varimax rotation. Factor loadings, Cronbach's α , composite reliabilities (CR), and average variance extracted (AVE) are presented in Table 2.

Table 2: Measurement validity assessment

Construct	Item No.	Factor loading	Cronbach's α	CR	AVE
Conflict resolution KSAs (CR)	CR1	0.66	0.68	0.71	0.55
	CR3	0.59			
	CR4	0.62			
Collaborative problem-solving KSAs (CPS)	CPS1	0.60	0.65	0.70	0.53
	CPS2	0.55			
	CPS3	0.56			
	CPS4	0.58			
Communication KSAs (CM)	CM1	0.78	0.72	0.72	0.64
	CM2	0.70			
	CM3	0.62			
	CM5	0.65			
Goal setting and performance management KSAs (GPM)	GPM1	0.72	0.77	0.78	0.62
	GPM2	0.66			
	GPM3	0.75			
	GPM4	0.75			
	GPM5	0.68			
Planning and task coordination KSAs (PTC)	PTC2	0.62	0.72	0.73	0.61
	PTC3	0.73			
	PTC4	0.62			
	PTC5	0.60			
Masterclass learning outcomes (MLO)	MLO1	0.70	0.79	0.81	0.68
	MLO2	0.74			
	MLO3	0.75			
	MLO4	0.77			
	MLO5	0.72			
Sourcing teamwork effectiveness (STE)	STE2	0.70	0.88	0.89	0.66
	STE3	0.82			
	STE4	0.85			
	STE5	0.82			
	STE6	0.78			
	STE7	0.88			
	STE8	0.88			

Based on the EFA results, six items (CR2, CPS5, CPS6, CM4, PTC1, and STE1) were discarded. The factor loading of each remaining item was greater than the recommended minimum of 0.50, all loadings were significant ($p < 0.05$), and all AVE values exceeded 0.50 benchmark (Hair et al., 2010), indicating convergent validity. The Cronbach's α values exceeded the minimum threshold of 0.60 (Jun et al., 2006), which meets the requirement for sufficient reliability. However, Cronbach's α values for CR (0.68) and CPS (0.65) were just below 0.70, which is the preferred cut-off point. Thus, composite reliability indices were examined. The composite reliabilities exceeded 0.70, reflecting the internal consistency of the indicators.

CFA was then performed with LISREL 8.80 to test uni-dimensionality (Byrne, 1998). The CFA results exhibit Chi-square (χ^2) of 639.01 ($p = 0.000$), a degree of freedom (df) of 443, and the relative Chi-square (χ^2/df) of 1.44, which is lower than the recommended threshold of 3.00 (Kline, 2016). The RMSEA value is 0.071, which is below the 0.08 benchmark (Kline, 2016). Results for the Normed Fit Index (0.90), Non-normed Fit Index (0.92), Comparative Fit Index (0.95), and Incremental Fit Index (0.95) also indicate an adequate fit between the measurement model and the data (Kline, 2016).

Finally, discriminant validity was assessed using two analyses. We first performed Chi-square difference tests. The χ^2 -difference tests for all pairs of variables returned significant at $p < 0.01$, supporting discriminant validity (Farrell, 2010). Second, following the procedure proposed by Fornell and Larcker (1981), the AVE was found to be higher than the squared correlation between all pairs of variables, exhibiting sufficient discriminant validity.

4. Data analysis and results

In the first step, data normality was evaluated using the Shapiro-Wilks test. The results revealed insignificant p-values for all variables, approximating a normal distribution (Curran et al., 1996). Correlations and descriptive statistics are shown in Table 3.

Table 3: Descriptive statistics

Variable	Mean	SD	1	2	3	4	5	6	7
1. Conflict Resolution	3.9944	.38030	1						
2. Collaborative Problem-Solving	3.8981	.41333	0.13*	1					
3. Communication	4.0289	.43194	0.45**	0.28*	1				
4. Goal Setting and Performance Management	3.3533	.66640	0.36**	0.09*	0.40**	1			
5. Planning and Task Coordination	3.7756	.45944	0.33**	0.15**	0.48**	0.22*	1		
6. Masterclass Learning Outcomes	3.1964	.60495	0.21*	0.33	0.35**	0.23*	0.28*	1	
7. Sourcing Teamwork Effectiveness	3.5911	.61656	0.38**	0.25*	0.53**	0.34*	0.46**	0.21*	1

Two-tail *t*-test was performed; * Significant at $\alpha=0.05$; ** Significant at $\alpha=0.01$.

Hierarchical regression analysis was conducted with ordinary least squares to assess each hypothesis. First, the main effects of the independent variables (IVs) were tested. The interaction effects between the IVs and the moderator were then analysed. To this end, three regression models were built and assessed (see Table 4).

Table 4: Hierarchical regression results

Variable entered	Dependant variable		
	Sourcing teamwork effectiveness		
	Model 1	Model 2	Model 3
<i>Main effects</i>			
Conflict resolution	0.23**	0.17**	0.19*
Collaborative problem-solving	0.13ns	0.22ns	0.17ns
Communication	0.38***	0.37***	0.40***
Goal setting & performance management	0.20*	0.28**	0.33**
Planning and task coordination	0.33***	0.29***	0.31***
<i>Moderator</i>			
Masterclass learning outcomes		0.18**	0.23**
<i>Interaction effects</i>			
Conflict resolution x Masterclass learning outcomes			0.21**
Collaborative problem-solving x Masterclass learning outcomes			0.26ns
Communication x Masterclass learning outcomes			0.38***
Goal setting & performance man x Masterclass learning outcomes			0.29*
Planning and task coordination x Masterclass learning outcomes			0.25**
R^2 (Sourcing teamwork effectiveness)	0.372	0.397	0.445
ΔR^2 (Sourcing teamwork effectiveness)	0.283	0.025	0.048
F hierarchical	30.908***	5.284**	10.603***

Note: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$; ns: not significant.

The F hierarchical values were obtained by comparing the changes in R^2 between a pair of models

H1 to H5 were tested with Model 1. We used Model 2 to assess the incremental explained variance and the F hierarchical values between the models (Carte and Russell, 2003). H6a to H6e were analysed with Model 3. Table 4 presents the results. The variance inflated factor (VIF) values were also calculated to assess multi-collinearity. The VIF values were below 10.0, ranging from 1.188 to 1.694, suggesting multi-collinearity was not a substantial concern (Hair et al., 2010).

As shown in Model 1, all KSAs constructs positively and significantly affect sourcing teamwork effectiveness apart from collaborative problem-solving. H1, H3, H4 and H5 are therefore supported whereas H2 was found to be not significant. Drawing on Model 3, four of the interaction effects, CR x MLO, CM x MLO, GPM x MLO and PTC x MLO, are positive and significant, indicating that the masterclass learning outcomes positively moderate the effects of these KSAs on teamwork effectiveness. H6a, H6c, H6d and H6e are therefore supported. However, the CPS x MLO interaction effect is not significant, and therefore H6b is not supported.

4.1 Post-hoc analysis

To ensure the robustness of the results, we further employed the partial least squares (PLS) approach using SmartPLS 3 to simultaneously analyse the conceptual model and used bootstrapping procedures with 5000 sub-samples to test the statistical significance of the posited path coefficients (Peng and Lai, 2012). The results of the PLS approach were largely consistent with our regression results (all the hypothesized relationships were statistically significant at 0.05 level), indicating that the results were not significantly different when each construct was included separately in our analyses.

5. Discussion

5.1 Theoretical implications

Our findings extend prior sourcing team research by showing which teamwork KSAs enable team members to exploit the opportunities offered by autonomy, make effective use of team communication processes, take a coordinated approach to decision-making, and cope with conflicting team-member preferences and priorities. This contrasts with existing contributions to research on the skills required for effective PSM, which generically identify that an ability to work in teams is important, but do not explore the specific component parts of this ability (Feisel et al., 2011; Knight et al., 2014).

Specifically, our research suggests that conflict resolution KSAs make an important contribution to teamwork effectiveness, because sourcing teams are typically cross-functional and conflicting priorities and preferences are therefore seen as inevitable (Pratt et al., 2006). Conflict resolution KSAs enable sourcing team members to prevent conflicts from escalating to destructive levels by being able to identify both the sources of conflict and suitable conflict resolution methods (Behfar et al., 2008). Our findings show that communication KSAs have a particularly significant positive relationship with sourcing teamwork effectiveness. This supports prior research suggesting that communication through decentralized channels, both within the team and with external stakeholders, is likely to be a key driver of team effectiveness, because sourcing is a boundary spanning cross-functional activity and team membership is often part-time and geographically dispersed (Driedonks et al., 2010, 2014).

We also find that goal setting and performance management and planning and task coordination KSAs have a significant positive relationship with sourcing teamwork effectiveness. These self-management KSAs enable team members to direct and control their tasks without frequent senior management interventions. This complements prior research showing that autonomy is

a key driver of team success, because it allows greater flexibility, better collaboration, and more effective communication (Driedonks et al., 2010; Hirunyawipada et al., 2010). Our research suggests that in a context where a team is empowered to be self-managing, team members need to have the KSAs that enable them to exploit this autonomy.

Interestingly, our research shows collaborative problem-solving KSAs do not significantly impact sourcing teamwork effectiveness. This contradicts suggestions in the general team research that collaborative problem-solving is advantageous for generating creative and effective solutions (Laughlin, 2011), and for widening organisational commitment to the implementation of solutions (Stevens and Campion, 1994). This may relate to the fact that in sourcing teams collaborative problem-solving tends to make decision-making slower and more difficult, because a wider variety of functional views are involved increasing the likelihood of conflict and lowering cohesiveness (Webber and Donahue, 2001). Prior research shows that increased functional diversity is associated with decreased effectiveness in terms of cooperation with other organisational stakeholders (Driedonks et al., 2010). Some studies have shown that this may be a consequence of goal misalignment between functions leading to political game playing (Franke and Foerstl, 2020b; Marshall et al., 2015; Stanczyk et al., 2015). Therefore, our research may suggest that goal misalignment within sourcing teams is challenging efforts at collaborative problem-solving. Moreover, this may be because the need for a diverse sourcing team increases as the complexity and riskiness of a sourcing decision increases (Johnston and Lewin, 1996). Our findings may thus reflect an association between collaborative problem-solving in a diverse sourcing team and more complex and higher risk sourcing decisions, where the likelihood of team effectiveness is lower.

Our findings also extend the very limited research base on skills in PSM by showing that the learning outcomes from a training and development intervention significantly strengthen the relationships between four team-member KSAs and sourcing teamwork effectiveness. One of

the few previous relevant studies reported that sourcing team members trained in team-working skills are better able to work together and with others outside the team (Driedonks et al. 2010). This earlier research did not, however, identify the possible mechanisms through which teamwork training enhances effectiveness. Our research shows that training with features of guided reflexivity (Gurtner et al., 2007) and cross-training (Cannon-Bowers et al., 1998), which is designed to enhance the similarity of team members' mental models, is an important mechanism to boost the effect of team-member KSAs on sourcing teamwork effectiveness.

Looking in more detail, the findings suggest that the masterclass learning outcomes significantly strengthen the positive relationships between conflict resolution, communication, goal setting and performance management, and planning and task coordination KSAs and sourcing teamwork effectiveness. The significant moderating effect shown for conflict resolution and communication is explicable on the basis that these are inter-personal KSAs, focused on the building and maintenance of good working relationships with other team members. It is logical therefore that a common learning experience, which increases the similarity of what team members know about each other and about their interaction environment, significantly strengthens the effect of these KSAs on sourcing teamwork effectiveness. In the case of goal setting and performance management and planning and task coordination KSAs, the moderating effect may be because a high level of role interdependence between team members is typical in sourcing (Handfield et al., 2009). This implies that the masterclass learning outcomes amplify the impact of these self-management KSAs on sourcing teamwork effectiveness, because the masterclass enables team members to better understand the roles and responsibilities of others from different functions and therefore to better recognise role interdependencies and interaction patterns when setting goals and planning and coordinating their activities.

Taken together these findings point to the key role played by guided reflexivity and cross-training features of the masterclasses as mechanisms for influencing the attitudes and behaviour of sourcing team members towards one another, thereby facilitating greater similarity in team mental models. Having an opportunity to discuss and reflect critically on team activities and strategies, and to learn about the roles and responsibilities of other team members, is likely to encourage a positive attitude towards open communication and collective goals, and a stronger commitment to resolving conflict within the team and with external stakeholders.

Lastly, we find that the masterclass moderating effect is positive but not significant for the relationship between collaborative problem-solving KSAs and sourcing teamwork effectiveness. This is unsurprising given our finding that collaborative problem-solving KSAs do not significantly impact sourcing teamwork effectiveness. Facilitating an increase in the similarity of team mental models may make sourcing team members more willing to tackle the challenges of collaborative problem-solving in a diverse cross-functional team, but the masterclass learning outcomes do not make those challenges easier to overcome.

5.2. Managerial implications

Our findings have two main managerial implications. The first relates to sourcing team composition. Prior research has addressed team composition from the perspective of functional diversity, focusing on task-work and the technical knowledge needed to undertake activities (Mentzer et al., 2008; Swink and Schoenherr, 2015). In contrast, this study follows the argument that for a team to be effective it must successfully perform both task-work and teamwork (Burke et al., 2003). Team composition therefore also requires an understanding of which team-member KSAs are crucial for teamwork effectiveness in the context of sourcing. We therefore suggest that managers could do sourcing team-member selection based on a combination of KSAs and the task-work knowledge required for specific sourcing contexts.

The second concerns the focus and design of teamwork training and development interventions in the context of sourcing teams. Our research shows that communication, conflict resolution, goal setting and performance management, and planning and task coordination KSAs have a significant impact on sourcing teamwork effectiveness. We suggest therefore that teamwork training should focus on these KSAs. Our research also shows that the effects of these team-member KSAs on sourcing teamwork effectiveness were strengthened by a particular type of development event. The strategic sourcing masterclasses introduced a comprehensive decision-making framework combined with guided reflexivity and cross-training interventions to facilitate the formation of similar team mental models (Mohammed et al., 2010), shared cognition about sourcing strategies, activities, roles, and responsibilities. We suggest, therefore, that managers seeking to maximize the effect of team-member KSAs on sourcing teamwork effectiveness should design their training interventions with these principles of a decision-making framework, reflexivity and cross-training in mind.

6. Conclusion and further research

This study contributes significantly to the first wave of empirical investigations into the impact of team-member KSAs on sourcing teamwork effectiveness, a perspective that is absent in the SCM literature. Previous research has explored the key factors driving sourcing team effectiveness including team autonomy (Driedonks et al., 2010), the extent to which team decision-making approaches are rational or intuitive (Kaufmann et al., 2014), and the degree of consensus between team member objectives (Meschnig and Kaufmann, 2015). While these factors do recognise the role of people in teams, they operate at an aggregate group or process level. Our research, in contrast, focuses on the characteristics of individual sourcing team members in terms of their KSAs and their perceptions of teamwork effectiveness. We thereby provide an individual actor-level perspective on the functioning of sourcing teams, responding

to calls for more behavioural research in the SCM field (Schorsch et al., 2017; Schulze et al., 2019). We also contribute to the very limited research base on skills in PSM by showing that the learning outcomes from a training and development intervention designed to enhance the similarity of team mental models significantly strengthen the relationships between four team-member KSAs and sourcing teamwork effectiveness.

There are some limitations in our study, however. First, rather than surveying a random sample of respondents from several firms, we used respondents from one large company, because we wanted to explore the influence of a particular learning experience on the perceptions of sourcing team members in that company. However, our findings may have been influenced by a relatively high degree of homogeneity in the organisational culture of our survey respondents, partly reflecting the national values of GAMC's home country and partly reflecting the values of the aerospace manufacturing sector. Consequently, generalization of our findings to a wider population of firms in different industry sectors and with different organisational cultures should be done with caution. Nevertheless, our approach is corroborated by existing research (Miron-Spektor et al. 2011), where all respondents were from the same company to gain richer insights of the phenomena under investigation.

Second, although the sample size is relatively small, the study is deemed meritorious given the limited accessibility of this type of large firm that has performed cross-functional training, and more importantly the limited willingness of executives to pause training for research purposes. The study approach is further corroborated by works of Meschnig and Kaufmann (2015) and Miron-Spektor et al. (2011), who used small samples under similar circumstances. Third, our survey uses only self-report measures, which means that the potential for common method bias cannot be entirely ruled out. The use of perceptual measures is common, however, in sourcing teams research (Driedonks et al., 2010, 2014; Kiratli et al., 2016), because it is difficult to

define and obtain objective measures of teamwork effectiveness and antecedent success factors.

Fourth, task-work effectiveness, related to the specific content of the sourcing strategies, is not considered in our research. Fifth, although we use a mature and established measure of collaborative problem-solving KSAs (Stevens and Campion, 1999; Aguado et al., 2014), it may not encompass wider obstacles preventing individuals from working together in a team. Moreover, our cross-sectional survey design limits our understanding of how team members might collaborate over time to overcome these obstacles. Finally, because we use a cross-sectional design, we are unable to provide evidence about how the effect of our moderator might change over time. We are unable to show if the moderating effect of this common learning experience is perhaps cumulative as sourcing team members embed what they have learned in their everyday behaviour, or if the learning transfer effect diminishes over time (Saks and Burke, 2012).

Given these limitations, we can identify several avenues for further research. First, a larger sample size would be desirable to enhance statistical power. This could include those GAMC sourcing team members who have not attended a masterclass to verify the KSAs-teamwork effectiveness associations (H1-H5). Evidence from a wider range of organisations and industry sectors would also allow us to consider the potential effect of different organisational cultures. Another avenue for further research would be to expand the teamwork effectiveness construct to include task-work aspects related to different types of sourcing context. It would also be useful to consider how individual team-member KSAs might influence task-work effectiveness. One possibility suggested by our research is that team-member KSAs might be a moderator, strengthening the effects of group level antecedents such as autonomy and communication processes on task-work effectiveness in different contexts. This line of enquiry would complement the work done by Knight et al. (2014), which shows how the knowledge

and skills required for effective PSM vary across different purchase categories. Moreover, future research could explore additional measurement items for other dimensions of collaborative problem-solving to map a more comprehensive measure, and longitudinal research would help us to understand better how PSM staff collaborate with other team members. Finally, a longitudinal research design would also enable us to shed light on how the moderating effect of a common learning experience might change over time via an interrupted time-series approach to measure the effects before and after training.

Appendix

Table A1. Constructs and measures

Construct	Item No.	Measure	References
Conflict resolution KSAs (CR)	CR1	When my sourcing team is in conflict, I try to make the conflict explicit so that solutions can be found	Aguado et al. (2014); Stevens and Campion (1999)
	CR2	<i>When I disagree with others, I make an effort to focus on what we have in common instead of centring on what separates us</i>	
	CR3	When we face an internal conflict because of a communication problem or misunderstanding, I try to solve it by asking questions and listening to the people involved	
	CR4	When my personal interests are in conflict with others' interests, I tend to be honest in the sourcing team discussion so that others understand my needs	
Collaborative problem-solving KSAs (CPS)	CPS1	I play an active role in sourcing team meetings by offering my opinions, asking questions and expressing my thoughts and ideas in a sincere and open way	Aguado et al. (2014); Stevens and Campion (1999)
	CPS2	When I am upset about something, I express my discomfort to the sourcing team in a constructive way, asking for solution alternatives	
	CPS3	If something upsets me in my sourcing team, I do not like to act as if nothing has happened	
	CPS4	During sourcing team meetings, I encourage all members to provide their opinions to avoid situations where only a few participate actively	
	CPS5	<i>In sourcing team meetings, I promote cohesion and seek to reach a majority agreement rather than paying attention to divergent opinions</i>	
	CPS6	<i>I try listening to my peers' opinions without evaluating their positions as good or bad</i>	
Communication KSAs (CM)	CM1	When I interact with my sourcing team-mates, I ask questions to better understand what they say	Aguado et al. (2014); Stevens and Campion (1999)
	CM2	I try to use the most appropriate mode of communication in my sourcing team to communicate different types of information, avoiding use of the same mode all the time	
	CM3	I make an effort to talk about less important things with my sourcing team-mates for the sake of team spirit and better internal communication	
	CM4	<i>When working in my sourcing team, I say what I think in an open and sincere way</i>	
	CM5	I expect my sourcing team-mates trust me enough to tell me about the aspects of my work that they most dislike	
Goal-setting and performance	GPM1	I often get involved in monitoring the task performance of other members of my sourcing team	Aguado et al. (2014);
	GPM2	I like to provide my sourcing team-mates with feedback about what they do and to assess and value their work	

management KSAs (GPM)	GPM3	I try to establish milestones in my sourcing team so that we can monitor our assigned tasks	Stevens and Campion (1999)
	GPM4	I provide my sourcing team-mates with relevant information on how well I think the team tasks are progressing	
	GPM5	I often provide my sourcing team-mates with feedback on their task performance	
Planning and task coordination KSAs (PTC)	<i>PTC1</i>	<i>To address trivial task-related issues, I do not need to talk first with all sourcing team-members so we reach a decision</i>	Aguado et al. (2014); Stevens and Campion (1999)
	PTC2	Having knowledge about my sourcing team-mates' skills and situation requirements is critical to assign tasks properly	
	PTC3	I often help others in my sourcing team to make clear the roles and tasks they have to perform	
	PTC4	When doing my job, I prioritize the tasks most necessary for my sourcing team-mates to complete their work	
	PTC5	I try to ensure that my outputs match the inputs needed by my sourcing team-mates to perform their tasks	
Masterclass learning outcomes (MLO)	MLO1	The masterclass content was directly relevant to my day-to-day role and responsibilities	Cannon-Bowers et al. (1998); Gurtner et al. (2007); Mathieu et al. (2000) Volpe et al. (1996)
	MLO2	The masterclass has improved my understanding of roles and responsibilities in sourcing and supplier management	
	MLO3	The masterclass has improved my understanding of cross-functional working in sourcing and supplier management	
	MLO4	The masterclass has improved my ability to discuss sourcing issues with colleagues who have also been on the programme	
	MLO5	The masterclass has improved my ability to discuss sourcing issues with my senior managers	
Sourcing teamwork effectiveness (STE)	<i>STE1</i>	<i>My sourcing team produces a large quantity or high amount of work</i>	Driedonks et al. (2014); Trent and Monczka, (1994)
	STE2	My sourcing team produces high quality or high accuracy of work	
	STE3	My sourcing team's reputation for work excellence is high	
	STE4	The efficiency of my sourcing team's operations is high	
	STE5	My sourcing team's ability to meet timing and task schedule targets is high	
	STE6	My sourcing team's ability to communicate and coordinate activities with non-team members across functional boundaries is good	
	STE7	My sourcing team's ability to work with others outside the team is good	
	STE8	My sourcing team's ability to cooperate with other departments and business units is good	

Note: The items in italics were dropped.

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