

Explaining effective team vision development in small, entrepreneurial teams: A shared mental models approach

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ABSTRACT

Organizing entrepreneurial collaboration in small, self-directed teams is gaining popularity. The underlying co-creation processes of developing a shared team vision were analyzed with a core focus on three underlying processes that originate from the shared mental models framework. These processes are: 1) the emergence of individual visions and vision integration, 2) conflict solving, and 3) redesigning the emerging knowledge structure. Key in the analysis is the impact of these three processes on two outcome variables:

1) the perceived strength of the co-creation process, 2) the final team vision. The influence of business expertise and the relationship between personality traits and intellectual synergy was also studied.

The impact of the three quality shared mental model (SMM) variables proves to be significant and strong, but indirect. To be effective, individual visions need to be debated during a second conflict phase. Subsequently, redesigning the shared knowledge structure resulting from the conflict solving phase is a key process in a third elaboration phase. This sequence positively influences the experienced strength of the co-creation process, the latter directly enhancing the quality of the final team vision. The indirect effect reveals that in order to be effective, the three SMM processes need to be combined, and that the influence follows a specific path. Furthermore, higher averages as well as a diversity of business expertise enhance the quality of the final team vision. Significant relationships between personality and an intellectual synergy were found. The results offer applicable insights for team learning and group dynamics in developing an entrepreneurial team vision.

Introduction

Much of the mainstream entrepreneurship literature focuses on the individual entrepreneur. However, a growing body of research acknowledges the collective nature of entrepreneurship (Misganaw, 2018). In line with these research results, in practice, organizing entrepreneurial activities in small, non-hierarchical teams is gaining popularity (Ernest, Matthew, & Samuel, 2015; Hensel & Visser, 2018; Hmieleski & Ensley, 2007; Kellermanns, Walter, Lechner, & Floyd, 2005; Lukes & Stephan, 2017; Unger, Rauch, Frese, & Rosenbusch, 2011). The following three points explain the growing scholarly interest in entrepreneurial

teams. First, significant portions of the new ventures are founded by teams (German Startups Association, 2016). Second, entrepreneurial teams tend to outperform solo starters (Baum & Silverman, 2004). And third, new venture performance in complex environments is impacted by unifying entrepreneurial behaviors in autonomous teams, embedded in flat, non-hierarchical organizational structures (Cooney, 2005; Hmieleski & Ensley, 2007; Kellermanns et al., 2005; Lechner & Floyd, 2012).

One of the core processes in entrepreneurial teams is the co-creation of a shared team vision (Dyer, Gregersen, & Christensen, 2008; Dyer, Gregersen, & Christensen, 2011). A multidimensional vision on business opportunities and their associated business strategies should be regarded as pivotal in innovative entrepre-

neurship. Innovative entrepreneurship is defined as exploring and exploiting new products and new markets, developing new business models or creating new markets for existing products (Dyer et al., 2008; Dyer et al., 2011). Evidence indeed exists that entrepreneurial collaboration enhances innovative capacities, which again fuel entrepreneurial effectiveness. This effect is due to 1) more and better human capital, by example more (diverse) experience, knowledge and skills; 2) social capital (larger and more diverse network); 3) greater learning capacity; 4) greater risk sharing; and 5) high quality shared mental models (SMMs). Research support exists that indeed small firm survival and success may depend on taking advantage of human, social and intellectual capital (Greene, Brush, & Brown, 1997; Sequeira, Weeks, Bell, & Gibbs, 2018). These SMMs refer to the overlapping mental representation of knowledge by team members, frequently labeled as the shared cognitive map (Badke-Schaub, Neumann, Lauche, & Mohammed, 2007; Sarasvathy & Dew, 2013; Venkataraman, Sarasvathy, Dew, & Forster, 2012).

The 'Shared Mental Models' (SMM) framework is highly relevant in this context (Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers, 2000). The underlying processes in developing SMMs help team members to develop a multidimensional-shared team vision, which can be characterized as a shared cognitive representation of all relevant relationships and causalities (Jonker, Van Riemsdijk, & Vermeulen, 2011; Klimoski & Mohammed, 1994; Mohammed, Ferzandi, & Hamilton, 2010). Teams in general, whose members develop high quality, shared knowledge structures or SSMs, performed better in defining strategic action and acting on it (DeChurch & Mesmer-Magnus, 2010; Xiang, Lu, & Gupta, 2013). The quality of these shared knowledge structures or SSMs depends highly on a comprehensive, multidimensional-shared cognitive representation on strategic goals, team tasks, key work processes, and key performance indicators. Moreover, a shared team vision, based on the strategic consensus on organizational goals, is considered to be a very important mechanism in the effectuation of an organizational strategy (Knight, Pearce, Smith, Olian, Sims, Smith, & Flood, 1999). Teams that perform well in ambiguous and complex circumstances need to be highly coordinated, in order to respond flexibly and deploy core competencies in a timely manner (Ensley, Hmieleski, & Pearce, 2006). An SMM is therefore a key issue, functioning as a strategically relevant coordination mechanism in innovative entrepreneurship.

The close associations between the SMM frame-

work, developing a shared entrepreneurial team vision and strategic decision making in teams is probably best illustrated by the definition of SMMs: "SMMs are defined as the knowledge structures held by members of the team that enable them to form accurate explanations and expectations for the task, and, in turn, to coordinate the actions and adaptive behavior of the task in two other team members' actions" (Zhou & Wang, 2010, pp. 434). Although the SMM framework seems helpful in understanding how entrepreneurial teams transform available resources (e.g. human and social capital) into shared team visions and business models, surprisingly few empirical studies have been conducted in the context of entrepreneurship. In this context, an additional challenge arises. Individuals are attracted to entrepreneurship or participate in startups in order to develop their visions and talents in their own autonomous and authentic way (Baum, Frese, & Baron, 2014). However, when entrepreneurship is organized in small teams or is founded by multiple entrepreneurs, individuals have to conform to the group with the consequence of being forced to give up their autonomy. This highlights the necessity of understanding the process of developing a team vision in the context of entrepreneurship in small teams or informally, non-hierarchically organized small businesses.

Theoretical Framework

Scientific concerns, based on meta studies, have been expressed on the strong diversity in theoretical perspectives used in analyzing the SMM framework, leading to quite some theoretical misunderstandings and a dysfunctional diversity in theoretical conceptualizations of the SMM framework itself (see for an overview in DeChurch & Mesmer-Magnus, 2010). The lack of specification of the theoretical lens in studying the SMM framework is key in this criticism. Consequently, a methodological claim exists. It is claimed, in the research on the SMM framework, that a classification system of the core theoretical perspective should be applied (DeChurch & Mesmer-Magnus, 2010). When applying this classification system, three major categories should be used: 1) *the elicitation method*, measuring the quality of the cognitive map or specific components of the emerging knowledge structure, 2) *the structure of the presentation between team members*, representing the degree of association of the distinct cognitive components between team members, and 3) *the representation of emergence*, measuring the team climate aiming at a strong shared consensus in team perceptions. In this paper, the core focus

is on the third perspective, analyzing the exact nature of the co-creation process and climate, in developing a shared team vision, and studying the influence of a team climate. Conflict solving, feedback mechanisms and creative elaboration and redesign mechanisms are key issues in studying the team climate. This core focus on the process and the climate of co-creating a shared team vision is also based on the following theoretical criticism: the majority of research in studying the SMM framework mainly focuses on the team's emerging knowledge structure or the quality level of association of the cognitive map, omitting highly relevant issues of the co-creation process (Preller, Breugst, & Patzelt, 2016; Van den Bossche, Gijsselaers, Segers, Woltjer, & Kirschner, 2011). Based on the theoretical consideration of scholars Kellerman et al. (2005), Sarasvathy & Dew (2013), Van den Bossche et al. (2011), and Venkataraman et al. (2012), a model will be developed and tested hypothesizing that three specific phases in the co-creation process exist. The *first phase* is characterized by an emerging knowledge structure, its quality closely related to the creativity of the emerging individual visions and the capacity to create a holistic overview of highly diverse innovative views and perspectives. *Phase two* is hypothesized to be a *cognitive conflict phase*, in which debating on differences in visions or perspectives and effective feedback mechanisms is highly relevant. The construction of a second phase is very much based on studies, revealing that the quality of the emerging knowledge structures and emerging visions only enhances a team performance when teams are able to timely activate effective cognitive conflict solving skills (Van den Bossche et al., 2011). However, an important distinction should be made between cognitive conflicts and affective conflicts (Van den Bossche et al., 2011). While cognitive conflicts refer to differences and subsequent clashes in perspectives and visions, affective conflicts are related to the underlying values and their associated emotions, which are often strong and intense. The *third phase* is an elaboration phase. This is based on studies and theoretical considerations that high-quality team member interactions (deep listening and intellectual synergy) should be aimed at the redesign and redevelopment of the emerging knowledge structure. The rationale of including this third phase follows research results and theoretical considerations, showing that a redevelopment and redesign of a shared team vision of the business model is highly relevant for entrepreneurial effectiveness, especially when innovative capacities are demanded (Sarasvathy & Dew, 2013; Talaulicar,

Grundeis, & Werder, 2005; Venkataraman et al., 2012). However, little is known about these insights with respect to the co-creation of an entrepreneurial vision in small self-directed teams.

It should be underscored that all the above listed considerations only hold for entrepreneurial activities in complex and ambiguous environments (for an overview see: (Kellermanns et al., 2005)). In this sense, as previously explained, the research results of this study can only be generalized to innovative entrepreneurship that has to operate and compete in such environments.

To create an overview, the three core SMM processes in this study include:

1. The cognitive, emerging knowledge structure (based on innovative and creative emerging individual visions and the capacity to integrate a high diversity of visions into a team vision).
2. Constructive cognitive, conflict solving and feedback.
3. Team members' interaction directed on the redesign and redevelopment of the emerging knowledge structure.

These three processes will form the three major (endogenous) variables of the SMM framework. It will be analyzed whether the sequence of the three SMM endogenous variables impact two dependent variables or success criteria including:

1. The perceived strength of the co-creation process.
2. The quality of the final shared team vision.

It is hypothesized that a specific path exists. Moreover, it will be tested whether the perceived strength of the co-creation process is both a dependent and independent variable. This implies that the three endogenous SMM variables will impact the perceived strength of the co-creation process, the latter enhancing the quality of the final team vision. Although it is often assumed that the perceived strength of the co-creation positively influences an entrepreneurial team performance, little scientific evidence seems available to support this direct relationship, especially when the perceived strength of the co-creation process is measured by all three SMM variables listed above (DeChurch & Mesmer-Magnus, 2010).

Close Associations of the Cognitive Map Between Team Members

There also exists another major theoretical complexity. As previously mentioned, the levels of association or closeness of the cognitive map between team members is frequently applied as a theoretical lens in analyzing SMMs. The central hypothesis in these studies is that closer associations strengthen the quality of SMMs (see for an overview in DeChurch & Mesmer-Magnus, 2010). However, some research and theoretical considerations seem to contradict the scientifically grounded application of this measure. Research has revealed that a close association has a mitigating effect on the team capacity to develop a team vision in a multi-faceted or multidimensional way (see for an overview in: Kellermanns et al., 2005). Furthermore, a diversity in opinions, a disagreement as opposed to a strong shared group conformity, as well as a continuous open discussion and disagreement have proved to have an enhancing effect on a team performance in complex environments (see for an overview in: Kellermanns et al., 2005). Moreover, a strong conformity towards group consensus combined with conflict avoidance hampers the team performance in analyzing ambiguous information, both representing important dysfunctional group processes in complex environments (LePine, Erez, & Johnson, 2002). Consequently, in this study, the measure of closeness of associations will be replaced by two other measures: 1) the team capacity to integrate a strong diversity of individual visions into a holistic overview, and 2) the enriching influence of an ongoing disagreement about the multi-faceted character of the shared team vision. The first variable will be used as a measure of the first phase, in which the knowledge structure emerges, and the second as a measure of the conflict-solving phase.

Business Expertise

Another key issue in this paper is an analysis of the influence of business knowledge. In this methodological approach, we follow scholars such as Unger et al. (2011) and Zhao, Seibert & Lumpkin (2010), arguing that when specific entrepreneurial success criteria are analyzed, the influence of competencies or entrepreneurial qualities should be compared to the enhancing effect of business expertise. In this study, the influence of collaboration competencies originating from the SMM framework will be compared to the impact of business knowledge. This is based on research showing that business expertise has a slightly higher

enhancing effect on general entrepreneurial success when compared to the influence of competencies, soft skills or entrepreneurial qualities (Zhao et al., 2010).

Intellectual Synergy in the Process of SMM Development and Personality

Very little is known about intellectual synergy in the context of knowledge innovation, or the development of a team vision in an entrepreneurial context. An intellectual synergy, often labeled as intellectual stimulation, is a key process in developing an entrepreneurial team vision, especially when innovation capacities are demanded (Dyer et al., 2008; Dyer et al., 2011; Sarasvathy & Dew, 2013). To enhance our theoretical understanding of an intellectual synergy, we analyzed the influence of personality traits on the intellectual synergy between team members. As explained earlier, we will only study small, self-directed teams, which implies that the research results are of interest mainly for this entrepreneurial context. This is based on the following three reasons. First, a strong heterogeneity of entrepreneurial teams exists. Claims of strong uniformity in entrepreneurial teams are commonly held to be a myth (Misganaw, 2018), and therefore the nature of the studied team should be specified. Second, innovative entrepreneurial capacities of teams relate to their levels of self-directedness and autonomy (Ensley et al., 2006). And third, the co-creation process team size matters. Learning and developing capacities in teams with a high number of team members are quite limited (Van den Bossche et al., 2011).

Core research question:

How do the Shared Mental Model processes relate to the perceived strength of the co-creation process and to the final team vision?

Sub-research question 1:

What is the impact of 1) business expertise and 2) personality traits related to an intellectual synergy, on the perceived strength of the co-creation process and the final team vision?

Sub-research question 2:

Is personality related to an intellectual synergy in the process of elaborating an emerging entrepreneurial knowledge structure?

Method

The model is based on data collected among un-

dergraduate students (N=97, 25 teams) of an entrepreneurial business program. To design a more realistic entrepreneurial research context, 25 groups of students were allocated to real retailers. All these retailers were in great need of an innovative digital marketing strategy, with a strong focus on the use of social media (Resnick, Cheng, Simpson, & Lourenço, 2016).

The major reason to select this cohort was the availability of a multi-rater judgment on expertise levels, and a very comparable level of entrepreneurial experience. Ninety-eight percent of the cohort succeeded in accomplishing four courses with real entrepreneurial activities, executing entrepreneurial skills in the prelaunch and launch phases of a small, self-directed team. Moreover, and maybe more importantly, by the mandatory nature of this research context the response rate was 100%. An 80% response rate is the absolute minimum for a valid and reliable team analysis, when individual scores are reciprocal interdependent (Kirkman, Tesluk, & Rosen, 2001; McNeish, 2017). Because the analysis of the co-creation process demands a small group size (Van den Bossche et al., 2011), the size of the allocated groups varied between three and five students ($M=3.9$; $SD=0.7$).

A questionnaire was designed to measure the three endogenous SMM latent variables. Its validity will be tested by a confirmative factor analysis using MPlus 7.4 software. Full explanation of the measures of these three endogenous SMM variables are revealed in Figure 1, presenting the final model. A structural equation model (MPlus 7.4 software) was developed and tested to understand and explain how three processes, supporting the construction of SMMs, relate to the (within groups) aggregated perceived strength of the team-process, as well to the quality of the final shared team vision. The quality of the shared, final team vision is constructed by the sum of two scores – the aggregated ‘within teams’ judgment provided by the team members themselves and the supervisor’s judgment on this final team vision – divided by two.

Because the judgments of the individuals proved to be reciprocally interdependent, it is important to mention that the response rate was 100%. An 80% response rate is the demanded minimum for

Personality

All participants of the study completed an entire extended version of a Big 5 personality test, the measurement instrument being completely based on the official Five Factor Model of personality (Barrick, Mount, & Judge, 2001; McCrae & Costa Jr, 1997).

This instrument measures the Big 5 domain scales as well as the Big 5 sub-scales, often labeled as the facets. The use of the facets next to the domains is based on research showing that models studying entrepreneurial behaviors, social learning and innovative behaviors should include the Big 5 facets next to the domains (Hensel & Visser, 2018; Schneider & Smith, 2004). Averages as well as standard deviations of the Big 5 domain and facet dimensions will be included in the model.

Business Expertise

To study the influence of business expertise, the aggregated group means as well as the aggregated standard deviation (diversity) of expertise levels will be included in the model. This is with the aim to analyze whether next to knowledge levels (means) a strong(er) diversity (standard deviation) impacts the two exogenous dependent variables, being the strength of the perceived co-creation process and the final shared team vision. The grade-point average (GPA) is used to measure expertise levels. The GPA, a multi-rater judgment, is considered to be a valid and reliable measure of expertise levels (Poropat, 2009; Richardson, Abraham, & Bond, 2012).

Results

The confirmative factor analysis (CFA) resulted in strong support for the use of the three latent variables, the three endogenous dimensions of the SMM framework (RMSEA:0.76; CFI: 0.96/TLI:0.95; SRMR:0.45). Furthermore, the second order CFA of the Big 5 personality test proved to have agreeable indices (RMSEA:0.79; CFI:0.90/TLI:0.91; SRMR:0.68). The CFA of the final model revealed that the quality of the emerging knowledge structure depends highly on innovative, creative visions, but especially on the team capacity to integrate a strong diversity of individual visions into a holistic team vision (estimated factor loading: 0.65***). This also holds for the item disagreement enriching a multifaceted team vision. It proved to be an important measure of the quality of the conflict-solving phase (estimated factor loading: 0.81**). The final model proved to have acceptable and good fit indices: RMSEA: 0.067; CFI: 0.95/TLI:0.94; SRMR: 0.064. The full model is on the next page. In Table 1a, all the direct effects of the full final model are presented.

Table 1a reveals that no direct relationships exist between the final shared team vision and the three la-

tent (endogenous) SMM variables. The final model, presented in Figures 1 and 2 (overview) shows that the effects of all three SMM variables on the final team vision is strong, significant, but indirect.

To create an overview, a selection of the three independent (endogenous) SMM variables, the two (aggregated) measures of business expertise, and the two (aggregated) outcome (exogenous) variables of the model are presented in Figure 2.

Figures 1 and 2 reveal that the perceived strength of the co-creation process is directly related to the quality of the final team vision, when 1) the quality of the emerging knowledge structure, the variables, 2) conflict solving, and 3) quality interaction in elaboration

Table 1a

Direct effects of the 3 SMM variables on the final shared team vision (estimated (stand.) R-square = 0.66)

Final shared team vision on:	Estimated Predictive Strength	Two-tailed P-value
Perceived strength of the co-creation process	0.61	0.00
Quality emerging individual visions/vision integration	-0.08	0.71
Conflict solving	-0.36	0.08
Quality team member interaction in elaboration process	0.49	0.09

ing on the emerging knowledge structure are included in one model. As hypothesized, the perceived strength of the process proves to be a dependent as well as an independent variable. This implies that the positive influence of all three SMM variables runs through (is completely mediated by) the perceived strength of the process. This means that after successfully executing three specific phases in the co-creation process, a significant enhancing effect is realized on the team members' perceived strength of the process. The perceived strength of the co-creation process is directly and strongly related to the final team vision with a strong regression weight: 0.57. An overview of the specific paths of the indirect (mediation) effects is presented in Tables 1b to 1d.

The specific order of the SMM variables in the model is illustrated by pointing out that the effect of the first SMM variable, the quality of the emerging knowledge structure on conflicting solving/feedback, is direct and strong (0.91***), just as the effect of conflicting solving/feedback on the quality of team members' interaction in the elaboration process (0.9***). The estimated proportion explained variance (R-square) of the first dependent variable, the perceived strength

Table 1b

Indirect effects of the SMM variable 'quality emerging individual visions/ vision integration' about the quality of the final shared team vision

Visions/vision integration indirect effect on: final shared team vision	Estimated Predictive Strength	Two-Tailed P-Value
Total	0.57	0.000
Indirect	0.48	0.014
Specific (path) indirect: Vision/vision integration Conflict solving Quality interaction in elaboration process	0.33	0.026
Strength of the co-creation process		

Table 1c

Indirect effects of the SMM 'conflict solving/feedback' on the quality of the final rated team vision

Conflict solving/feedback indirect effect on: final shared team vision	Estimated predictive strength	Two-tailed P-value
Total	0.39	0.20
Indirect	0.37	0.53
Specific (path) indirect: Conflict solving Quality interaction in elaboration process	0.36	0.025
Strength of the co-creation process		

Table 1d

Indirect effects of the SMM variable 'quality team interaction' in the redesign and redevelopment process on the quality of the final rated team vision

Redesigning an emerging knowledge structure indirect effect on: final shared team vision	Estimated predictive strength	Two-tailed P-value
Total	0.039	0.86
Indirect	0.4	0.02
Specific (path) indirect: Quality interaction in elaboration process	0.4	0.02
Strength of the co-creation process		

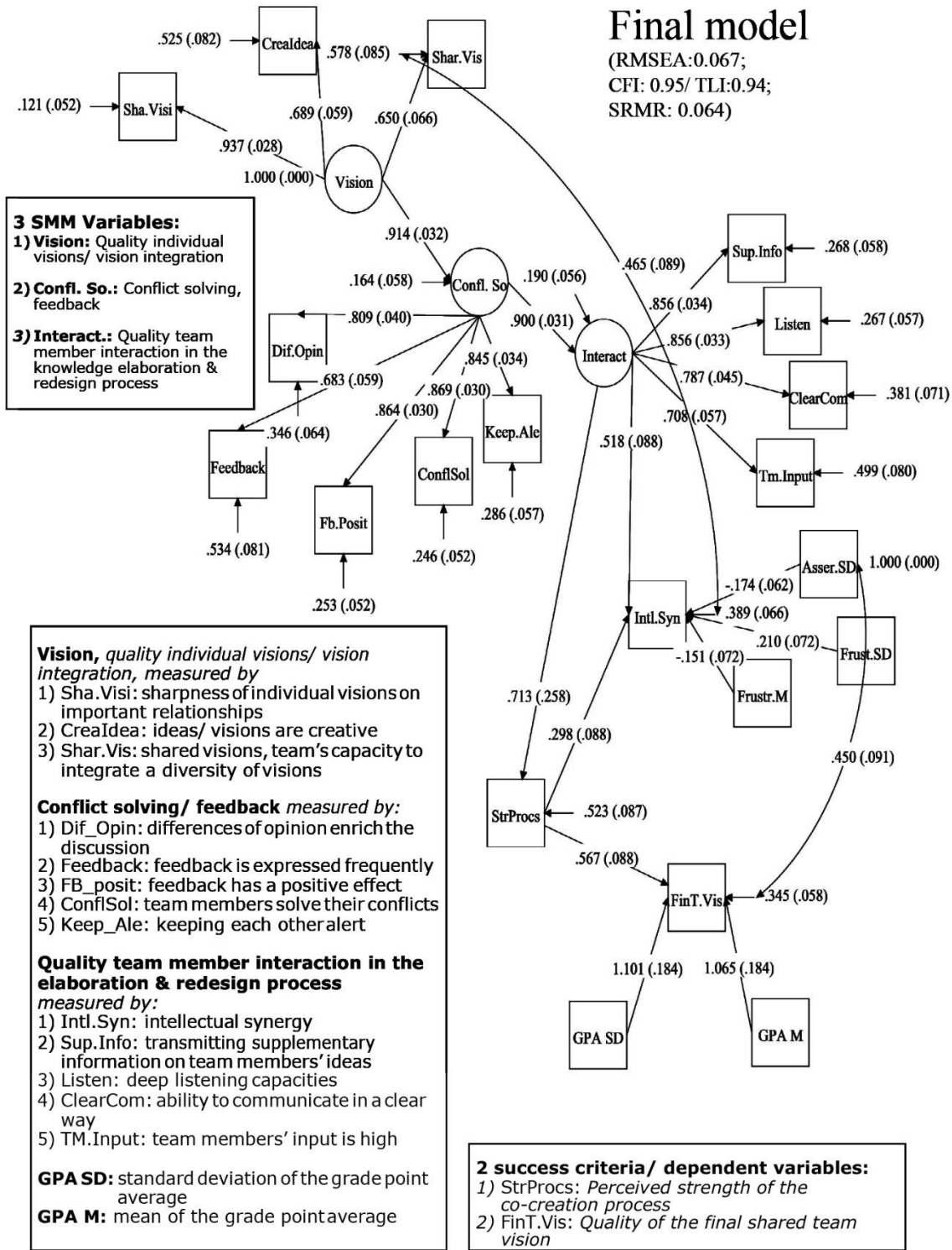


Figure 1. The complete final model, including a comprehensive presentation of the measures of the three SMM variables.

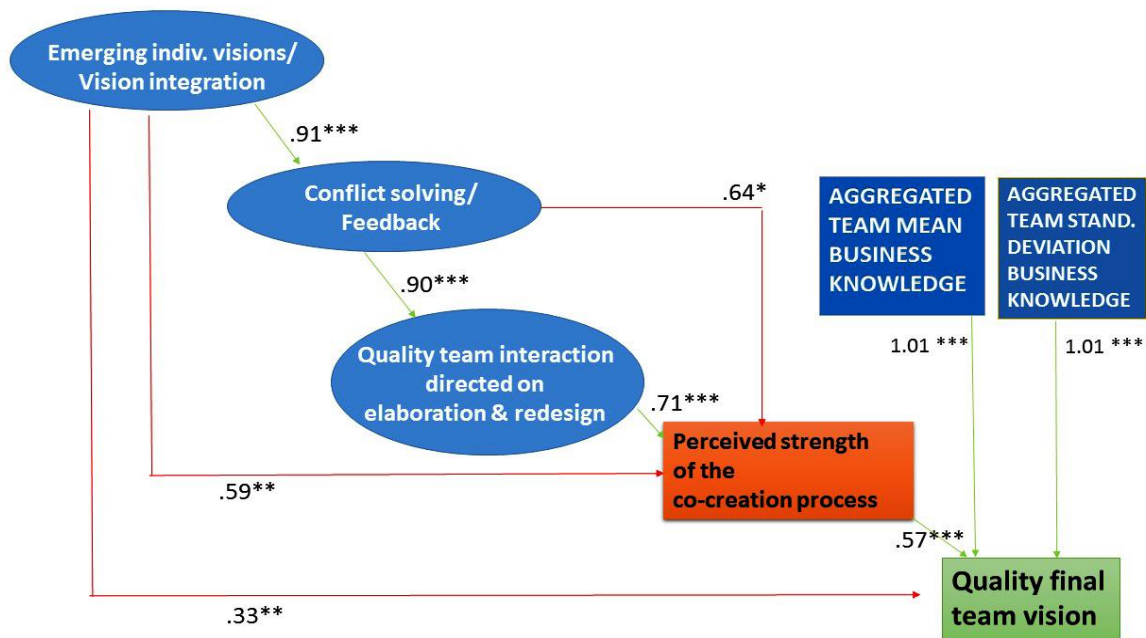


Figure 2. Overview of the final model

of the SMM co-creation process is 46 percent. For the second success dependent variable, the aggregated and combined judgment on the quality of the final team vision, the proportion explained variance is 66 percent. This is considered to be a very satisfying result (McNeish, 2017). All the direct effects are presented in Tables 2a to 2c.

The impact of 1) the quality of the individual visions/integrating visions on conflict solving, just as 2) conflict solving on the quality of team member interaction, and 3) the quality of team member interaction on the first dependent variable, the perceived strength of the co-creation process, is direct and strong. Moreover, the proportion explained variance, presented by the

standardized estimated R-square, is very high at 84% (emerging individual visions/vision integration), 81% (conflict solving/feedback), and 48% (team interaction directed on redesigning an emerging knowledge structure).

Intellectual Synergy

The final model (presented in Figure 1) shows that a direct and strong relationship exists between the perceived strength of the process and an intellectual synergy. Table 3 shows that, as hypothesized, relationships exist between an intellectual synergy and personality.

Intellectual synergy is an important measure of

Table 2a

Direct effects of the SMM variable quality individual visions/vision integration on conflict solving/feedback

Conflict solving/feedback on:	Estimated predictive strength	Stand. estimated R-square (prop. explained variance)
Quality emerging individual visions/vision integration	0.91***	0.84

Table 2b

Direct effects of the SMM variable conflict solving/feedback/vision integration on quality of team interaction in the elaboration process

Quality of team interaction on:	Estimated predictive strength	Stand. estimated R-square (prop. explained variance)
Conflict solving/feedback	0.90**	0.84

Table 2c

Direct effects of the SMM variable ‘quality of team interaction’/vision integration on the ‘perceived strength of the co-creation process’

Strength of the co-creation process on:	Estimated predictive strength	Stand. estimated R-square (prop. explained variance)
Quality team interaction	0.61**	0.48

the elaboration process, phase three. The aggregated standard deviation of the personality trait assertiveness, as well as the aggregated mean of the personality trait frustration is negatively related to the intellectual synergy between team members. The aggregated standard deviation of frustration, measuring the diversity of this personality trait, has an enhancing effect on the

Table 3

Estimated predictive strength of intellectual synergy (estimated (stand.) R-square: 0.7) between team members

Intellectual synergy on:	Estimated predictive strength
Aggregated standard deviation assertiveness	-0.22**
Aggregated standard deviation coping with frustrations	0.2**
Aggregated mean coping with frustrations	-0.2**

outcome variable. Assertiveness measures self-initiative and assertive behaviors with a strong focus on own interests. The sub-dimension assertiveness originates from the domain dimension extraversion.

The personality trait frustration measures personal effectiveness to cope with interpersonal conflicts, irritations and annoyances. Higher averages on this dimension are related to dysfunctional intra-psychological and interpersonal coping behaviors with respect to conflict solving. The negative direction of the predictive strength implies that a high(er) diversity and lack of personal effectiveness with respect to affective conflict solving and coping with annoyances has a negative effect on an intellectual synergy.

Business Expertise

Table 4 shows the (direct) relationships of the final shared team vision with 1) the perceived strength of the

co-creation process, as well with the ‘within groups’ 2) aggregated standard deviations and the 3) aggregated means of business expertise.

Table 4 reveals that a direct relationship exists between the perceived strength of the co-creation process and the quality of the final team vision. The proportion explained variance of the second exogenous dependent variable is strong (estimated R-square = 0.66). Furthermore, it shows that higher aggregated team means on levels of the business expertise, as well as higher aggregated standard deviations of business expertise, are positively related to the quality of the final team vision.

Table 4

Predictive strength of the perceived strength of the co-creation process, averages and standard deviation of business expertise on quality of the final team vision (estimated (stand.) R-square: 0.66)

Quality of the final team vision on:	Estimated predictive strength
Perceived strength of the co-creation process	0.57***
Aggregated standard deviation business expertise	1.01***
Aggregated mean business expertise	1.01***

Discussion

The most salient result of this study indicates that a SMM co-creation process in small entrepreneurial self-directed teams seems to demand a sequence:

First, high-quality ideas have to be expressed and the diversity of ideas has to be integrated into a holistic, shared knowledge structure. Subsequently, these ideas and the holistic shared knowledge structure have

to be challenged by constructive cognitive conflict or debate, with effective feedback mechanisms being highly relevant. A specific team member interaction has to emerge, characterized by intellectual stimulation and elaboration skills such as deep listening, in order to redevelop and redesign the emerging shared mental model. The impact of all three endogenous SMM variables on the quality of the final result is completely mediated by the perceived strength of the co-creation process.

The existence of the mediating effects pinpoints that all the latent variables have to be combined together; however a specific order seems to be necessary. This is very much in line with the majority of theoretical considerations described in the introduction and the paragraph with theoretical considerations. The practical implication for the co-creation process in developing an entrepreneurial team vision is that creative new visions have to be debated during a conflict phase, followed by an elaboration and redesign process. However, the model shows that only creative and inspiring emerging visions and vision integration impact the second phase, the conflict solving phase. This is in accordance with research that effective debates and open discussions leading to innovation demand strong visions (see for an overview in Kellermanns et al., 2005; for an entrepreneurial context, see: Dyer et al., 2008; Dyer et al., 2011; Sarasvathy & Dew, 2013; Venkataraman et al., 2012).

This quality of the third phase, the redesign phase, demands a high-quality team member interaction, characterized by deep listening and an intellectual synergy. This will impact the team members' perceived strength of the co-creation process, the latter again impacting the final result: the quality of the final team vision. All these theoretical considerations depend on the strength of the direct effect between the three SMM variables. The quality of the emerging knowledge structure during the first phase fuels the second phase, its impact being direct and strong (0.91***). The same holds for the second indirect (complete mediation) effect, the conflict solving phase on the elaboration phase (0.9***).

As explained earlier, team member interaction during the third phase should have a very specific focus: it should support the team members' elaboration and redesign of the emerging entrepreneurial knowledge structure. This is very much in line with scholars such as Dyer et al. (2008), Dyer et al. (2011) and Venkataraman et al. (2012). These scholars have explained to us that entrepreneurial visions have to be challenged, redesigned and reconstructed in order to be effective. In addition, their research reveals strong

support that inspiring social interaction fuels redesign and intelligent elaboration on business models.

The specific sequence of the model seems to suggest some imperative linear austerity or linear strictness. However, the effectuation framework, the theoretical foundation of the third phase, clarifies this to be not the case. The effectuation framework shows that innovative business visions have to be redesigned and redeveloped to be effective, especially by synergistic social interaction (Sarasvathy & Dew, 2013; Venkataraman et al., 2012). This insight highlights the circularity of the process. During the third phase, the 'lessons learned' phase, the initial emerging knowledge structure is reevaluated and again debated, thus illustrating this circularity identified above. This circular theoretical conceptualization of the process is very much in line with research on knowledge innovation in teams (Hu, Horng, & Sun, 2009).

The confirmative factor analysis shows that the measure of the capacity to integrate a diversity of visions (measure of the first phase), and the measure disagreement as an enrichment of the multidimensionality of the team view (measure of the conflict solving phase), should be regarded to be important and valid components of the model. This supports a discouragement of the use and application of the level of association of the cognitive map between team members, when SMMs are studied in an entrepreneurial context. Furthermore, and maybe more importantly, this research result is very supportive of the theoretical reflections accentuating the importance of multidimensional learning in the context of strategic decision making in teams, strategic organizational change (Pieterse, Caniëls, & Homan, 2012), and innovative entrepreneurship (Venkataraman et al., 2012). This line of reasoning is in line with research results showing that mentoring by an open and intense dialogue on strategical issues empowers entrepreneurial talents (Wilbanks, 2015). However, it should be noted that most studies on the SMM framework are conducted in quite a different organizational context: for example, teams that have to perform in complex high pressure situations such as airport control towers or nuclear power plants in crisis (Zhou & Wang, 2010). In such an organizational context, teams have to solve complex problems in a timely manner while being under high pressure with a complex team members' interdependency. In such contexts, a strong and close association of the team members seems to be an important and relevant measure of the SMM. This context differs quite distinctively to an entrepreneurial context, in which teams are involved in an evolving, iterative process with a moving target: the co-creation

of a shared team vision on innovative business models or innovative marketing strategies. Therefore, it seems to be justified to conclude that collaboration competencies in developing a shared team vision seem to differ when the organizational context differs. This is in line with research revealing that for designing work-related competencies, a specification of the organizational context is demanded (Hensel, 2010).

The model seems to offer interesting and valuable insights when a team members' self-efficacy has to be enhanced in the co-creation process in order to develop an entrepreneurial team vision. This is useful for entrepreneurs collaborating in small, self-directed teams, for small, entrepreneurial firms with lean and flat organizational structures, as well as for business coaches and incubators, in demand of evidence-based tools to enhance the entrepreneurial self-efficacy in the co-creation process of a shared team vision.

Generally, a high self-efficacy demands:

- 1) A strong vision on those specific coping skills, which are necessary to be successful, and
- 2) a positive anticipation of the valence and effectiveness of applying these coping skills (Bandura, 1993; Bandura, 2001).

The three SMM variables – quality of the visions/vision integration, cognitive conflict solving, and elaborating on emerging knowledge structures – seem to be quite useful for specifying the collaboration skills when an entrepreneurial team vision has to be developed. Furthermore, it shows that these three SMM variables enhance the perceived strength of the co-creation process, the latter again having an enhancing effect on the final result, the final shared team vision.

Moreover, the research results are in strong compliance with Tuckman's (Tuckman & Jensen, 1977) 'forming, storming, norming and performing' model. This is a very popular model for strategic human resource development programs aiming at the enhancement of team work (Zwikael & Unger-Aviram, 2010). From a theoretical point of view, the model seems to explain to us that an integration of all theoretical considerations described in the introduction are quite relevant. It justifies the severe scientific criticism of most studies, that solemnly focus on emerging knowledge structures and the level of association of the cognitive map and is insufficient for an enhancement of our theoretical understanding of SMMs development, at least in this entrepreneurial context. Strong alignment with the insights described above can be detected with re-

spect to conflict solving and team cohesion. Next to goal commitment, group cohesion is one of the major predictors of a team performance (Van den Bossche et al., 2011). Effective conflict solving is one of the major important prerequisites of team cohesion (Zwikael & Unger-Aviram, 2010).

Knowledge Matters

Another important result of the study is that knowledge matters. This reveals the relevance of knowledge dissemination in developing a shared entrepreneurial team vision. The aggregated mean of the rated level of knowledge, as well as the diversity (standard deviation) has a strong impact on the quality of the final team vision. This has important implications, next to entrepreneurial competencies holding a high(er) level of entrepreneurial body of knowledge, but also including a diversity of knowledge, positively influences an entrepreneurial team performance. It should be highlighted that business expertise was only related to the quality of the final team vision, not to the perceived strength of the group process. However, positive relations exist between the diversity of business expertise, measured by the aggregated standard deviation and the quality of the final shared team vision. This is an interesting result, implying that a diversity in business expertise has a positive influence on the final team vision. This can be interpreted in the following way: differences or higher diversity in expertise levels is functional, a strong diversity probably strengthening the co-creation process. However, within the teams, expertise levels in general should never be too low as the impact of higher averages on business expertise proved to be strong and positive.

Intellectual Synergy

An intellectual synergy, often labeled as intellectual stimulation, is a key process in developing an entrepreneurial team vision, especially when innovational capacities are demanded (Dyer et al., 2008; Dyer et al., 2011; Sarasvathy & Dew, 2013). However, an intellectual synergy seems to be a highly ambiguous concept. The results of this study offer interesting perspectives, and to deepen our understanding of this concept we analyzed its relatedness to personality traits.

Assertiveness

The negative influence of the diversity of the personality trait assertiveness on an intellectual synergy is

a quite interesting one. It shows that a high(er) diversity in assertiveness can be dysfunctional. This personality trait measures assertive behaviors with a strong focus on own interests and a strong self-initiative. The model reveals that the diversity of the personality traits assertiveness is negatively related to a group performance. This again is very much in line with theoretical insights with respect to the phenomenon group think. Strong differences between introverts and extroverts, without the use of specific group process interventions, cause a very limited information search process (Edmondson, Dillon, & Roloff, 2007; Mullen, Anthony, Salas, & Driskell, 1994). This implies that to effectively develop a team vision and SMMs in an entrepreneurial context, team members should learn specific group process interventions. The use of these interventions should be aimed at limiting and hampering dysfunctional group processes related to a stronger diversity in assertiveness.

Coping with Frustrations

Higher averages of the personality trait coping with frustrations proved to have a negative effect on an intellectual synergy. The Big 5 facet coping with frustrations originates from the domain dimension neuroticism. Its negative effect can be explained as follows. As described earlier, a cognitive conflict should be distinguished from an affective one (Van den Bossche et al., 2011). Only constructive cognitive conflicts lead to high-quality SMMs or team visions. It seems to be righteous to assume that higher team means on this personality trait are associated with a dysfunctional conflict solving style. This dysfunctionality in coping with frustrations and annoyances hampers or mitigates team members' conflict solving capacities. It is likely that dysfunctional conflict solving styles increase the chance that cognitive conflicts converse into affective conflicts. A cognitive conflict is related to conflicting visions or perspectives, whilst an affective conflict is related to conflicting underlying values (Arnold, Silvester, Cooper, Robertson, & Burnes, 2005, p. 464; Van den Bossche et al., 2011). An important characteristic of a value conflict is its high chance for a fast and intense escalation. Moreover, value conflicts are associated with strong emotions, which is also considered to be an important precondition of conflict escalation (Arnold et al., 2005, pp. 463-466).

Consequently, group process interventions seem to be indicated. It demands a meta-analytical view on group processes and aligned group process interventions to fine-tune dysfunctional conflict coping be-

haviors into constructive, cognitive elaboration skills on emerging knowledge structures. In contrast to the aggregated mean of coping with frustrations, a strong diversity proves to have a positive relationship with the outcome variable. This means that a diversity in coping with frustrations can be used as a strength in the interactional process of elaborating on the emerging knowledge structure.

Limitations

An important limitation is the selected cohort, a group of undergraduate students. However, the design of a realistic entrepreneurial research context (students had to design a digital marketing strategy for real retailers) could be regarded as being supportive for the generalizability of the research results in an entrepreneurial context. Moreover, the research focus was on the process not on the cognitive content, and furthermore, a valid measure of business expertise is central to this study. Another disadvantage is the cross-sectional character of the study.

Practical implications

In order for team entrepreneurs to benefit from the increased pool of accessible resources, they need to understand the mechanisms that lead to the development of a shared team vision. Naturally, this also holds for incubators and business coaches seeking practical tools to enhance entrepreneurial team effectiveness. Studies have shown that the timely activation of entrepreneurial core competencies enhances entrepreneurial success (Alvarez & Busenitz, 2001).

References

- Alvarez, S. A., & Busenitz, L. W. (2001). The entrepreneurship of resource-based theory. *Journal of Management*, 27(6), 755-775.
- Arnold, J., Silvester, J., Cooper, C. L., Robertson, I. T., & Burnes, B. (2005). *Work psychology understanding human behavior in the workplace* (4th ed.). Harlow, New York: Prentice Hall.
- Badke-Schaub, P., Neumann, A., Lauche, K., & Mohammed, S. (2007). Mental models in design teams: A valid approach to performance in design collaboration? *CoDesign*, 3(1), 5-20.
- Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist*, 28(2), 117-148.
- Bandura, A. (2001). Social cognitive theory: An agen-

- tic perspective. *Annual Review of Psychology*, 52(1), 1-26.
- Barrick, M. R., Mount, M. K., & Judge, T. A. (2001). Personality and performance at the beginning of the new millennium: What do we know and where do we go next? *International Journal of Selection and Assessment*, 9(1-2), 9-30.
- Baum, J. R., Frese, M., & Baron, R. A. (2014). *The psychology of entrepreneurship*. Hove, East Sussex: Psychology Press.
- Baum, J. A., & Silverman, B. S. (2004). Picking winners or building them? Alliance, intellectual, and human capital as selection criteria in venture financing and performance of biotechnology startups. *Journal of Business Venturing*, 19(3), 411-436.
- Cooney, T. M. (2005). What is an entrepreneurial team?. *International Small Business Journal*, 23(3), 226-235.
- DeChurch, L. A., & Mesmer-Magnus, J. R. (2010). The cognitive underpinnings of effective teamwork: A meta-analysis. *Journal of Applied Psychology*, 95(1), 32-53.
- German Startups Association. (2016). *European startup monitor 2016. Country report Austria*. Vienna: Dömötör, R., & Spannocchi, B.
- Dyer, J., Gregersen, H., & Christensen, C. M. (2011). *The innovator's DNA: Mastering the five skills of disruptive innovators*. Boston, MA: Harvard Business School Publishing.
- Dyer, J. H., Gregersen, H. B., & Christensen, C. (2008). Entrepreneur behaviors, opportunity recognition, and the origins of innovative ventures. *Strategic Entrepreneurship Journal*, 2(4), 317-338.
- Edmondson, A. C., Dillon, J. R., & Roloff, K. S. (2007). 6 three perspectives on team learning: Outcome improvement, task mastery, and group process. *The Academy of Management Annals*, 1(1), 269-314.
- Ensley, M. D., Hmieleski, K. M., & Pearce, C. L. (2006). The importance of vertical and shared leadership within new venture top management teams: Implications for the performance of startups. *The Leadership Quarterly*, 17(3), 217-231.
- Ernest, K., Matthew, S. K., & Samuel, A. K. (2015). Towards entrepreneurial learning competencies: The perspective of built environment students. *Higher Education Studies*, 5(1), 20-30.
- Greene, P. G., Brush, C. G., & Brown, T. E. (1997). Resources in small firms: An exploratory study. *Journal of Small Business Strategy*, 8(2), 25-40.
- Hensel, R. W. (2010). *The sixth sense in professional development. A study on the role of personality, attitudes and feedback concerning professional development* (Doctoral dissertation). Twente University, Enschede, Netherlands.
- Hensel, R., & Visser, R. (2018). Shared leadership in entrepreneurial teams: The impact of personality. *International Journal of Entrepreneurial Behavior & Research*, 24(6), 1104-1119.
- Hmieleski, K. M., & Ensley, M. D. (2007). A contextual examination of new venture performance: Entrepreneur leadership behavior, top management team heterogeneity, and environmental dynamism. *Journal of Organizational Behavior: The International Journal of Industrial, Occupational and Organizational Psychology and Behavior*, 28(7), 865-889.
- Hu, M. L. M., Horng, J. S., & Sun, Y. H. C. (2009). Hospitality teams: Knowledge sharing and service innovation performance. *Tourism Management*, 30(1), 41-50.
- Jonker, C. M., Van Riemsdijk, M. B., & Vermeulen, B. (2011). Shared mental models. In M. De Vos, N. Fornara, J. Pitt & G. Vouros (Eds.), *Coordination, organizations, institutions, and norms in agent systems VI* (pp. 132-151). New York: Springer-Verlag.
- Kellermanns, F. W., Walter, J., Lechner, C., & Floyd, S. W. (2005). The lack of consensus about strategic consensus: Advancing theory and research. *Journal of Management*, 31(5), 719-737.
- Kirkman, B. L., Tesluk, P. E., & Rosen, B. (2001). Assessing the incremental validity of team consensus ratings over aggregation of individual-level data in predicting team effectiveness. *Personnel Psychology*, 54(3), 645-667.
- Klimoski, R., & Mohammed, S. (1994). Team mental model: Construct or metaphor?. *Journal of Management*, 20(2), 403-437.
- Knight, D., Pearce, C. L., Smith, K. G., Olian, J. D., Sims, H. P., Smith, K. A., & Flood, P. (1999). Top management team diversity, group process, and strategic consensus. *Strategic Management Journal*, (20)5, 445-465.
- Lechner, C., & Floyd, S. W. (2012). Group influence activities and the performance of strategic initiatives. *Strategic Management Journal*, 33(5), 478-495.
- LePine, J. A., Erez, A., & Johnson, D. E. (2002). The nature and dimensionality of organizational citizenship behavior: A critical review and meta-analysis. *Journal of Applied Psychology*,

- 87(1), 52-65.
- Lukes, M., & Stephan, U. (2017). Measuring employee innovation: A review of existing scales and the development of the innovative behavior and innovation support inventories across cultures. *International Journal of Entrepreneurial Behavior & Research*, 23(1), 136-158.
- Mathieu, J. E., Heffner, T. S., Goodwin, G. F., Salas, E., & Cannon-Bowers, J. A. (2000). The influence of shared mental models on team process and performance. *Journal of Applied Psychology*, 85(2), 273-283.
- McCrae, R. R., & Costa Jr, P. T. (1997). Personality trait structure as a human universal. *American Psychologist*, 52(5), 509-516.
- McNeish, D. (2017). Small sample methods for multi-level modeling: A colloquial elucidation of REML and the Kenward-Roger correction. *Multivariate Behavioral Research*, 52(5), 661-670.
- Misganaw, B. A. (2018). Why we know what we know about entrepreneurial teams? Unlocking implicit assumptions in entrepreneurial team research. *International Journal of Entrepreneurship and Small Business*, 33(3), 354-379.
- Mohammed, S., Ferzandi, L., & Hamilton, K. (2010). Metaphor no more: A 15-year review of the team mental model construct. *Journal of Management*, 36(4), 876-910.
- Mullen, B., Anthony, T., Salas, E., & Driskell, J. E. (1994). Group cohesiveness and quality of decision making: An integration of tests of the group-think hypothesis. *Small Group Research*, 25(2), 189-204.
- Pieterse, J. H., Caniëls, M. C., & Homan, T. (2012). Professional discourses and resistance to change. *Journal of Organizational Change Management*, 25(6), 798-818.
- Poropat, A. E. (2009). A meta-analysis of the five-factor model of personality and academic performance. *Psychological Bulletin*, 135(2), 322-338.
- Preller, R., Breugst, N., & Patzelt, H. (2016). Do we all see the same future? Entrepreneurial team members' visions and opportunity development. In *Academy of Management Proceedings*, (2016(1), 13642). Briarcliff Manor, NY: Academy of Management.
- Resnick, S. M., Cheng, R., Simpson, M., & Lourenço, F. (2016). Marketing in SMEs: A "4Ps" self-branding model. *International Journal of Entrepreneurial Behavior & Research*, 22(1), 155-174.
- Richardson, M., Abraham, C., & Bond, R. (2012). Psychological correlates of university students' academic performance: A systematic review and meta-analysis. *Psychological Bulletin*, 138(2), 353-387.
- Sarasvathy, S. D., & Dew, N. (2013). Without judgment: An empirically-based entrepreneurial theory of the firm. *The Review of Austrian Economics*, 26(3), 277-296.
- Schneider, B., & Smith, D. B. (2004). *Personality and organizations*. Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.
- Sequeira, J. M., Weeks, K. P., Bell, M. P., & Gibbs, S. R. (2018). Making the case for diversity as a strategic business tool in small firm survival and success. *Journal of Small Business Strategy*, 28(3), 31-47.
- Talaulicar, T., Grundei, J., & Werder, A. V. (2005). Strategic decision making in start-ups: The effect of top management team organization and processes on speed and comprehensiveness. *Journal of Business Venturing*, 20(4), 519-541.
- Tuckman, B. W., & Jensen, M. A. C. (1977). Stages of small-group development revisited. *Group & Organization Studies*, 2(4), 419-427.
- Unger, J. M., Rauch, A., Frese, M., & Rosenbusch, N. (2011). Human capital and entrepreneurial success: A meta-analytical review. *Journal of Business Venturing*, 26(3), 341-358.
- Van den Bossche, P., Gijssels, W., Segers, M., Wolter, G., & Kirschner, P. (2011). Team learning: Building shared mental models. *Instructional Science*, 39(3), 283-301.
- Venkataraman, S., Sarasvathy, S. D., Dew, N., & Forster, W. R. (2012). Reflections on the 2010 AMR decade award: Whither the Promise? Moving Forward with Entrepreneurship As a Science of the Artificial. *Academy of Management Review*, 37(1), 21-33.
- Wilbanks, J. E. (2015). Mentoring and entrepreneurship: Examining the potential for entrepreneurship education and for aspiring new entrepreneurs. *Journal of Small Business Strategy*, 23(1), 93-101.
- Xiang, C., Lu, Y., & Gupta, S. (2013). Knowledge sharing in information system development teams: Examining the impact of shared mental model from a social capital theory perspective. *Behaviour & Information Technology*, 32(10), 1024-1040.
- Zhao, H., Seibert, S. E., & Lumpkin, G. T. (2010). The relationship of personality to entrepreneurial intentions and performance: A meta-analytic review. *Journal of Management*, 36(2), 381-404.
- Zhou, Y., & Wang, E. (2010). Shared mental models as moderators of team process-performance

relationships. *Social Behavior and Personality: An International Journal*, 38(4), 433-444.

Zwikael, O., & Unger-Aviram, E. (2010). HRM in project groups: The effect of project duration on team development effectiveness. *International Journal of Project Management*, 28(5), 413-421.