

Dynamic Capabilities of SMEs: The Contributions of Bricolage and Social Capital

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ABSTRACT

Objective: Dynamic capabilities are defined as “the firm’s ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments” (Teece et al., 1997, p. 516). In doing so they create value, derived from the capacity of a management team to identify opportunities and threats and reconfigure a firm’s repertoire of resources and operations to address them (Teece, 2007). While there is agreement that dynamic capabilities facilitate a firm’s competitiveness; there remains a lack of clarity around the notion and complexity surrounding the way in which they evolve (Eriksson, 2014). This, in particular, has created difficulties in identifying valid measurement tools to appraise their creation and deployment leading to the extant literature to rely upon qualitative, often longitudinal, case studies to analyse the phenonoma (Wang and Ahmed, 2007, Barreto, 2010, Eriksson, 2014). While previous research has investigated the dynamic capability concept in relation to its antecedent factors, the characteristics integral to their implementation, potential outcomes and influences upon competitive advantage and performance of firms (Zott, 2003, Song et al., 2005, Zuniga-Vicente and Vicente-Lorente, 2006, Wang et al., 2015). There is limited evidence available that examines the contribution made by the bricolage and social capital of management teams to the generation and use of dynamic capabilities.

Literature review: It is suggested that the dynamic capabilities of SMEs originate from the often ad-hoc approaches to problem solving (Winter, 2003) and learning that results from the need to reconfigure resources and routines to address challenges (Prashantham and Floyd, 2012). This activity supports the development of soft assets - values, culture and experience – that underpin a firm’s dynamic capabilities and inform future learning processes adopted by management teams (Corner and Wu, 2012). The process, therefore, is associated with a firm’s resource-based changes, which include the improvement of existing capabilities and the development of new capabilities (Prashantham and Floyd, 2012). As indicated this is often ad hoc and achieved through trial-and-error and improvisation (Ahuja and Lampert, 2001, Miner et al., 2001), such learning has the effect of embedding capabilities into the DNA of a firm (Teece, 2007, Argote and Ren, 2012, Prashantham and Floyd, 2012). Changes in the dynamic capabilities of firms are the result of the learning that takes place within a management team during the process of improvisation and experimentation within the existing resource base (Hambrick and Mason, 1984, Martin, 2011, Kor and Mesko, 2013). It is argued that social capital is one mechanism for acquiring, assimilating and exploiting external knowledge and resource to transform a firm’s capability over time (Zahra and George, 2002, Le Breton-Miller and Miller, 2006, Prashantham and Young, 2011). Although Nemanich et al. (2010) have argued that social capital can overload and delay processes that create solutions; we propose that the social capital of a management team positively influences the development and appropriation of a firm’s dynamic capabilities. Bricolage helps create new from old and “something from nothing” (Baker and Nelson, 2005, p. 357) that lead to the strategic development of diverse, non-specialized resources (Gurca and Ravishankar, 2016). Those redefined resources at hand are appropriated through learning processes that are both improvisational (performative) and

experimental (ostensive) (Weick, 1998, Baker, Miner and Eesley, 2003, Kreiser, 2011); and the outcomes are integrated into building dynamic capabilities.

Method: This study is distinct from previous research as it employs a quantitative method and constructs a new multidimensional dynamic capability measurement by aggregating definitions, analysis and suggestions from previous literature to establish and test hypotheses (Teece, 2014). This measurement is validated by using the confirmatory factor analysis method before being utilized to examine a research framework. While early literature perceived social capital to be a unidimensional concept (Burt, 1992) this paper takes a more multidimensional perspective as posited by Adler and Kwon (2002), and employs a three-dimension approach, measuring relational, structural and cognitive social capital; first introduced by Nahapiet & Ghoshal (1998); and validated in later works (Karahanna and Preston, 2013, Huynh, 2016). To measure the bricolage of a management team, we employ a measurement constructed and validated by prior researchers (Davis et al., 2013, Senyard, Baker, Steffens and Davidsson, 2014). Hypotheses are tested and findings presented using data drawn from 274 SMEs in the UK. Structural equation modelling (SEM) is used to test the research hypotheses. This entails a two-stage approach; a measurement model using confirmatory factor analysis (CFA) to examine the validity and reliability of measurements, and a structural model to test the relationships among latent variables (Byrne, 2010).

Findings: The results indicate support for all hypotheses; the social capital of management teams has a significant positive impact on the dynamic capabilities of SMEs. There is a significant positive link between the bricolage of management teams and the dynamic capabilities of SMEs and the social capital of management teams has a significant positive influence upon the bricolage of management teams. The results show that the mutual connections between social capital and bricolage, bricolage and dynamic capabilities, and social capital and dynamic capabilities are significantly positive.

Values: This study addresses the gap in the literature and examines the influence that the social capital and bricolage of management teams have upon the the development of dynamic capabilities within SMEs. We build on insights into the antecedents of dynamic capabilities in the context of resource-constrained firms through the deployment of bricolage and social capital, (Nahapiet and Ghoshal, 1998, Baker and Nelson, 2005) and enhance this using fine-grained analyses to analyse how SMEs and their management teams learn through bricolage and each element of social capital contribute to the generation and appropriation of all three sub-sets of dynamic capabilities; sensing, seizing and reconfiguring.

Keywords: Dynamic capabilities, Bricolage, Social Capital, SMEs, Improvisation

INTRODUCTION

Dynamic capabilities are defined as “the firm’s ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments” (Teece, Pisano, and Shuen, 1997, p. 516). In doing so they create value, derived from the capacity of a management team to identify opportunities and threats and reconfigure a firm’s repertoire of resources and operations to address them (Teece, 2007). Dynamic capabilities therefore help to answer a fundamental question of how a firm can develop skills and competencies which create and sustain competitive advantage (Franco *et al.*, 2009; Mitchell and Skrzypacz, 2015; Zahra,

Sapienza, and Davidsson, 2006). However, the term has been variously described as tautological, obscure, vague and elusive (Danneels, 2008; Winter, 2003), and often used interchangeably with distinctive competence (Lenox, Rockart, and Lewin, 2006; Selznick, 1957), organizational routine (Nelson and Winter, 1982), core competence (Karim, 2009; Prahalad and Hamel, 1990), and combinative capability (Kogut and Zander, 1992). Therefore, while there is agreement that dynamic capabilities facilitate a firm's competitiveness; there remains a lack of clarity around the notion and, in particular, how they evolve within a firm (Eriksson, 2014). This has created difficulties in identifying valid measurement tools to appraise their creation and implementation; as a consequence, the extant literature has relied upon qualitative, often longitudinal, case studies to analyse the phenonoma (Barreto, 2010; Wang and Ahmed, 2007).

Our limited understanding of how dynamic capabilities evolve and the perception that their development and contribution to organisational performance is a resource intensive, time consuming process; potentially mitigates against their utilization within the SME context (Delmar and Shane, 2003; Helfat and Peteraf, 2003; Teece and Pisano, 1994). This observation, however, has been questioned as SMEs often thrive despite resource limitations; taking advantage of adaptability, flexibility and speed of response; qualities associated with the notion of dynamic capabilities (Arend, 2014b; Arthurs and Busenitz, 2006; Weerawardena *et al.*, 2007; Winter, 2003; Zahra, Sapienza, and Davidsson, 2006).

Furthermore, while previous research has investigated the dynamic capability concept in relation to its antecedent factors (Doving and Gooderham, 2008; Karim, 2006; King and Tucci, 2002; Kor and Mahoney, 2005), the characteristics integral to their implementation (Aragon-Correa and Sharma, 2003; Galunic and Eisenhardt, 2001; Gilbert, 2006; Teece, 2012, 2014; Winter, 2003; Wollersheim and Heimeriks, 2016), potential outcomes (Kale and Singh, 2007;

Lee, Lee, and Rho, 2002; Ng, 2007; Oliver and Holzinger, 2008; Wilhelm, Schlömer, and Maurer, 2015), and influences upon the competitive advantage and performance of firms (Song *et al.*, 2005; Wang, Senaratne, and Rafiq, 2015; Zott, 2003; Zuniga-Vicente and Vicente-Lorente, 2006). There is limited evidence available that examines the contribution made by the bricolage and social capital of management teams to the generation and use of dynamic capabilities.

This study is distinct from previous research as it employs a quantitative method and constructs a new multidimensional dynamic capability measurement by aggregating definitions, analysis, and suggestions from previous literature to establish and test hypotheses (Argote and Ren, 2012; Teece, 2007, 2012, 2014; Teece, Pisano, and Shuen, 1997). This measurement is validated by using the confirmatory factor analysis method before being utilized to examine a research framework, which contextualizes the roles of social capital and bricolage of management teams in the SME context. The findings are used to evaluate the contribution made by management teams to the dynamic capabilities of SMEs and, through this, addresses a theoretically fundamental question of how the social capital and bricolage of a management team contributes to the development and use of dynamic capabilities within an SME. To make these arguments, we explore the literature on social capital, bricolage and dynamic capabilities to construct a research framework and a set of hypotheses to investigate potential inter-relationships. These hypotheses are then tested and findings presented using data drawn from 274 SMEs in the UK. Exploring these findings, we suggest that a management team exploits its bricolage and social capital to improve three aspects of the firm's dynamic capabilities; identified as sensing, seizing, and reconfiguring capabilities. The implications this has for SMEs and organisations wishing to foster their development are then discussed.

THEORETICAL BACKGROUND AND HYPOTHESES

It is well documented that dynamic capabilities are informed by the learning of specific and identifiable processes (Ambrosini and Bowman, 2009; Eisenhardt and Martin, 2000) leading to stable patterns of collective activities and organizational routines (Zollo and Winter, 2002). For this reason they are identified as intangible assets that, in some combination, facilitate the creation of valuable, rare, inimitable, and organisation specific resources (Winter, 2003) which help to establish new strategies and build competitive advantage (Eisenhardt and Martin, 2000; Teece, 2007; Teece, Pisano, and Shuen, 1997). Dynamic capabilities are normally categorized into three components: sensing – scanning the environment and identifying new opportunities, seizing – mobilizing and developing resources to respond to identified opportunities, and reconfiguring – reorganizing existing resources and routines (Helfat and Peteraf, 2015; Helfat and Winter, 2011; Protogerou, Caloghirou, and Lioukas, 2012; Teece, 2007, 2012; Teece, Pisano, and Shuen, 1997; Zollo and Winter, 2002). The process of building dynamic capabilities, and accruing benefit, takes time to evolve and this has led some to question whether the SME context, with its liabilities of smallness (Baker and Nelson, 2005; Zahra, Sapienza, and Davidsson, 2006), is appropriate for the concept to develop (Delmar and Shane, 2003; Helfat and Peteraf, 2003; Teece and Pisano, 1994). However, other scholars (Arend, 2014a; Arthurs and Busenitz, 2006; Weerawardena *et al.*, 2007; Winter, 2003; Zahra, Sapienza, and Davidsson, 2006) are more positive, suggesting that the characteristics of adaptability, flexibility, and speed of response often associated with SMEs are in themselves dynamic capabilities and highlighting that many SMEs are able to solve problems, exploit opportunities, survive, and even flourish despite the difficulties they face in attracting new resources.

The process of building dynamic capabilities in SMEs

It is therefore suggested that the dynamic capabilities of SMEs originate from the often ad-hoc approaches to problem solving (Winter, 2003) and learning that results from the need to reconfigure resources and routines to address challenges (Hambrick and Mason, 1984; Prashantham and Floyd, 2012; Zahra, Sapienza, and Davidsson, 2006). This activity supports the development of soft assets - values, culture and experience – that underpin a firm’s dynamic capabilities and inform future learning processes adopted by management teams (Corner and Wu, 2012; Kale and Singh, 2007; Teece, Pisano, and Shuen, 1997). The process, therefore, is associated with a firm’s resource-based changes, which include the improvement of existing capabilities and the development of new capabilities (Prashantham and Floyd, 2012). As indicated this is often ad hoc and achieved through trial-and-error and improvisation (Ahuja and Lampert, 2001; Miner, Bassoff, and Moorman, 2001), such learning has the effect of embedding capabilities into the DNA of a firm (Argote and Ren, 2012; Prashantham and Floyd, 2012; Teece, 2007)

In a more detailed, micro study, Prashantham and Floyd (2012), suggest that SMEs achieve this by adjustments to the performative and ostensive aspects of routines. Variability in the performative aspect of routines is associated with improvisational learning and occurs, most often, in the early stages, when a management team’s experience is low and they need to improvise to address challenges (Autio, Sapienza, and Almeida, 2000; Miner, Bassoff, and Moorman, 2001; Zahra, Sapienza, and Davidsson, 2006). The outcomes of improvisation are reflected in changes to the cognitive schema of routines (Bingham, 2009) and articulated, codified and (re)combined with other routines to construct new capabilities within an SME (Prashantham and Floyd, 2012; Zollo and Winter, 2002). Variability in the ostensive aspect of routines is associated with learning by experimentation that leads to improvements to the

existing stock of capabilities (Prashantham and Floyd, 2012). This is differentiated from improvisation as it involves the deliberate use of elements from the “bag of tricks” available to the firm to test outcomes and appropriateness (Zahra, Sapienza, and Davidsson, 2006, p. 937). It is suggested that outcomes from experimentation will prompt small changes in the patterns of specific actions and lead to modifications in the ostensive aspect of routines (Moorman and Miner, 1998; Prashantham and Floyd, 2012). Such changes in the ostensive aspect do not create new capabilities, but improve the existing capabilities of ventures (Moorman and Miner, 1998; Prashantham and Floyd, 2012). Those performative and ostensive variations are based upon changes in the repertoire of existing resources, routines, and capabilities (Mintzberg, 1996; Moorman and Miner, 1998; Weick, 1993). Changes in the dynamic capabilities of firms are the result of the learning that takes place within a management team during the process of improvisation and experimentation within the existing resource base (Hambrick and Mason, 1984; Kor and Mesko, 2013; Martin, 2011).

Social capital and dynamic capabilities

Social capital has previously been defined as the sum of actual and potential resources that can be accessed from the network of relationships developed and maintained by the management team over time (Adler and Kwon, 2002; Bourdieu, 1983; Nahapiet and Ghoshal, 1998). While social capital has been identified as critical to the survival and growth of SMEs (Morse, Fowler, and Lawrence, 2007) its value and contribution depend on the characteristics and context of the networks to which individuals belong (Blyler and Coff, 2003; Burt, 1997; Rooks, Klyver, and Sserwanga, 2016; Rowley, Behrens, and Krackhardt, 2000). Social capital has been characterised as having three dimensions: structural, relational, and cognitive (Nahapiet and Ghoshal, 1998). ‘Structural’ refers to the pattern of connections within networks (i.e. ties and configurations) that

forms the infrastructure around which social capital is developed and deployed (Pearson, Carr, and Shaw, 2008). ‘Relational’ describes the nature and quality of linkages represented in key attributes, such as trust, norms, obligations, and identity (Nahapiet and Ghoshal, 1998). ‘Cognitive’ denotes a shared meaning between partners (Nahapiet and Ghoshal, 1998) that provide a basis for individuals within a network to understand, clarify, and codify information into categories (Tsai and Ghoshal, 1998). These three dimensions of social capital are critical in determining a management team’s access to resources in a network and instrumental in dictating the quality of such resources.

It is argued that the acquisition and assimilation of external knowledge provided by social capital can support both the improvisation (performative) and experimentation (ostensive) processes (Kreiser, 2011). External knowledge can address the limitations associated with internal resources (Rui, Cuervo-Cazurra, and Un, 2016; Vera *et al.*, 2016), challenge internal paradigms (Amabile, 1998), and inject new ideas that improve a team’s ability to reconfigure past experiences in new ways (Bresman, 2010; Kyriakopoulos, 2011; Vera *et al.*, 2016). In other words, this managerial process ultimately aims to enhance the diversity and dexterity of the repertoire of a firm’s resources to address challenges (Autio, George, and Alexy, 2011) and, as a consequence, influence the foundation of dynamic capabilities.

In addition, social capital facilitates the acquisition of resources by providing access to regular and diverse information sources (Blyler and Coff, 2003; Shane and Cable, 2002; Shane and Stuart, 2002); while a sensing capability assists a firm to assimilate and synthesise this information to understand its relevance (Atuahene-Gima and Murray, 2007). The management teams of SMEs that exhibit a sensing capability are able to leverage social capital to identify valuable, current and accurate market information to address the challenges of a fast-changing

environment (Blyler and Coff, 2003; Zhang and Wu, 2013). In such environments, reconfiguration is a critical quality of dynamic capabilities; enabling a firm to maintain their competitive advantage while adapting to new contexts (Coleman, 1988).

Having sensed changes within the environment, the management team often look to their social networks for support in seizing the opportunity. A firm's internal networks provide a vehicle for sharing and confirming perspectives thus reinforcing a commitment to act (Helfat and Martin, 2015) and provide a deep understanding of the capabilities of individuals (Salimath and Jones Iii, 2011). External networks provide access to skills, knowledge, fine-grained information, and useful new technology (Baker, Miner, and Eesley, 2003; Burt, 2004; Powell, Koput, and SmithDoerr, 1996; Sosa, 2011). These links can help to mobilize external resources (Helfat and Martin, 2015; Pfeffer and Salancik, 1978) and to adapt and develop solutions by utilising the management teams prior knowledge of resources available within their networks and the routines by which they operate (Vera *et al.*, 2016).

In this way, it is argued that social capital is one mechanism for acquiring, assimilating and exploiting external knowledge and resource to transform a firm's capability over time (Le Breton-Miller and Miller, 2006; Prashantham and Young, 2011; Zahra and George, 2002). Although Nemanich *et al.* (2010) have argued that social capital can overload and delay processes that create solutions; we propose that the social capital of a management team positively influences the development and appropriation of a firm's dynamic capabilities.

Hypothesis 1: The social capital of management teams positively influences the dynamic capabilities of SMEs.

Bricolage and dynamic capabilities

Bricolage, first advanced by Levi-Strauss (1966), has been defined as the use of “whatever resources and repertoires one has, to perform whatever tasks one faces” (Weick, 1993, p. 352) and “making do by applying combinations of resources already at hand to new problems and opportunities” (Baker and Nelson, 2005, p. 333). Where SMEs face liabilities of newness and smallness, creation and execution often occur at the same time, and the ability to plan for specific activities is limited (Prashantham and Floyd, 2012). In these contexts management teams have difficulty planning future resource requirements, and turn to those resources readily at hand (Baker, Miner, and Eesley, 2003). Under bricolage, the resource usage fundamentally departs from the original or conventional function and, in similar contexts, a different management team could find the same or similar resources inappropriate or inadequate (Baker, Miner, and Eesley, 2003). Bricolage helps create new from old and “something from nothing” (Baker and Nelson, 2005, p. 357) leading to the strategic development of diverse, non-specialized resources (Gurca and Ravishankar, 2016). Those redefined resources at hand are appropriated through learning processes that are both improvisational (performative) and experimental (ostensive) (Baker, Miner, and Eesley, 2003; Kreiser, 2011; Weick, 1998); and the outcomes are integrated into building dynamic capabilities.

The bricolage process starts with an inventory of the repertoire in which the bricoleur considers, or reconsiders, a firm’s internal and external resources available cheaply or for free (Bicen and Johnson, 2015; Senyard *et al.*, 2014). Throughout the process of assembly (bricolage), the capacity of a repertoire’s elements need to be assessed for functionality and this is achieved through experimentation to ascertain the most appropriate combination of elements (Baker and Nelson, 2005; Duymedjian and Rueling, 2010; Garud and Karnøe, 2003). New opportunities are identified by scanning the market or created, within the firm by exploring and

re-evaluating the promising applications of the repertoire with the resources available at hand (Ardichvili, Cardozo, and Ray, 2003; Corner and Wu, 2012).

A management team with bricolage capability is likely to possess a set of skills that can be employed to respond to the challenges associated with, the seizing of, identified opportunities (Baker and Nelson, 2005; Bicen and Johnson, 2015). Within the context of SMEs, where management teams face significant resource constraint, they have to imagine, search and experiment to turn existing resources into novel combinations (Campbell, 2004; Desa and Basu, 2013; Miettinen and Virkkunen, 2005; Weick, 1993) that are able to conceive and exploit new opportunities (Andersen, 2008; Baker and Nelson, 2005; Campbell, 1997; Leybourne, 2010; Shane, 2000). It is important to recognize that bricolage is an essential factor that underpins the creation of successful and novel resource combinations that seize new opportunities.

Management teams that engage in bricolage tend to shift roles, build cross-member expertise, reorganize routines and reassemble work processes (Bechky and Okhuysen, 2011; Campbell, 2004; Garud and Karnøe, 2003). The recursive duality of institutional structure and those functionalities resulting from bricolage behaviour leads, over time, to a transformation effect on the firm (Barley and Tolbert, 1997; Desa, 2012). Such practices, particularly within SMEs, may evolve into an organizational resilience that enables a firm to survive and develop in uncertain business environments (Desa, 2012). As a consequence, we propose that bricolage behaviour within a management team may positively influence the dynamic capabilities of a firm.

Hypothesis 2: The bricolage of management teams positively influences the dynamic capabilities of SMEs.

The relationship between social capital and bricolage

As bricolage is a dynamic construct, which is continuously learned, acquired and used (Baker and Nelson, 2005; Duymedjian and Rueling, 2010), it goes beyond a firm's known resource base to include the accumulation of additional resource from social capital (Carlsson-Wall and Kraus, 2015; Daniel, Domenico, and Sharma, 2015). The importance of external resources in the bricolage process is reflected in the suggestion by Edelman and Yli-Renko (2010) that bricoleurs, in this case an SME management team, should be open and seek access to the external resources that are made available (Ferneley and Bell, 2006).

Social capital is able to offer a broad menu of options that provide solutions to complex problems (Debrulle, Maes, and Sels, 2014; Morse, Fowler, and Lawrence, 2007; Ooi, Hooy, and Som, 2015) that can lead to organizational advantage (Morse, Fowler, and Lawrence, 2007; Nahapiet and Ghoshal, 1998). Whilst these solutions are available from networks, how a firm benefits is subject to the ability of a management team to access, acquire, assimilate, and exploit this external resource (Debrulle, Maes, and Sels, 2014; Vohora, Wright, and Lockett, 2004; Yli-Renko, Autio, and Sapienza, 2001). The introduction of social capital enhances the dynamic element of bricolage (Baker and Nelson, 2005; Duymedjian and Rueling, 2010) and highlights the role of potential resources available from external networks to combine with those already at hand to facilitate the emergence of novel solutions that recognize alternative applications for the resources at hand (Duymedjian and Rueling, 2010).

The external network can provide a temporary frame of meaning, offering a diverse range of information, knowledge and skills that identify synergistic combinations of a firm's existing resources that lead to new potential repertoires (Anand and Khanna, 2000; Cao, Simsek, and Jansen, 2015; Carroll and Simpson, 2012; Kor and Mesko, 2013; Lee and Venkataraman, 2006).

In this way, social capital influences the repertoire of negotiable resources exchanged and accumulated over time (Lester and Cannella, 2006) and shapes the way management teams handle challenges (Andersen, 2008). However, the notion that social capital impacts upon the bricolage of a management team is not universally accepted, for example Banerjee and Campbell (2009) posit that bricolage is a process that does not involve resource acquisition from external sources. In this research, we test this disputed issue by proposing that social capital has a positive impact on the bricolage of management teams.

Hypothesis 3: The social capital of management teams positively influences their bricolage process.

The mediation role of bricolage

We have discussed how social capital can foster the generation and appropriation of dynamic capabilities within SMEs; however, having access to social capital does not mean that all, or some, of those resources will be assimilated, transferred and used to the benefit of an SME (Nemanich *et al.*, 2010). Certain resources available from social networks, while identified, will be regarded as inappropriate or unusable in the current repertoire; in this state such resources are held in abeyance and referred to as resources at hand; available to management teams as and when required (Senyard *et al.*, 2014). As contexts change, bricolage facilitates a process whereby such, previously unused, resource can be incorporated into the repertoire (Baker, Miner, and Eesley, 2003; Senyard *et al.*, 2014). This mediation role (Hayes, 2013) has the potential to make such resources relevant and apposite (Halme, Lindeman, and Linna, 2012); contributing to the generation and appropriation of dynamic capabilities.

Hypothesis 4: Bricolage partially mediates the positive relationship between the social capital

of management teams and the dynamic capabilities of SMEs.

METHODS

Sample

Using a web based survey, we have obtained 285 responses from UK SMEs (defined as having less than 250 employees); however, 11 responses were discounted as they were not completed by a member of the management team, leaving 274 usable responses. It should be noted that 92% of usable responses were completed by a member of the founding team that was in situ at the time the venture was created. The demographic of the sample indicates the majority were established after 2000, are limited companies with less than 50 employees, based in the south of England and are involved in a broad range of business activity (see table 1).

Table 1. Descriptive statistics

Variables	N	%	Mean	SD
Firm's legal status				
- Charity	10	3.6		
- Limited company	225	82.1		
- Limited liability partnership	1	0.4		
- Partnership	7	2.6		
- Sole trader	29	10.6		
- Other	2	0.7		
Firm's age	274		13.693	15.738
Firm's size	274		11.843	21.207
Industry				
- Manufacturing and construction (CF)	31	11.3		
- Retail, transportation, accommodation and food service (GHI)	63	23		
- Information, telecommunications and entertainment (JR)	92	33.6		
- Business and administrative services (KLMN)	54	19.7		
- Others	34	12.4		
Regions in the UK				
- Middle Land	44	16.1		
- London	26	9.5		
- North	36	13.2		
- Northern Ireland	2	0.7		
- Scotland	13	4.7		
- South	144	52.6		
- Wales	9	3.3		

Measurement development

To ensure the content validity of measurements, questions employ a seven-point Likert scale (ranging from 1 = strongly disagree to 7 = strongly agree) adapting constructs from existing management studies. A standard scale development procedure was adapted to ensure the validity and reliability of new measurements. The questionnaire requires respondents to self-report on behalf of the firm on a variety of issues that relate to the social capital and bricolage of their management team against the dynamic capabilities of firms.

Independent variables

Social capital. While early literature perceived social capital to be a unidimensional concept (Burt, 1992; Coleman, 1988) this paper takes a more multidimensional perspective as posited by Adler and Kwon (2002), Nahapiet and Ghoshal (1998), Huynh (2016) and Huynh *et al.* (2017). We recognise that some multidimensional measurements based upon notions of bonded social capital and bridging social capital (Adler and Kwon, 2002) have recently been criticised for not offering discrete measures (Appel *et al.*, 2014). As a consequence this paper employs a three-dimension approach, measuring structural, relational and cognitive social capital; first introduced by Nahapiet & Ghoshal (1998); and validated in later works (Carr *et al.*, 2011; Gu, Wang, and Wang, 2013; Huynh, 2016; Karahanna and Preston, 2013) (see Appendix 1).

Bricolage. To measure the bricolage of a management team, we employ a measurement constructed and validated by prior researchers (Davis *et al.*, 2013; Senyard *et al.*, 2014). The measurement consists of an eight-item scale to assess the ability of management teams to combine and recombine resources at hand for the purpose of goal accomplishment (see Appendix 1).

Dependent variable

Dynamic capabilities. It has been argued that prior to 2010 studies relating to dynamic capabilities focused on the antecedent factors that led to their evolution or the outcomes created (Barreto, 2010). To measure the dynamic capabilities of a firm, Barrales-Molina, Bustinza, and Gutierrez-Gutierrez (2013) used three flexibility dimensions: strategic, structural, and operational. However, these measurements evaluate indicators and causes that generate dynamic capabilities they do not explain the qualities of a dynamic capability or how it is employed. This led to the construction of other instruments to measure the dynamic capabilities of a firm, such as sensing, learning, integrating and coordinating capabilities (Pavlou and El Sawy, 2011), competitive scanning and quality management capabilities (Lee *et al.*, 2011), reconfiguring, organizational and technological flexibility capabilities (Jiao *et al.*, 2013), and integration, learning and reconfiguration capabilities (Lin and Wu, 2014). However, the approach of each study, separately, does not fully measure the dynamic capabilities according to the definition initially introduced by Teece and Pisano (1994). Thus, we develop and test a new scale to measure the dynamic capabilities of SMEs following standard protocols (De Vellis, 2003). To achieve this a list of items are employed to measure three dimensions of dynamic capabilities by self-generating and adopting relevant scales introduced by earlier studies (Jiao *et al.*, 2013; Lee *et al.*, 2011; Lin and Wu, 2014; Pavlou and El Sawy, 2011). To ensure the face and content validity, we analyse all items to make sure that they are aligned with each element of Teece's definition of dynamic capabilities (Teece, 2007, 2014; Teece, Pisano, and Shuen, 1997). All questions were reviewed and vetted by our academic colleagues and some senior managers of local SMEs and a pilot test was then undertaken to reduce the number of items. Items that exaggerate the effect, pressure successful outcomes or only invite affirmative answers for

particular instances of dynamic capabilities were dropped from the questionnaire. From a list of twenty-one items, a final list of fifteen items (five items per each dimension of dynamic capabilities) as an aggregate multidimensional measurement was constructed to measure the dynamic capabilities of SMEs (see Appendix 1).

Control variables

It is recognised that new, young and small firms face liabilities that are linked to a lack of legitimacy and a limited resource base (Baker and Nelson, 2005; Zahra, Sapienza, and Davidsson, 2006) and that larger firms are more likely to have a substantial and diverse resource base on which to draw (Wernerfelt, 2013). To address these possible differences we control for *firm size* measured through the logarithm of total number of employees at the time the survey was conducted. In addition, it has been suggested (Arend, 2014b) that firms of different age profiles employ different methods to execute dynamic capabilities. *Firm age* was therefore controlled and measured based upon a firm's founding year. We also use industrial dummy variables to control for any unobserved environmental effects between the four groups of sectors identified in the dataset as: information, telecommunications and entertainment (JR), retail, transportation, accommodation and food service (GHI), business and administrative services (KLMN), and manufacturing and construction (CF) (Table 1) (Carmeli and Azeroual, 2009).

ANALYSIS AND RESULTS

Structural equation modelling (SEM) is used to test the research hypotheses. This entails a two-stage approach; a measurement model using confirmatory factor analysis (CFA) to examine the validity and reliability of measurements, and a structural model to test the relationships among latent variables (Anderson and Gerbing, 1988; Byrne, 2010; Shook *et al.*, 2004). This study

employs three criteria suggested in previous literature to address model fit (Bagozzi and Yi, 1988; Eddleston and Kellermanns, 2007; Lado, Dant, and Tekleab, 2008; Marsh, Hau, and Wen, 2004). Firstly, the normed χ^2 (i.e., the ratio of χ^2 to the degree of freedom) which is required to be lower than 3; secondly, the root mean square error of approximation (RMSEA) which is required to be lower than 0.06; and thirdly, a three indices comparative fit index (CFI) that employs both incremental fit index (IFI) and the Tucker-Lewis index (TLI), that requires a score greater than 0.9.

Stage 1: Measurement model

Validity and reliability. To reduce common method bias, previously validated measurements were employed (Spector, 1987) and a pilot test on 40 SMEs in Dorset was undertaken to help fine tune the survey instrument. To avoid measurement errors, the study conducted survey measures and used a construct validation test for validity (convergent and discriminant) and reliability.

We construct the first-order CFA for bricolage, social capital and dynamic capability, and second-order CFA in which structural, relational and cognitive factors indicate social capital, and dynamic capability is constituted by sensing, seizing, and reconfiguring variables. The results indicate that first order CFA of the bricolage model is an acceptable fit (CMIN/DF=1.469, RMSEA=0.059, CFI=0.995, IFI=0.995, TLI=0.988), and the loading of each item is significant at 0.001 levels (Appendix 1). In terms of social capital CFA both first- and second-order measurements are a good fit (first order: CMIN/DF=1.917, RMSEA=0.058, CFI=0.975, IFI=0.976, TLI=0.963; second order: CMIN/DF=1.835, RMSEA=0.055, CFI=0.977, IFI=0.977, TLI=0.967) and each item loads on a single factor is significant at 0.001 levels (Appendix 1). In the case of dynamic capabilities the first-order CFA measurement revealed an acceptable fit

model (CMIN/DF=1.895, RMSEA=0.057, CFI=0.965, IFI=0.965, TLI=0.951). However from the set of items measuring the seizing variable, the loading of the first item was the least (0.58), resulting in an average variance smaller than 0.5. We thus dropped this item and repeated the process to test the validity of the dynamic capability measurement. The new results show that both the first- and second-order CFA for the dynamic capability measurement models are a good fit (first order: CMIN/DF=1.824, RMSEA=0.055, CFI=0.971, IFI=0.971, TLI=0.957; second order: CMIN/DF=1.824, RMSEA=0.055, CFI=0.971, IFI=0.971, TLI=0.957) and each item loads on a single factor and is significant at 0.001 levels (Appendix 1).

To assess convergent validity, we examined construct loadings and the average variance extracted. The results from the first-order CFA of social capital, bricolage and dynamic capability models reveal that all standardized loading estimates are higher than 0.5 (Appendix 1) and all are greater than 0.5 (Appendix 2a) when the indexes of average variance extracted (AVE) is employed; suggesting adequate convergent validity. Discriminant validity tests (i.e., unidimensionality) reveal that all AVE estimates are greater than the maximum shared variance (corresponding squared interconstruct correlation) (Appendix 2a) inferring that discriminant validity of the hypothesized structure are supported by our data. Because both convergent and discriminant validity measurements hold, the research measurements are valid to use for hypothesis tests. Having established this we compute the composite reliability of all first-order factors (above 0.70) by the formula of Fornell and Larcker (1981) that indicates reliability in the research measurement (Hatcher, 1994) (Appendix 2a).

Measurement model. We construct a measurement model by estimating the second-order factors (social capital and dynamic capabilities) and the covariance among these factors and bricolage. The result suggests that the measurement model is a good fit (CMIN/DF=1.174,

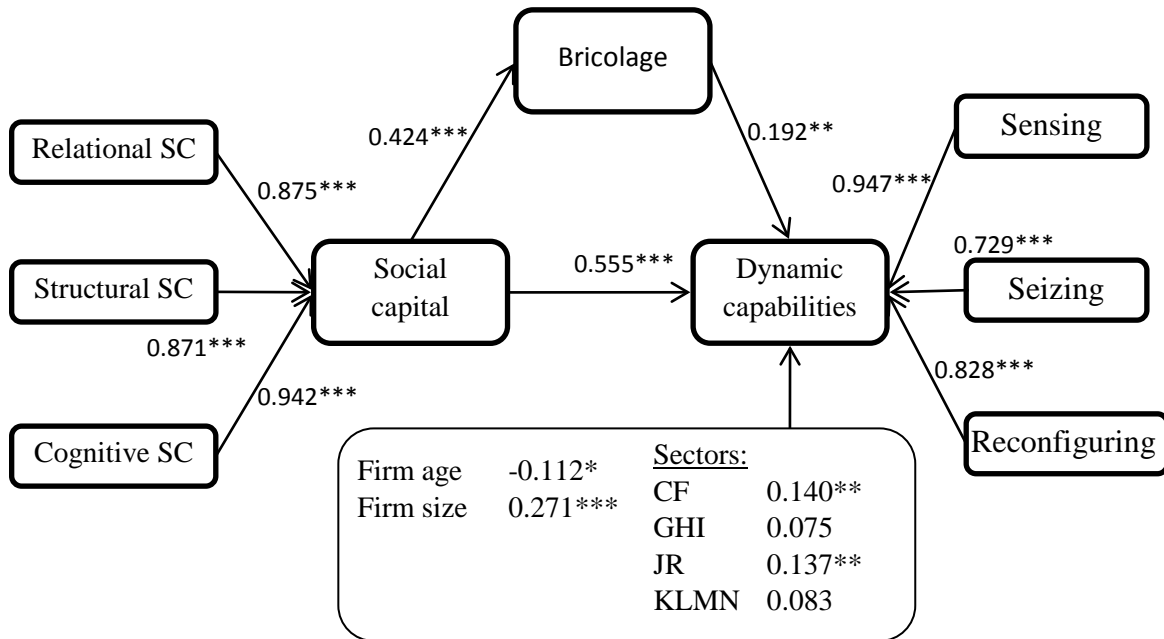
RMSEA=0.025, CFI=0.984, IFI=0.984, TLI=0.980) and all first-order variables significantly ($p < 0.001$) load on second-order factors (see Appendix 1). Thus, the measurement model is valid to construct a structural model for hypothesis tests.

Stage 2: Structural model

Figure 1 shows that the structural model is a good fit (CMIN/DF = 1.621, RMSEA = 0.048, CFI = 0.924, IFI = 0.925, TLI = 0.913) and appropriate to test the research hypotheses. The results indicate support for all four hypotheses; the social capital of management teams has a significant positive impact (0.555, $p < 0.001$) on the dynamic capabilities of SMEs; thus, hypothesis 1 is supported. There is a significant positive link between the bricolage of management teams and the dynamic capabilities of SMEs (0.192, $p = 0.003$) and the social capital of management teams has a significant positive influence (0.424, $p < 0.001$) upon the bricolage of management teams; providing support for hypothesis 2 and hypothesis 3. To test hypothesis 4, the mutual connections between social capital and bricolage, bricolage and dynamic capabilities, and social capital and dynamic capabilities must be estimated (Hayes, 2013). The results show that all of those links are significantly positive (0.424, $p < 0.001$; 0.192, $p < 0.003$; 0.555, $p < 0.001$); indicating that the bricolage of a management team plays a partial mediation role (MacKinnon, Fairchild, and Fritz, 2007) between the social capital of a team and dynamic capabilities of a firm; indicating support for hypothesis 4 (Figure 1).

In terms of control variables, the results reveal that age has a significant negative (-0.112, $p = 0.04$) and size a significant positive (0.271, $p < 0.001$) influence upon a firm's dynamic capabilities. The results that refer to the possible influence of industry sector upon the creation and implementation of dynamic capabilities is more varied. Those SMEs that operate within manufacturing and construction (CF) or information, telecommunications and entertainment (JR)

exhibit a significantly positive influence; while SMEs in the retail, transportation, accommodation and food service (GHI) or business and administrative services (KLMN) industries were not impacted by any contextual factors of the sector (0.075, $p = 0.151$; 0.083, $p = 0.116$).



Model Fit: CMIN/DF = 1.621, RMSEA = 0.048, CFI = 0.924, IFI = 0.925, TLI = 0.913;
 * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; All error terms omitted for clarity.

Figure 1. Dynamic capabilities model

Fine-grained analysis

The results have shown that both social capital and bricolage of management teams positively influence the dynamic capabilities of SMEs, but how each dimension of social capital and bricolage contribute to this process is unclear. We thus undertake a fine-grained analysis to discover the nature of those influences by constructing three sub-models for dynamic capabilities; sensing, seizing and reconfiguring and create measurement models which incorporate the notion of bricolage and three dimensions of social capital (structural, relational,

and cognitive) before investigating possible relationships. For bricolage and dynamic capabilities in all sub-models; sensing (-0.049, $p = 0.712$; 0.042, $p = 0.722$), seizing (-0.009, $p = 0.948$; 0.257, $p = 0.062$), and reconfiguring (-0.032, $p = 0.802$; -0.052, $p = 0.644$) structural social capital shows no impact.

Sensing Model. In this model the results reveal an acceptable fit (CMIN/DF=1.860, RMSEA=0.056, CFI=0.936, IFI=0.937, TLI=0.928) and all variables are valid and reliable to build a structural model (see Appendix 2b). The acceptable fit model shown in Table 2 (CMIN/DF=1.834, RMSEA=0.055, CFI=0.919, IFI=0.920, TLI=0.906) provides evidence that the cognitive social capital and bricolage of management teams has a significant positive influence upon the sensing capability of SMEs (0.537, $p < 0.001$; 0.244, $p < 0.001$). In addition, relational social capital has a significant positive influence upon the bricolage of management teams (0.464, $p < 0.001$). Interestingly, the sensing capability of an SME is likely to be higher if the SME is younger (-0.124, $p = 0.023$), larger (0.197, $p < 0.001$) and in the manufacturing and construction (CF) (0.132, $p = 0.011$) or business and administrative services (KLMN) sectors (0.109, $p = 0.048$) (Table 2).

Seizing model. We have constructed a seizing model based upon an acceptable fit of measurement (CMIN/DF=1.751, RMSEA=0.052, CFI=0.947, IFI=0.948, TLI=0.939), and all variables are valid and reliable to construct a structural model (see Appendix 2b) which is also an acceptable fit (CMIN/DF=1.835, RMSEA=0.055, CFI=0.920, IFI=0.921, TLI=0.908). The structural model identifies that only cognitive social capital has significant positive influence on the seizing capability of SMEs (0.411; $p < 0.001$) and that relational social capital is the only influence upon the bricolage of management teams (0.458, $p < 0.001$). However, results do not show that relational social capital influence upon bricolage leads to improvements in the seizing

capability of SMEs (0.079, $p = 0.289$). The findings also suggest that firm size significantly positively influences the seizing capability of SMEs (0.244, $p < 0.001$) (Table 2).

Reconfiguring model. All variables in the acceptable fit measurement model (CMIN/DF=1.741, RMSEA=0.052, CFI=0.945, IFI=0.946, TLI=0.938) are valid and reliable to construct a structural model (see Appendix 2b). The result from structural equation modelling analysis shows that the reconfiguring model is acceptable fit (CMIN/DF = 1.810, RMSEA = 0.054, CFI = 0.920, IFI = 0.921, TLI = 0.908). This model suggests that only the cognitive social capital of management teams has a significant positive influence (0.416, $p < 0.001$) on the reconfiguring capability of SMEs. In addition, the findings suggest that relational social capital has a significant positive influence upon the bricolage of management teams (0.457, $p < 0.001$) and such bricolage processes have a significant positive influence upon an SMEs reconfiguring capability (0.222, $p < 0.001$). While firm age has a significant negative impact (-0.113, $p = 0.037$), firm size (0.171, $p = 0.002$) and the industrial environment, such as information, telecommunications and entertainment (JR) (0.308, $p < 0.001$), business and administrative services (KLMN) (0.148, $p = 0.004$), and manufacturing and construction (CF) (0.161, $p = 0.002$), have a significantly positive influence upon the reconfiguring capability of SMEs (Table 2).

Table 2. Fine-grained analysis

Variables	Sensing Model	Seizing Model	Reconfiguring Model
Controls			
Firm age	-0.124*	-0.010	-0.113*
Firm size	0.197***	0.244***	0.171**
Sectors			
CF	0.132*	0.074	0.161**
GHI	0.022	0.083	0.094 [†]
JR	0.067	0.010	0.308***

KLMN	0.109*	0.047	0.148**
Bricolage	0.244***		0.222***
Structural social capital		0.253 [†]	
Relational social capital		-0.268 [†]	
Cognitive social capital	0.537***	0.411***	0.416***
Relational social capital → Bricolage	0.464***	0.458***	0.457***
Model fit			
CMIN/DF	1.834	1.835	1.810
RMSEA	0.055	0.055	0.054
CFI	0.919	0.920	0.920
IFI	0.920	0.921	0.921
TLI	0.906	0.908	0.908

[†] p < 0.1; * p < 0.05; ** p < 0.01; *** p < 0.001.

DISCUSSION

The importance of dynamic capabilities for developing and sustaining SMEs is well documented (Wang, Senaratne, and Rafiq, 2015; Zott, 2003), yet little is known about how such capabilities are generated and appropriated within such contexts. This study addresses this gap in the literature and examines the influence that the social capital and bricolage of management teams have upon the the development of dynamic capabilities within SMEs. We build on insights into the antecedents of dynamic capabilities in the context of resource-constrained firms through the deployment of bricolage and social capital, (Baker and Nelson, 2005; Nahapiet and Ghoshal, 1998) and enhance this using fine-grained analyses to analyse how SMEs and their management teams, through the structural, relational and cognitive elements of social capital and bricolage contribute to the generation and appropriation of the dynamic capabilities of sensing, seizing, and reconfiguring.

Zollo and Winter (2002) highlighted a direct connection between dynamic capabilities and

the survival of firms that operate in complex and fast changing business environments; with a firm developing its capabilities during the process by which it acquires and combines resources (Pandza *et al.*, 2003). As such a firm's resource creation is path-dependent, an accumulation and a reconfiguration of new or existing resources (Lichtenthaler, 2009; Macher and Mowery, 2009). The results of this study strengthen our theoretical understanding about how social capital and bricolage are embedded in improvisational and experimental learning processes (Prashantham and Floyd, 2012), enabling a firm to reconfigure existing resources and create new resources; which helps to generate and shape the dynamic capabilities of a firm. A conclusion supported by previous findings that suggest making do with available resources and creating new resources from tools at hand (Baker, Miner, and Eesley, 2003) contribute significantly to the generation and development of dynamic capabilities.

These findings begin to fill a theoretical knowledge gap by identifying what contributes to the generation and development of the three principal dimensions of dynamic capabilities: sensing, seizing, and reconfiguring. The sensing capability of SMEs is associated with the ability of management teams to identify and shape opportunities through scanning, searching, and exploring across the business environment (Nelson and Winter, 1982; Teece, 2007). Such activities are determined by the ability to access new and existing information and the mechanism to recognize and take advantage of disequilibrium (Teece, 2007, 2012, 2014). Our findings revealed that information and knowledge shared by parties, who have similar representations, interpretations and systems of meaning (cognitive social capital), with a management team is likely to be useful for the process of opportunity recognition. Meanwhile, a network that has relational capital and exhibits high quality links associated with characteristics of trust, norms, obligation and identity; is likely to provide information and knowledge that

facilitates a process by which the bricolage mechanism is able to reconfigure the repertoire to enhance the sensing process. Trust creates the glue that enables the management team to access external networks and use them as antennae into the wider community. This helps them to sense new alternative options and then use the knowledge, expertise, and experience of the wider network to sift, filter and examine how these options fit with the resources and strategic objectives of the firm. In this way relational social capital through the bricolage process begins to identify options that can be usefully employed.

Once opportunities have been sensed management teams need to find or reconfigure resource to seize the opportunities made available (Teece, 2007). During this stage cognitive social capital helps to limit the potential for misunderstanding, the shared vision acts as a bonding mechanism that helps different parts of a network integrate knowledge (Inkpen and Tsang, 2005). By emphasizing the relevance of common goals, solidarity fosters information sharing, and resource exchange (Atuahene-Gima and Murray, 2007) and this is supported by our findings which indicate a significant direct relationship between cognitive social capital and the seizing capability of SMEs. While our model identifies that relational capital significantly influences the bricolage process in supporting the sensing capability our findings, at the seizing stage, only suggest that relational social capital is important in supporting bricolage. The findings, however, find no evidence that bricolage subsequently influences the seizing capability in SMEs. We posit that this finding may relate to the notion that external networks will be less useful in supporting such decisions as they have limited knowledge of a firms internal resources, strategic objectives, or personal preferences. The bricolage process becomes more important when a firm decides a reconfiguration of such elements is required to help SMEs to break free from unfavourable path dependencies and maintain evolutionary fitness (Teece, 2007, 2012).

Previous literature (Helfat and Martin, 2015; Le Breton-Miller and Miller, 2006; Prashantham and Young, 2011; Zahra and George, 2002) indicates that networks may help to acquire, assimilate and exploit knowledge and resources to alter personnel, organizational structure, and physical assets through a process of reconfiguration. While our findings support this literature they go further to highlight the direct significance of cognitive social capital in directly influencing an SMEs ability to reconfigure resources, enabling access to new opportunities and helping to overcome unfavourable path dependencies. In addition, through relational social capital external networks help to adapt and develop solutions by utilising the management teams prior knowledge of resources available within their networks and the routines by which they operate (Vera *et al.*, 2016). In other words, relational social capital can enhance the diversity and dexterity of the repertoire of a firm's resources to address challenges (Autio, George, and Alexy, 2011) and, as a consequence, influence the the reconfiguration capability through bricolage. In undertaking our fine-grained research we found no significant relationship between structural social capital and any of the three identified dynamic capabilities. Structural social capital refers to the pattern of connections within networks (i.e. ties and configurations) that forms the infrastructure around which social capital is developed and deployed (Pearson, Carr, and Shaw, 2008). We would argue that structural social capital forms the basis upon which relational and cognitive social capital can be fostered, enabling external knowledge to address the limitations associated with internal resources (Vera *et al.*, 2016), challenge internal paradigms (Amabile, 1998), and inject new ideas that improve a team's ability to reconfigure past experiences in new ways (Bresman, 2010; Kyriakopoulos, 2011; Vera *et al.*, 2016). The control variables of size, age and sector are also relevant. The dynamic capabilities of an SME are likely to improve as firm size increases. So older firms that have increased in size will show a

positive change in their dynamic capabilities; however older firms that have not shown increases in size are likely to exhibit lower levels of dynamic capability. Whilst the findings do indicate that sector does have an influence upon the development of dynamic capabilities we are of the opinion that the broad categories into which they have been grouped limits any implications that can be drawn.

CONCLUSIONS

This paper investigates the impact on dynamic capabilities as a consequence of the bricolage and social capital exhibited by management teams of SMEs. The research is distinctive in its focus upon SMEs in the UK and the use of management teams as the unit of analysis. This research posited that the bricolage and social capital of a management team would be positively related to improvements of the dynamic capabilities of a firm. This study employs the dynamic capability construct developed by Teece (2007) and the improvisation and experimentation learning models of Prashantham and Floyd (2012) to construct a research framework that examines the contributions that the social capital and bricolage of management teams have on the dynamic capabilities of SMEs. This develops the extant literature that has, up until now, employed longitudinal qualitative theoretical frameworks; our analysis has established a suite of statistical models based upon a new set of measurements to test the factors that influence the creation and implementation of dynamic capabilities. To do this hypotheses were developed and tested on survey data from 274 SMEs across the UK. The results indicate that a management team is likely to improve its firm's dynamic capabilities by exploiting its own social capital and the resources it has at hand.

This results from this research contribute to our understanding as to how capabilities emerge from individual action and interaction (Abell, Felin, and Foss, 2008) by conceptualizing

social capital and bricolage as an important factor promoting the development of SME dynamic capabilities. The establishment of this link is of particular importance given the limited amount of research, especially research of empirical nature (Danneels, 2008), on the microlevel origins of organizational capabilities (Felin *et al.*, 2012; Zollo and Winter, 2002). As a result, this empirical study is among the first to integrate management team considerations into a predominantly firm level concept. This contribution is important as the individuals (and their underlying characteristics, skills, and motivations) who compose the management team are key to understanding strategy processes at the firm level (Felin *et al.*, 2012). Secondly, our fine-grained analysis examines how the three different elements of social capital impact upon all three identified aspects of capability, either directly or through the bricolage process. While this is not straightforward to address, this level of detail has not been attempted before and provides some interesting findings that could inform future research.

While previous studies have established the importance of dynamic capabilities and their contribution to the competitive advantage of firms, our research concentrates upon the source of these capabilities which makes it particularly useful for practitioners. More specifically, we hypothesized that management teams and their interactions with members from their network have an important effect on SME capabilities. In particular, management teams should actively build up trust and establish close network ties with their exchange partners and ensure the effective and efficient sharing of information to translate the effects of social capital into capabilities. Thus, the consistent message of our research is that building organizational capabilities is greatly dependent on the existence of a management team's appropriate social capital and its interplay with bricolage. SME management teams should therefore seek to cultivate relationships with a wide array of external stakeholders to ensure access to crucial

information and resources. They should further promote the importance of trust and solidarity among network members by providing opportunities for social interactions and by striving for a shared vision. Managers of SMEs should also focus on developing their abilities to network, collaborate, and share information and knowledge.

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Appendix 1. Measurement constructs and factor loadings

Measures		First order loadings (Variance explained)	Second order loadings (Variance explained)
<u>Social capital</u>			
<i>Adapted from Nahapiet and Ghoshal (1998), Carr et al. (2011), Gu, Wang, and Wang (2013), Karahanna and Preston (2013), Huynh (2016), and Huynh et al. (2017).</i>			
<u>Relational social capital</u>			0.861*** (0.731)
<i>Would you please rate your level of agreement with these statements about personal and business networks that the management team of your company has with other individuals or companies? From 1 (Strongly disagree) to 7 (Strongly agree).</i>	We and others in the network deal with each other honestly and transparently	0.772*** (0.596)	
	We and others in the network pay attention to confidentiality when sharing information	0.74*** (0.548)	
	We and others in the network abide by all of mutual relationships	0.795*** (0.632)	
	We and others in the network encourage independent thinking to generate new knowledge	0.805*** (0.648)	
	Our knowledge is well informed by others in the network	0.798*** (0.636)	
	We and others in the network provide good support to each other	0.767*** (0.589)	
<u>Structural social capital</u>			0.87*** (0.757)
<i>Would you please rate your level of agreement with these statements about personal and business networks that the management team of your company has with other individuals or companies? From 1 (Strongly disagree) to 7 (Strongly agree).</i>	We maintain close relationships with others in the network	0.789*** (0.623)	
	We spend a lot of time interacting with others in the network	0.885*** (0.784)	
	We frequently communicate with others in the network	0.903*** (0.816)	
	We directly communicate with others in the network	0.796*** (0.634)	
	We and others in the network immediately share new information that helps the community	0.78*** (0.609)	

7 (Strongly agree).

Cognitive social capital

0.93***
(0.865)

<i>Would you please rate your level of agreement with these statements about personal and business networks that the management team of your company has with other individuals or companies? From 1 (Strongly disagree) to 7 (Strongly agree).</i>	We and others in the network have the same views and values on sharing matters	0.744*** (0.554)
	Most people in our networks have new knowledge	0.73*** (0.534)
	We know how to transfer new knowledge from the network into our company's operations	0.747*** (0.559)
	There is a shared understanding of new knowledge in our network	0.843*** (0.711)
	In our network, there are many well-respected business people with a track-record of business success	0.7*** (0.49)
	In our network, those people with good track-records influence our business practices	0.721*** (0.519)

Bricolage

Employed from Davis et al. (2013) and Senyard et al. (2014)

<i>Would you please rate your level of agreement with these statements about the management style of management team? From 1 (Strongly disagree) to 7 (Strongly agree).</i>	We can find workable solutions to new challenges by using our existing resources	0.7*** (0.49)
	With our existing resources, we take on a broader range of challenges than other companies	0.589*** (0.346)
	We would use any existing resource that would seem useful to respond to a new problem or opportunity	0.773*** (0.588)
	We deal with new challenges by applying a combination of our existing resources and other freely available resources	0.8*** (0.629)
	When dealing with new problems or opportunities, we take action and assume that we will find a workable solution	0.737*** (0.543)
	By combining our existing resources, we take on a surprising variety of new challenges	0.714*** (0.51)
	When we face new challenges, we put together workable solutions from our existing resources	0.764*** (0.584)
	Often resources are combined to accomplish new challenges outside the original remit of such resources	0.698*** (0.488)

Dynamic capabilities

Constructed from Teece, Pisano, and Shuen (1997), Teece (2007), Pavlou and El Sawy (2011), Lee et al. (2011), Jiao et al. (2013), Lin and Wu (2014), and Teece (2014).

Sensing capability

0.922***
(0.851)

<i>Would you please rate your level of agreement with these statements about your firm's methods to shape new opportunities? From 1 (Strongly disagree) to 7 (Strongly agree)</i>	We constantly scan, search, and explore customer needs	0.71*** (0.525)
	We constantly scan, search, and explore technological possibilities	0.691*** (0.497)
	We try to understand the structural evolution of industries and markets	0.658*** (0.453)
	We assess how and when competitors, suppliers and customers will respond to our company's new ideas	0.704*** (0.516)
	We identify which market segments the company's new business ideas can target	0.747*** (0.579)

Seizing capability

0.686***
(0.471)

<p><i>Would you please rate your level of agreement with these statements about your firm's methods to address an opportunity once it is identified? From 1 (Strongly disagree) to 7 (Strongly agree)</i></p>	<p>We select target customers for the opportunity</p> <p>We invest in product-specific marketing, distribution and purchasing networks</p> <p>We have rules for those activities addressing new opportunities to generate benefits for the company</p> <p>We select or recruit the managers appropriate to oversee the implementation of a new business opportunity</p> <p>We have proper disciplines to mitigate bias in all activities that address new opportunities</p>	<p>--</p> <p>0.713*** (0.509)</p> <p>0.759*** (0.576)</p> <p>0.742*** (0.55)</p> <p>0.745*** (0.554)</p>	
			0.804*** (0.636)
<p>Reconfiguring capability</p> <p><i>Would you please rate your level of agreement with these statements about your firm's methods to sustain its growth? From 1 (Strongly disagree) to 7 (Strongly agree)</i></p>	<p>We engage in technological research and development</p> <p>We access and integrate technology developed by other people/institutions</p> <p>We continuously identify, develop, and utilise specialised assets (e.g. technology, strategy, process, business model, etc.) which are difficult to imitate</p> <p>We create value by combining specialised assets that exist within and outside the company (e.g., other organisations, universities)</p> <p>We promote the flow of technology while protecting intellectual property rights from misappropriation and misuse</p>	<p>0.655*** (0.429)</p> <p>0.702*** (0.492)</p> <p>0.817*** (0.667)</p> <p>0.707*** (0.5)</p> <p>0.703*** (0.495)</p>	

*First order social capital model fit (CMIN/DF=1.917, RMSEA=0.058, CFI=0.975, IFI=0.976, TLI=0.963);
Second order social capital model fit (CMIN/DF=1.835, RMSEA=0.055, CFI=0.977, IFI=0.977, TLI=0.967);
First order bricolage model fit (CMIN/DF=1.469, RMSEA=0.059, CFI=0.995, IFI=0.995, TLI=0.988);
First order dynamic capability model fit (CMIN/DF=1.824, RMSEA=0.055, CFI=0.971, IFI=0.971, TLI=0.957);
Second order dynamic capability model fit (CMIN/DF=1.824, RMSEA=0.055, CFI=0.971, IFI=0.971, TLI=0.957);
*** Loading significant at the 0.001 level.*

Appendix 2a. Reliability and validity test for hypothesized model

Factors	Composite Reliability (CR)	Average Variance Extracted (AVE)	Maximum Shared Variance (MSV)
<i>Hypothesized model</i>			
<i>Social networks</i>			
Relational social capital	0.918	0.501	0.413
Structural social capital	0.903	0.608	0.564
Cognitive social capital	0.918	0.693	0.564
<i>Bricolage</i>			
Cognitive social capital	0.884	0.561	0.501
<i>Bricolage</i>			
Cognitive social capital	0.898	0.501	0.206
<i>Dynamic capabilities</i>			
Sensing capability	0.849	0.501	0.413
Seizing capability	0.830	0.503	0.420
Reconfiguring capability	0.829	0.547	0.420
Reconfiguring capability	0.842	0.517	0.383

Appendix 2b. Reliability and validity tests for fine-gained analysis

Factors	Composite	Average	Maximum
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	Reliability (CR)	Variance Extracted (AVE)	Shared Variance (MSV)
<u>Sensing model</u>			
Relational social capital	0.905	0.614	0.556
Structural social capital	0.920	0.699	0.556
Cognitive social capital	0.880	0.552	0.546
Bricolage	0.899	0.501	0.213
Sensing capability	0.813	0.508	0.379
<u>Seizing model</u>			
Relational social capital	0.902	0.607	0.560
Structural social capital	0.918	0.693	0.560
Cognitive social capital	0.880	0.553	0.503
Bricolage	0.898	0.501	0.203
Seizing capability	0.809	0.518	0.147
<u>Reconfiguring model</u>			
Relational social capital	0.903	0.608	0.564
Structural social capital	0.919	0.694	0.564
Cognitive social capital	0.881	0.554	0.503
Bricolage	0.898	0.501	0.203
Reconfiguring capability	0.849	0.530	0.251
<p><i>Sensing measurement model:</i> (CMIN/DF=1.860, RMSEA=0.056, CFI=0.936, IFI=0.937, TLI=0.928);</p> <p><i>Seizing measurement model:</i> (CMIN/DF=1.751, RMSEA=0.052, CFI=0.947, IFI=0.948, TLI=0.939);</p> <p><i>Reconfiguring measurement model:</i> (CMIN/DF=1.741, RMSEA=0.052, CFI=0.945, IFI=0.946, TLI=0.938).</p>			