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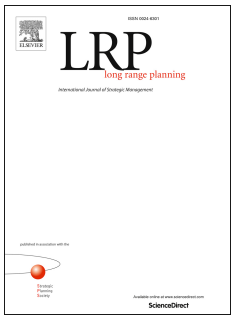

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Consolidation and Fragmentation in Environmental Scanning: A Review and Research Agenda

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Consolidation and Fragmentation in Environmental Scanning: A Review and Research Agenda

Abstract

Environmental scanning is a broadly defined concept, having first received attention from scholars in the late 1960s. Over the years a number of similar and overlapping constructs have emerged in management literature. The aim of this study, via a systematic review and thematic analysis of relevant empirical research, is to consolidate foundation environmental scanning knowledge, demonstrate how scanning research has developed and fragmented over time, and propose an agenda for future research. The first contribution of our review is a new typology of environmental scanning research made up of five discrete research views, which provides a more comprehensive and contemporary overview of the field than previous studies. The second is a proposed agenda for future research that explicitly acknowledges the role of technology, an area that is presently underdeveloped in foundation scanning literature. The third contribution is to signpost future directions for research on scanning and organisational performance using a number of theoretical perspectives. The overall outcome of our review is to move scanning research on from increasingly incremental contributions concerned with context to a place where the changing role of technology and the mechanisms through which environmental scanning contributes to competitive advantage can be more thoroughly understood.

Keywords: Environmental Scanning; Organisational Learning; Organisational Capabilities; Information Systems; Ambidexterity

Introduction

Environmental scanning (ES) is a foundation topic in strategic management and has been identified as an essential component of many organisational processes. ES is closely related to scenario planning (Sharma and Yang, 2015), supports product innovation (Martini et al., 2017), and is a precursor to strategic change (Ben-Menahem et al., 2013). From its initial conception as a basic information seeking activity, ES has evolved into a complex concept entailing diverse individual and organisational practices to deal with an ever-changing environment (Robinson and Simmons, 2018).

This evolution of ES research has resulted in a number of related fields emerging. For example, ES can be viewed as the foundation construct upon which areas such as competitive intelligence (Franco et al., 2011; Qiu, 2008), market intelligence (Mortara et al., 2009), and business intelligence (Marshall et al., 2004) have been built. Indeed such terms, along with ES, are often used synonymously. ES research also feeds into other areas of management theory, such as strategic sense-making (Thomas et al., 1993) and organisational learning (Daft and Weick, 1984). ES encompasses activities such as horizon scanning (van Rij, 2010) and aspects of scenario planning (Saritas and Nugroho, 2012), both of which are regularly seen as discrete research areas in their own right.

This proliferation of ideas suggests some fragmentation of ES research over time. Despite this, attempts to review the field and map out the future have been limited. Reviews of a number of closely related areas exist, such as opportunity evaluation (Wood and McKelvie, 2015) and strategic foresight (Iden et al., 2017), but these mention ES only as far as underlining its importance. Other recent work has focused on subsets of ES activity such as competitor analysis (Hatzijordanou et al., 2019). Overall such reviews focus only on a single aspect of ES.

A review concerned with the related topic of environmental uncertainty (Kreiser and Marino, 2002) identified inconsistencies in the way the concept was defined and operationalised; it appears that the situation with ES is not dissimilar. A prior attempt to review research explicitly addressing ES (Costa, 1995) is limited by a focus on the information practices of senior executives and a now dated literature set. A subsequent conceptual integration (Choo, 2001), identified four effects on ES around which existing studies were grouped: situational dimensions, organisation strategy, managerial traits and information behaviour.

Neither existing review adequately reflects contemporary practice in ES and both fail to address the theoretical complexity evident in the wider strategic management field, which has become increasingly pluralistic as it has grown (Nag et al., 2007). Such pluralism has led to fragmentation becoming a source of serious concern from some authors (Hambrick, 2004; Oxley et al., 2010). Moreover, integration and consolidation via reviews of existing literature has been identified as a priority for the wider field (Durand et al., 2017) and the need to present a consolidated view of ES has already been acknowledged (Rohrbeck and Bade, 2012).

We therefore propose to undertake a review of ES literature both to consolidate existing knowledge and develop an agenda for future research. ES research underpins or feeds into other areas of management theory; the field thus requires consolidation and links with other areas some elaboration. In addition, the approach in existing reviews has been to focus on individual aspects of ES or to examine related constructs. The ES field as a whole lacks synthesis and integration and a review of ES is timely.

Further, the way in which ES is conducted in organisations has changed dramatically over the last fifty years and this needs to be acknowledged in future ES research. Again the situation reflects the wider field, where various possible emphases for the future have been suggested

(Laamanen, 2017). These include the impact of technological change, where the increasing prevalence of artificial intelligence and data analytics are having a large impact on the way organisations work and consequent implications for strategy (Singh et al., 2019; van Rijmenam et al., 2019; Warner and Wäger, 2019). Related to technological change are the cognitive challenges emerging from digital transformation in organisations (Raffaelli et al., 2019) and the related need to integrate management cognition into other areas of research (Buyl et al., 2011). Another area is the potential of multi-level analysis to better understand the relationship between microprocesses and macro level outcomes (Kassotaki et al., 2019; Kouamé and Langley, 2018; Walrave et al., 2018). All of these may be relevant to ES research in future.

Our paper is structured as follows. First we identify and appraise themes in existing ES research to develop a holistic understanding of the field. We accomplish this via a systematic review and thematic analysis of the literature and develop a new typology of ES research consisting of five overarching research views: *Upper Echelons, Planning and Process, Capability Learning and Innovation, Information Systems,* and *Cognitive*. Next, this typology is used as a foundation for the second and more substantive outcome of our study, which is an agenda for future ES research. This agenda is developed via a synthesis across views and proposes future directions that acknowledge current directions in the wider strategic management field. The outcome is to move future ES research in a direction that both addresses existing gaps in existing research and is compatible with contemporary practice.

Method

We conducted a systematic review in order identify, analyse and synthesise relevant research on ES. The systematic approach was considered appropriate because it facilitates gathering of a wide range of relevant sources (Crossan and Apaydin, 2010) and provides clarity for

readers on criteria used for inclusion and exclusion of studies in the final sample (Mackay and Zundel, 2017). Systematic reviews are also appropriate where a field lacks intellectual coherence or a standard theoretical framework (Liñán and Fayolle, 2015). We broadly followed the steps of planning, execution and reporting (Tranfield et al., 2003).

This section is in two parts; the first outlines how the literature was selected and the second provides an overview of our analytical process.

Sample Selection

We used the following working definition of ES to acknowledge the diversity of approaches evident in extant research and to provide a focus for our review:

Environmental Scanning is the way in which organisations and individuals within organisations learn about and make sense of their environment. ES may or may not be part of some formal system, involves both passive observation and active gathering of information and is conducted at various levels in organisations.

The definition was intentionally broad in order to facilitate the objective of consolidating a wide area of research. The relationship of ES to multiple cognate or overlapping areas, however, required us to restrict our search to studies explicitly concerned with ES. Therefore, the term *(environment* OR information OR market) scanning* was used to search titles, abstracts and keywords in two key social sciences databases (ISI Social Sciences Citation Index and EBSCO Business Source Premier). This approach to the search ensured that, in addition to covering fundamental ES literature, the sample included studies from other relevant fields explicitly connected to ES. Setting this boundary was important for our systematic review. Inclusion of all related fields, such as competitive intelligence, in their entirety would have resulted in too wide a pool of studies and could have led to the inclusion

of parts of those fields not directly relevant to ES. We aimed for variability only to the extent of relevance to ES.

Searches were run for all English language papers published from 1970 to the end of 2017 in peer-reviewed academic journals. 1970 was chosen as the starting date in order to capture the early emergence of the strategic management field in peer-reviewed literature as well as more recent work. Moreover, the early 1970s has been identified previously as the time when ES started to emerge in the management literature (Costa, 1995). The initial search produced 4,355 results, which were then filtered by subject area; only those in the business and management areas were included. This left 668 potentially relevant papers. After checking for duplicate entries a further 101 results were removed.

Next, a quality filter was applied to make the sample size more manageable. Using the Chartered Association of Business Schools (CABS) Academic Journal Guide 2018, a total of 119 papers published in journals not listed in the guide were removed. We favoured the CABS rankings as opposed to other quality measures because various metrics such as SSCI citation reports and Scopus data are combined to reach the final CABS rankings. While we acknowledge the debate around the validity of such rankings (see Tourish and Willmott, 2015 for example), their use as a measure of journal quality is ubiquitous.

The next stage of the process involved a more detailed review of titles and abstracts. Our inclusion or exclusion of literature was guided by the research question: *How has the study of ES evolved over time and how should ES research move forward?*

Given the intention to focus on how ES has been studied, papers that lacked empirical evidence were excluded at this stage. We took empirical evidence to include both quantitative research using statistical tests and qualitative research using case studies or non-numeric data. This is in contrast to some other reviews focusing on empirical work (David and Han, 2004;

Newbert, 2007) that consider only quantitative research. Exclusion of theoretical work allowed us to focus exclusively on ES theory and relationships that have been operationalised. A meta-analysis was not considered appropriate because it would have resulted in the exclusion of qualitative studies from the sample, thus limiting the scope of the review.

Using a similar approach to Lee (2009), the remaining papers were then categorised A, B or C where A meant directly relevant to the research question, whereas B and C papers were only marginally relevant or not relevant[1]. The exercise was conducted first by one author individually and reviewed by the others for consistency and accuracy. Only the 120 papers rated 'A' were included in the final set.

During the analysis a small number of additional relevant papers were identified based on citations. To account for potentially relevant studies published while the review process was ongoing, a Google Scholar alert was set up; three further papers were added to the final sample, resulting in a final pool of 132 studies. Table 1 provides an overview of our literature selection process.

INSERT TABLE 1 HERE

Analytical Process

Thematic analysis was selected for its ability to provide a rich, detailed, yet structured account of complex datasets (Braun and Clarke, 2006). Such an approach can be used in

[1] In order to be categorised as 'A', a paper had to contain some empirical evidence, either qualitative or quantitative, that showed how, in what way, for what reasons ES occurs and/or what its impact might be. Papers categorised as 'B' tended to examine issues related to ES such as environmental uncertainty, absorptive capacity or strategic agility but crucially did not empirically examine ES behaviour or its outcomes. Those categorised as 'C' did not address any aspect of ES either conceptually or empirically.

systematic reviews where a diversity of approaches and theoretical perspectives is evident in the literature base (Jones et al., 2011). An alternative approach would have been to group studies by theoretical perspective; this would, however, have resulted in an extremely fragmented outcome.

To identify themes the sample was first ordered chronologically. Each paper was read in detail, with notes being taken on the study's focus, objectives, key arguments, method and theoretical perspective. From this a short statement was developed outlining each paper's primary focus, from which initial thematic codes were developed. New codes were developed as required, or earlier codes applied to similar papers published more recently, as appropriate.

When all papers had been analysed, codes were grouped according to similarity and reviewed for duplication. This resulted in a clear set of 41 codes and 16 groupings that were then organised into five overarching research views. These views make up our typology of ES research, which is presented along with further details of the analysis below.

Literature Analysis

The analysis is organised as follows. First we provide a brief overview and present our typology of ES research developed through a thematic analysis of the literature set. This is followed by a detailed examination of each overarching view in terms of key theories, areas of focus and contributions.

An initial examination of the literature showed that ES has been researched as both an individual and an organisational activity. Various studies use individual managers as the unit of analysis (e.g. Jennings and Lumpkin, 1992; McGee and Sawyerr, 2003) while others use the organisation as a whole (e.g. Clemens, 2009; Yasai-Ardekani and Nystrom, 1996).

Studies concerned with individuals tend to focus on ES behaviour of top management (e.g. Auster and Choo, 1993; Garg et al., 2003).

Research on ES as a purely informal activity (Abebe, 2012) co-exists with research that treats ES as part of a formal planning or decision-making process (Lau et al., 2012; Lenz and Engledow, 1986). It is not uncommon, however, for researchers to acknowledge that ES varies significantly in level of formality and takes place both inside and outside formal routines (e.g. Jogaratnam, 2005; Raymond et al., 2001).

ES has been examined in a wide range of empirical domains in terms of both geographic location and industry sector. Early research was set in North America and Western Europe, but over time there has been increasing volumes of research conducted in Eastern Europe, the Middle East, Asia-Pacific and Africa. Studies have been conducted in product and service industries, private and public sectors, dynamic and stable environments. Some studies ground their empirical work in one sector, arguing that a consistent environment across multiple organisations allowed a closer study of differences in ES behaviour. Others examine multiple sectors, arguing that multiple empirical domains made any findings about ES more generalisable.

The thematic analysis resulted in the typology of ES research presented in Table 2. The table runs from left to right, moving from individual codes, up to groupings and finally to the overarching research view.

INSERT TABLE 2 HERE

The first two views together comprise the foundation literature on ES. The *Upper Echelons* view, which commenced in the 1970s and is the largest body of work, treats ES as an activity

conducted by senior managers. The *Planning and Process* view, which emerged in parallel to the *Upper Echelons* view, investigates ES as an organisational process. The *Capability, Learning and Innovation* view has emerged more recently and investigates how ES relates to constructs such as dynamic capabilities and innovation. The *Information Systems* view focuses on the use of technology in ES and the *Cognitive* view is concerned with management perception and mental processes involved in ES. Growth of the *Upper Echelons* and *Planning and Process* views has slowed in recent years, giving way to increased growth of areas such as the *Capability, Learning and Innovation* and *Information Systems* views. Figure 1 shows the growth of each research view over time.

INSERT FIGURE 1 HERE

Theoretical perspectives employed to study ES are diverse, ranging from competitive dynamics, organisational adaptation theory to information processing theory, sense making, resource-based/knowledge-based/non-market perspectives and transaction cost economics. It is perhaps unsurprising that such a variety of approaches exists, given the evolution in strategic management theory over the period in question. Therefore each overarching view might contain a number of theoretical perspectives through which common themes have developed.

The remainder of our analysis is devoted to a more detailed examination of each of these five research views. We start with the largest and continue to the smallest. Each view is organised around the groupings in Table 2. We follow the analysis with a synthesis across views, upon which our research agenda is developed.

Upper Echelons View

The *Upper Echelons* view represents the largest body of work in the sample and emerged early in the development of the strategic management field. Research in this tradition is grounded partially in upper echelons theory (Hambrick and Mason, 1984), which purports that an organisation is shaped by the background of its senior managers. We take a wider view here and include all ES research concerned primarily with the scanning behaviour of senior executives. Ideas such as organisational adaptation theory and the attention-based view of the firm, in addition to traditional upper echelons theory, underpin this view of ES.

Individual and Contextual Influences

It is well-established that individual differences influence ES behaviour. Early research showed that functional and educational background have some influence on behaviour (Farh et al., 1984; Hambrick, 1981; Kefalas and Schoderbek, 1973), principally in terms of the areas of the environment scanned most often (Hambrick, 1982; Watson, 1990). Subsequent studies have shown that factors such as individual entrepreneurial orientation (Jogaratnam, 2005; Qiu, 2008) can also influence ES behaviour.

Organisation context can also influence the ES activities of individual managers. Organisation size is more influential than industry context in predicting ES behaviour (Aldehayyat, 2015; Haase and Franco, 2011) but organisational life cycle stage does not appear to influence ES practices (Lester and Parnell, 2008). Country context may also affect ES behaviour (Abu-Rahma and Jaleel, 2019). A comparative investigation of ES behaviour in three European countries during the euro crisis (Barron et al., 2015) showed that external volatility may result in the evolution of more formal scanning routines by individuals.

Perceived Environmental Uncertainty

A significant body of empirical evidence supports the proposition that perceived environmental uncertainty (PEU) in a given sector of the environment encourages managers' scanning activity in that sector (Daft et al., 1988). It is, however, strategic uncertainty – PEU in a sector of the environment that is considered by managers to be important – that drives this relationship (Boyd and Fulk, 1996; Jogaratnam and Wong, 2009).

The existence of uncertainty in a given sector of the environment has been shown to drive increased reliance on human as opposed to written sources of information (Daft et al., 1988; Elenkov, 1997), perhaps because of the non-availability of hard data, but there is also evidence to suggest that this relationship depends the sector of the environment in question (Sawyerr, 1993) or the national setting in which ES takes place (Jogaratnam and Law, 2006).

Sectors of the environment providing highest levels of strategic uncertainty depend on context. While the task environment is a more significant source of uncertainty than the general/remote environment in UK/US based studies (Daft et al., 1988; Xu et al., 2003), this may not apply in transition or industrialising economies. For example the legal environment (a subset of the general environment) was a particular source of PEU in Bulgaria (Elenkov, 1997), Nigeria (Sawyerr, 1993) and Russia (May et al., 2000). Subsequent comparative work (Stewart et al., 2008), however, identified some convergence in behaviour between India and the US.

Scope of Scanning

In addition to being influenced by PEU, the scope of scanning activity can depend on the strategy being pursued. Early research, using the framework suggested by Miles and Snow (1978), found little difference in the ES behaviour in firms with different strategy types (Hambrick, 1982). In contrast, a later study found that firms pursuing a differentiation strategy were more concerned with customer-related issues while those pursuing a cost-based

strategy spent most of their time scanning the competitor environment (Jennings and Lumpkin, 1992). In smaller firms, managers' scanning scope tends to be orientated towards opportunities and threats (Lang et al., 1997) and is related to strategy type and industry life cycle stage (Julien et al., 1999; Raymond et al., 2001).

A broader scope of scanning, combined with increased frequency, has been associated with better alignment between strategy and environment (Beal, 2000). Increased scope of scanning has also been associated with higher firm growth in manufacturing industries (Peters and Brush, 1996). Focus on task environment issues has a positive impact on company performance in dynamic environments (Garg et al., 2003) and a focus on customer and competitor issues has been shown to improve corporate turnaround performance (Abebe, 2012).

Mode of Scanning

Another important factor in scanning behaviour of managers is the medium or mode through which information is gathered. Early work by Keegan (1974) used interviews with senior managers to establish information sources used to scan the environment. These were categorised as either internal or external sources, and as either human or documentary types of information. A similar breakdown was used by Daft *et al.* (1988) but the expression 'mode of scanning' was used to refer to the personal or impersonal and external or internal nature of sources used. The approach adopted in later research (e.g. Jogaratnam and Wong, 2009; May et al., 2000) has been to treat mode and source/channel as synonymous.

With regard to the personal or impersonal nature of data sources, findings suggest that managers overwhelmingly prefer information received directly from other people (Jogaratnam and Law, 2006; Smeltzer et al., 1988). This preference is not absolute, however,

and a number of moderating factors exist, such as accessibility (Culnan, 1983) or the perceived quality and reliability of information (Auster and Choo, 1993).

The age of the organisation in question has been shown to affect managers' information channel selection, where personal channels are used more in 'younger' organisations and impersonal channels are favoured in more mature ones (McGee and Sawyerr, 2003). This is consistent with earlier research suggesting that ES during new venture creation is mostly limited to personal sources in customer and competitor sectors of the environment (Brush, 1992). In these situations, impersonal sources tend to be used either when personal sources are not available (Sawyerr, 1993) or as a complement to information gathered through personal channels (Jennings and Jones, 1999; Julien et al., 1999).

Findings on preference for external or internal sources are mixed. Early research emphasised the external source over the internal, in that customers, family, friends were preferred to employees or colleagues (Sawyerr, 1993; Smeltzer et al., 1988). Some have found that increased PEU results in an increased reliance on external sources of information (Daft et al., 1988; Ebrahimi, 2000). Subsequent studies, however, have found that internal sources are used more frequently as the level of PEU increases (Jogaratnam and Law, 2006; Sawyerr et al., 2003).

Conclusion

The *Upper Echelons* view provides a foundation on which other ES research is built. Most relationships are now accepted as well-established in multiple empirical domains. These include the influence of PEU and role of individual characteristics in determining scanning behaviour, concepts such as scope and mode of scanning, the preference for information received from personal sources and the positive, if sometimes complex, relationship between ES and organisational performance.

Indeed, the firmly-established nature of this body of work means that more recent contributions tend to be incremental or contextual in nature. Therefore our research agenda will propose that only modest gains will be achieved by developing this perspective further in its own right.

Planning and Process View

The *Planning and Process* view is grounded in a number of theoretical perspectives, including organisational adaptation theory, institutional theory, strategic decision-making theory and competitive dynamics. Studies taking a *Planning and Process* view of ES treat the organisation as the unit of analysis, rather than the individual, and examine formally organised ES processes, units, teams and departments.

Early ES Processes

Early research focused on formal ES units found them limited in existence and often ineffective (Fahey and King, 1977; Jain, 1984; Terry, 1977). Other research around the same time found ES units to be generally effective (Thomas, 1980), but used only publicly available information. Despite the apparent lack of structure, an early categorisation of organisations' ES processes (Fahey et al., 1981) suggested three distinct categories of approach:

- Irregular: scanning is crisis-initiated, ad hoc and simplistic in terms of analysis
- Periodic: scanning is issue-oriented, periodically conducted and forecast-oriented
- Continuous: scanning is opportunity and problem-focused, ongoing and conducted formally with substantial future-oriented analyses

Other early research proposed that ES should be future oriented, broad and formalised (Stubbart, 1982); increasing formalisation of ES processes and an emergent focus on forecasting techniques was observed through the 1980s (Preble et al., 1988).

Design of ES Processes

The nature of ES processes may depend on environmental characteristics, with more volatile environments being associated with larger units and more senior management involvement in ES (Yasai-Ardekani and Nystrom, 1996). Formal ES processes tend to develop as firms expand if there is a perception that existing understanding of the environment is inadequate (Costa and Teare, 2000). More recently it has been proposed many firms have some kind of process in place for scanning their environment (Olamade et al., 2011), although this may depend on country context (du Toit, 2016).

Some formal ES techniques relate to the wider body of foresight literature such as horizon scanning. Although some authors treat horizon scanning and ES as synonymous, there is a distinction. If ES is concerned with an organisation's environment, horizon scanning is concerned with its future environment (van Rij, 2010). Horizon scanning therefore has both a deliberate nature and future focus.

Another structured and systematic approach to ES that attempts to challenge existing views and present multiple possible futures is scenario planning (Rowe et al., 2017). Scenario planning allows organisations to make better use of their scanning efforts than traditional processes (Richards et al., 2004) and provides a formal output from the ES process (Clemens, 2009).

In parallel to these widely applicable processes, researchers have developed systems and techniques for a variety of industry-specific (Russell and Prince, 1992; Wu et al., 1998),

function-specific (Fabbe-Costes et al., 2014) and country-specific applications (Franco et al., 2011).

Impact of ES Processes

Formalised ES processes can assist with crisis detection and management (Paraskevas and Altinay, 2013). The use of a structured ES process assists in reducing information overload for individuals and minimising potential blind spots for the organisation (Schoemaker et al., 2013).

Early research on the effectiveness of formal units found that those integrated into strategy development processes of organisations were more effective, yet there was a disconnect between practice and what the strategy literature proposed should happen (Lenz and Engledow, 1986). The existence of formal ES units and processes appears to result in better organisational performance (Davis et al., 2008; Subramanian et al., 1993), increased likelihood of success in new foreign ventures (Lim et al., 1996) and adaptiveness to change in the multinational context (Muralidharan, 2003). Others have noted that the scanning-performance link is stronger when there is also a formal planning system in place (Stratis and Powers, 2001; Temtime, 2004).

Organisational/Individual Links

Research concerned with the link between individual behaviour and formal organisational processes is limited. Early analysis of both individual behaviours and organisational systems (Ghoshal, 1988) did not attempt to link the two aspects together, but two relatively recent studies are of note in this regard.

Strobel et al. (2017) examined the individual antecedents of proactive scanning among employees throughout organisations, noting that an individual employee's future focus and

orientation towards promotion positively influenced their propensity to scan. Around the same time, Robinson and Simmons (2018) acknowledged the use of different scanning modes at different levels in organisations of various sizes, both within and outside formal systems.

Conclusion

Research in the *Planning and Process* view can also be regarded as part of the foundation literature on ES, establishing a relatively clear link between formal ES processes and organisational performance. Research on the determinants of ES processes has tended to emphasise the institutional context over environmental influences such as PEU, in contrast to *Upper Echelons* research.

Similar to the *Upper* Echelons view, more recent *Planning and Process* research provides increasingly incremental contributions, focusing on country-specific or industry-specific applications. The exception is the relatively recent move towards looking at how ES works as an organisation-wide phenomenon, encompassing both individual behaviour and more structured processes, groups and systems. This perhaps represents an emerging synthesis of *Planning and Process* research with that taking an *Upper Echelons* view. We explore this integration further in the research agenda.

Capability, Learning and Innovation View

The third-largest group to emerge from our analysis is the *Capability, Learning and Innovation* view. Research taking this view is theoretically grounded in a number of cognate areas, including the knowledge-based view of the firm, organisational learning, dynamic capabilities and is divided into four groups. The first is concerned with organisational ambidexterity, the second, with absorptive capacity, the third, with dynamic capability theory and the fourth with innovation. We group these themes together because of their relationship with organisational learning, dynamics and change.

Ambidexterity

The tension in organisations between exploration and exploitation is well known (Wilden et al., 2018) and the ability to simultaneously manage both of these activities is known as organisational ambidexterity (Gibson and Birkinshaw, 2004). Acquisition and use of external knowledge is critical in maintaining competitive advantage, whether firms are pursuing explorative or exploitative activities (Bierly et al., 2009). ES facilitates increased explorative activity in organisations, especially in the presence of customer turbulence (Danneels and Sethi, 2011) and supports more effective organisational foresight, increasing the organisation's ability to balance exploration and exploitation (Paliokaite and Pacesa, 2015). Thus ES is a key component of organisational ambidexterity.

Absorptive Capacity

Absorptive capacity, which is the ability to identify, assimilate and utilise external knowledge, is a key determinant of organisational learning. The level of absorptive capacity in an organisation is partly determined by its ability to scan the environment (Petersen et al., 2008). Absorptive capacity, in conjunction with increased scanning effort by the organisation, can also help to align internal and external rates of change (Ben-Menahem et al., 2013). Increased ES activity has a positive impact on organisational learning (Claycomb and Miller, 1999).

Dynamic Capability

Dynamic capability theory, a cognate construct of organisational ambidexterity, proposes that firms derive competitive advantage through their ability to add, develop, remove and reconfigure resources and competences over time (Teece, 2007). Although it has been proposed that ES is itself a dynamic capability (Garg et al., 2003), most researchers tend to

treat ES as a competence rather than a capability in its own right. Competences can be defined as a set of integrated routines and processes that an organisation develops to deliver a given outcome, while organisational capabilities are the ability to build, integrate and deploy competences and resources to achieve competitive advantage. (Teece et al., 1997).

Research related to entrepreneurial behaviour has characterised ES as part of a wider set of entrepreneurial competences that enhance the ability to spot market opportunities (Taipale-Erävala et al., 2015). ES using personal networks in small firms has been shown to enhance marketing competences (Frazier and Huddleston, 2009) and broad ES enhances an organisation's ability to develop new competences over time (Danneels, 2008). Indeed ES facilitates the ability to integrate and reconfigure resources and competences in response to external change (Liao et al., 2009).

Subsequent research has characterised ES as underpinning the entrepreneurial capability, namely the ability to reconfigure resources to seize emergent opportunities (Swoboda and Olejnik, 2016). Recent work by van Uden et al. (2018) has shown that dynamic and uncertain environments can hamper the development of effective ES routines.

Innovation

ES has a positive impact on an organisations' ability to introduce new products successfully and identify disruptive opportunities. Early findings demonstrated that the use of information systems and formal collection and analysis of external data increased the likelihood of new product success (Ahituv et al., 1998). Subsequent research adds depth to this positive relationship, finding that increased scanning of task environment sectors improved creativity during the process and timeliness of product introduction (So-Jin and Sawyerr, 2014).

The ES behaviour of senior managers can influence the innovation process in organisations. External engagement by senior managers with other innovative firms and R&D conferences and networks is positively related to successful innovation (Jenssen and Nybakk, 2009). In addition, framing environmental issues as opportunities is more likely to result in innovation success than framing issues as threats (Howell and Shea, 2001).

Focused scanning by supplier-focused employees can result in more frequent identification of disruptive opportunities and the ability to process and capitalise on those opportunities (Cousins et al., 2011). Scanning of the technological environment is also positively associated with successful product innovation (Canez et al., 2007; Frishammar and Hörte, 2005).

Action research on new product innovation has shown that the role of ES changes at different stages of the innovation process. ES can assist in both idea generation in early stages and uncertainty reduction in later stages (Börjesson et al., 2006). More generally ES activities have been identified as a key component of entrepreneurial alertness, which is the ability to identify and capitalise upon new opportunities (Tang et al., 2012).

Conclusion

The *Capability, Learning and Innovation* view is distinctive in its concern for the impact of ES on organisational outcomes. The role ES plays in organisational learning, ambidexterity, dynamic capabilities and innovation is acknowledged at a macro-level, but a more granular ES-focused treatment of these issues is warranted. This view may help to explain the link between ES and organisational performance in more detail and overall there is significant scope for growth in this area of ES research. This view transcends the individual/organisational perspectives taken by the *Upper Echelons* and *Planning and Process* views and incorporate both organisational and individual behaviours.

Information Systems View

The link between ES and technology has been recognised since the mid-1980s, but research in this area did not expand significantly until the early 2000s. There is now a an established stream of ES research that is related to a much wider body of knowledge around information systems (IS) theory. The relatively small size of this sample, however, suggests that research explicitly linking ES to technology and information systems is still relatively limited. Research in this view could be considered a further evolution of the *Planning and Process* view in that it deals with formal, organised approaches to ES. The consistent theme of technology, however, means that it deserves separate treatment.

Executive Information Systems

Information Systems ES research focuses on the use, setup and features of computer-based executive information systems (EIS) designed for managers to use for information gathering.

Early research concerned with system use proposed that, because managers prefer information received from personal sources, any online information system would need to be bespoke to the organisation if it were to be used by managers (El Sawy, 1985). This is a theme picked up by later research in the area, which is generally concerned with how an EIS can best support ES activity.

By the mid-1990s the shifting information environment resulted in a need for systems that could assist managers in gathering and organising information for decision-making purposes (Morgan, 1996). Changes in technology meant that computer systems could automate collection and filtering of information quickly, allowing timely and informed decision-making (Marshall et al., 2004).

Indeed, although many organisations attempt to develop information systems for ES, failure to implement is not uncommon. Lesca and Caron-Fasan (2008) examined 39 failed projects intended to set up effective ES systems. Failure often arose because of inappropriate management involvement or interference, poorly defined expectations and objectives or weak stakeholder involvement. This suggests that, despite their prevalence and perceived usefulness, EIS and automated systems more widely may still be underutilised in organisations.

Research in the wake of the 2008-9 financial crisis suggested that EIS may still be ineffective, noting a lack of analysis of user requirements and, reportedly, poor integration of scanning outcomes into decision-making systems (Mayer et al., 2013). Such systems may be most effective when they are aligned with managerial cognitive processes (Ontrup et al., 2009)

Advances in ES Technology

The role of an EIS is not without controversy and there is debate over the optimum level of automation versus human input into ES activity. While an EIS allows quick, structured and easy access to information, the way in which information is presented may affect scanning behaviour.

The increasing use of IT is expected to shift human scanning behaviour from data search and acquisition to interpretation and implementation (Keller and von der Gracht, 2014). Walters et al. (2003) developed an EIS including both internal and external information and examined how managers used the system in small manufacturing firms. They proposed that such a system should only categorise information and allow managers to filter and select information according to their own preferences.

The view that managers should be able to customise incoming information for maximum effectiveness is supported by research on managerial perceptions of artificial intelligence (AI) for gathering and interpreting information from the environment. While managers generally perceive the use of AI as beneficial in information gathering, they tend to be extremely sceptical of its ability to properly interpret information (Xu et al., 2011). Others have highlighted the importance of suitably qualified human input to process and source information and maintain a robust EIS (Xu and Kaye, 2002).

With regard to the automation of ES activities, models have been available to detect events from online news sources for some time (Wei and Lee, 2004). Related research has demonstrated how mathematical models can be used to scan news sources and use the outcomes to predict share price performance (Aasheim and Koehler, 2006) or to quantify and organise outcomes from an automated scan of a given external issue (Tonn, 2008). More recently, complex models for scanning social media to support cross-border merger and acquisition decisions (Lau et al., 2012) and text-mining techniques for strategic forecasting (Kayser et al., 2014) have been developed.

It has therefore been demonstrated that the use of automated systems and AI can be useful in gathering and filtering information about the environment. The limitation of these studies, however, lies in their lack of grounding in an organisational context. It appears that there is little integration between research on management use of EIS and the automation of information gathering and analysis.

Conclusion

Overall, it is apparent that the integration of IS theory with ES theory is not yet sufficiently developed. Research on automation exists in a separate sphere to research on systems development and use. There is thus a clear need to examine how such automated processes

are used in practice. In addition, research on systems use has tended to focus on senior managers as users of system output and does little to address how technology can support an organisation-wide network of individuals who both use outputs and provide inputs into the system.

Such limitations are apparent despite the existence of significant information systems literature streams in their own right. This is perhaps because ES, however complicated, has improved decision-making by human agents as its intended outcome. While advances in technology have changed the amount of information available and the technology available to process it, the input of individuals into organisational processes is still of primary importance.

Cognitive View

The *Cognitive* view of ES dates from the early 1990s and is complementary to research in the *Upper Echelons* tradition. Research taking this view focuses on the individual manager but, rather than examining behaviour, is concerned with the way in which managers think. If the *Planning and Process* and *Information Systems* views represent the organisation then the *Upper Echelons* and *Cognitive* views addresses individual actions, decisions, perceptions and processes.

Again, a variety of theories underpin research in this stream, including sensemaking, cognitive learning and information processing theory. The first strand examined below deals with perception versus reality and the role ES plays in determining this relationship. The second deals with how ES interacts with the sense making process.

Management Perceptions

Rather than being concerned with the impact of PEU on ES behaviour, the approach taken by the *Upper Echelons* view, the *Cognitive* view of ES is concerned with the accuracy of

management perceptions of the environment. It is possible for perceived and actual environmental stages to diverge, perhaps due to inherent perceptual bias or differences between aggregate industry environments and the specific environment faced by the firm (Doty et al., 2006). That said, research combining both objective and perceived measures of the environment has shown that PEU may be positively related to environmental complexity and dynamism (Oreja-Rodríguez and Yanes-Estévez, 2010).

Structured ES techniques such as scenario planning significantly reduce perceptual bias about the environment (Meissner et al., 2017) but formalising ES cannot engineer out uncertainty (Hough and White, 2003). Overall ES plays a key role in aligning objective and perceived environments. In an investigation of the link between perceived and objective measures of environmental munificence and instability, Sutcliffe (1994) found frequency, formality and intensity of ES to be more significant in explaining accurate perceptions of the environment held by senior managers than other organisational factors and suggested that formal ES routines should not restrict the diversity of information to which managers are exposed.

ES and Sensemaking

ES is the first step in the sensemaking process, comprising scanning, interpretation and action (Daft and Weick, 1984) and formal ES techniques such as horizon scanning have been conceptualised as a form of collective sense-making (Amanatidou et al., 2012).

The *Cognitive* view differentiates between active and passive scanning. Managers use active scanning to build new mental models and passive scanning to maintain existing models (Vandenbosch and Higgins, 1996). Active scanning also helps managers challenge their existing mental models (Vandenbosch and Huff, 1997). Managers also have a lower tolerance for ambiguity and uncertainty when conducting focused scanning than when engaging in a more passive manner (Lesca et al., 2012).

Active scanning is seen as valuable by decision-makers and is linked to the way in which external issues are interpreted (Nastanski, 2004). A higher volume of information use results in the interpretation of external strategic issues as positive and controllable (Thomas et al., 1993). Subsequent research has deepened this understanding by demonstrating that, while time spent looking at information may increase the likelihood of an issue being perceived as a threat, the use of more diverse information sources means an issue is more likely to be interpreted as an opportunity (Anderson and Nichols, 2007). Industry velocity may also affect how managers interpret and then respond to their environment (Nadkarni and Barr, 2008).

Conclusion

The *Cognitive* view of ES provides further insight into individual cognitive processes and provides some internal explanations for why managers scan their environments and how that scanning differs depending on what they are trying to achieve. Research in this tradition has, however, evolved somewhat in isolation to the foundation ES literature.

There is an opportunity to develop a deeper understanding of ES by combining some of the approaches and measures in this area with other views identified above to develop new theoretical insights. Furthermore, the impact of ES on how issues are interpreted has a number of practical implications in terms of the design of organisational processes and information systems.

Synthesis and Research Agenda

The five views of ES we identify here have evolved both separately and concurrently; it would be a mistake to treat them as entirely distinct bodies of knowledge. Findings from the two foundation views underpin many more recent developments in the field. In the case of newer perspectives, studies reviewed here represent the movement of ES research into other

wider bodies of knowledge. The emergence of different views, however, suggest some fragmentation of ES research in recent years.

In parallel to this fragmentation, contributions in the foundation literature (*Upper Echelons* and *Planning and Process* views) have become more incremental, focusing on contextualisation of existing relationships as opposed to development of new theory (e.g. Abu-Rahma and Jaleel, 2019; du Toit, 2016). There is also a divergence between these two views in terms of how ES is defined. The *Upper Echelons* view characterises ES as an individual activity while the *Planning and Process* view treats ES exclusively as an organisational process. This distinction is readily apparent in the analysis presented here, but not so clear in individual studies. Many studies in both of these groups were not explicit about their unit of analysis and were grouped according to their treatment of ES rather than a definition they explicitly provided.

The split between individual and organisational ES exists also in later views, but is more nuanced. The *Information Systems* view acknowledges the role of the individual manager in using technology to scan the environment (e.g. Xu et al., 2011) and at the same time deals with formalised organisational processes. The *Cognitive* view, although focused on individuals, recognises the role that formal processes play in shaping cognition (e.g. Meissner et al., 2017). Thus later views provide a more holistic treatment of ES than the foundation literature.

The *Capability, Learning and Innovation* view acknowledges both individual and organisational ES, but focuses on the impact and outcomes of ES on areas such as ambidexterity (e.g. Paliokaite and Pacesa, 2015) and innovation (e.g. Börjesson et al., 2006). Thus the *Capability, Learning and Innovation* view serves to provide a deeper understanding

of the relationship between ES and performance identified by both *Upper Echelons* and *Planning and Process* views.

A number of links between views have emerged through the analysis. Recent ES research concerned with the link between individual behaviour and more formal organisational systems (Robinson and Simmons, 2018; Strobel et al., 2017) suggests some emergent synthesis between the *Upper Echelons* and *Planning and Process* views. Implicit links exist between the *Upper Echelons* and *Cognitive* views due to their common unit of analysis. The same is true of the *Planning and Process* and *Information Systems* views, because both deal with formalised processes and systems for scanning the environment. Implicit links also exist between *Planning and Process* and *Cognitive* views, where formal ES techniques have been studied as forms of collective sensemaking (Amanatidou et al., 2012). Finally, an explicit link exists between *Information Systems* and *Cognitive* views, where systems aligned to managers' cognitive processes have been proposed (Ontrup et al., 2009).

Contradictions between views also exist. For example the normative recommendations of the *Cognitive* view contrast with that of the *Planning and Process* view, which advocates more formal, structured systems for ES. The *Cognitive* view suggests, alternatively, that such formality in organisational routines cannot engineer out uncertainty (Hough and White, 2003) and should not restrict the diversity of information to which managers are exposed (Sutcliffe, 1994). Tensions are also apparent between the *Upper Echelons* and *Information Systems* views. While *Upper Echelons* research notes that managers prefer information received from personal sources (Jogaratnam and Law, 2006), *Information Systems* researchers have forecast an ever-accelerating use of technology in ES, thus depersonalising the scanning process (Keller and von der Gracht, 2014).

In existing ES research, the emergent streams that cross boundaries, along with the tensions between different views are of significant interest. These similarities and differences between views suggest that multiple future directions are possible in ES research and further fragmentation likely. We therefore propose a research agenda that consolidates research to date and moves ES research forward. To achieve this a more integrated approach across research views, which might yield more substantive contributions to the field in future, is required. Figure 2 shows existing views identified in the typology and five proposed areas of future research, each of which integrates themes from two or more overarching views of ES. These are discussed in turn below, both in relation to existing ES research and the wider field. We then develop a set of fundamental research questions for each area to address before moving on to the discussion

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INSERT FIGURE 2 HERE

Area 1: ES Complexity

The first area of future focus integrates research from *Upper Echelons* and *Planning and Process* traditions. We name this area *ES Complexity* in order to acknowledge the multi-level perspective required to understand ES in organisations today. The interaction between individual behaviour and organisational processes in ES is at present poorly understood, despite the recent emergence of studies concerned with how individual ES behaviour can contribute to wider, more formalised organisational ES (e.g. Strobel et al., 2017). The multi-level approach has already been used to develop new perspectives on issues such as ambidexterity and innovation (Kassotaki et al., 2019; Walrave et al., 2018) and is a key part of linking scholarly endeavour to management practice (Kouamé and Langley, 2018). This suggests that its use in ES research could yield significant theoretical and practical insights in future. Research in this area should focus on the way in which formal ES processes (Yasai-

Ardekani and Nystrom, 1996) and informal ES behaviour (Stewart et al., 2008) work together in organisations. At the same time such research needs to examine the determinants of behaviours and processes and how outcomes from ES are used and operationalised (Robinson and Simmons, 2018).

The definition of ES adopted for the purposes of our review acknowledges both individual and organisational perspectives; this definition can be used as the foundation on which *ES Complexity* research is built. Contextual contributions taking either an *Upper Echelons* or *Planning and Process* view are also of value (e.g. Barron et al., 2015), but their ability to advance, as opposed to contextualise, ES theory is now limited. In contrast, the *ES Complexity* approach, by adopting multi-level analysis, can better elucidate the determinants, conduct and outcomes of ES as it manifests itself in organisations today.

Area 2: ES Systems

The technological environment in which ES occurs has changed significantly over the period reviewed in this study, yet it is poorly addressed by existing views in isolation. For example, scanning mode research has shown an increasing tendency for managers to use internal sources as opposed to external sources in recent years (Jogaratnam and Law, 2006). Such a change could be caused by advances in technology but is not addressed by the *Upper Echelons* view.

The rise of artificial intelligence, data analytics, automation (Kayser et al., 2014) and vast increases in the amount of granular external data available (Keller and von der Gracht, 2014) provides an opportunity to better integrate IS and ES theory. Therefore the second area we propose for future research cuts across the *Upper Echelons, Planning and Process* and *Information Systems* views. By integrating these three views, *ES Systems* research can take account of the individual, organisational and technological nature of ES in organisations

today. Such research should seek to build upon *ES Complexity* research and examine how changes in technology used in ES might influence management behaviour and the impact this might have on the organisation. Further study of how organisations use combinations of automation and human activity in terms of both collection and analysis (Aasheim and Koehler, 2006; Walters et al., 2003; Xu et al., 2011) in their ES activities is also warranted.

Pursuit of the *ES Systems* agenda also allows future ES research to explicitly acknowledge the impact of digital transformation in organisations (Singh et al., 2019; Warner and Wäger, 2019) and better contribute to contemporary debates on issues such the use of big data analytics in strategy making (van Rijmenam et al., 2019). Recent insights in this area suggest a positive link between the use of analytics and performance, especially in highly competitive or turbulent environments (Müller et al., 2018). It has also been demonstrated that systematic and enterprise-wide use of big data analytics may allow firms to better sense and respond to changes in customer behaviour (Kitchens et al., 2018). Further, a balanced approach to such responses, incorporating both automated and human interventions, is more likely to produce positive results (Lehrer et al., 2018). These findings show alignment with existing ES research, so a closer integration of the two agendas in future may yield significant insights.

Area 3: ES Interpretation and Response

Although the *Information Systems* and *Cognitive* views are treated as distinct groups in our review, the wider trend in other disciplines such as IS research may have resulted in some alignment (Raffaelli et al., 2019). The two views have seen consistent and similar growth across time, suggesting an emerging connection. Technological advances and recent developments in AI and automation have been studied through the lens of human cognition (Ontrup et al., 2009). Indeed, deeper understanding of human information processing and

decision-making have assisted in the development of sophisticated algorithms supporting cognitive automation (Lau et al., 2012).

The *Cognitive* view requires further investigation to better understand the link between scanning and individual decision-making (e.g. Nadkarni and Barr, 2008). In addition, the suggestion that formal, structured ES systems may inhibit management thinking (Hough and White, 2003; Sutcliffe, 1994) warrants further study; integration with the *Information Systems* view would provide useful future contributions in this area. We therefore propose that the third area for future ES research should be *ES Interpretation and Response*. This area would build on *ES Systems* research and integrate a deeper understanding of the cognitive aspects of ES into the design and use of systems (Ontrup et al., 2009; Xu et al., 2011), organisational processes and ES techniques such as scenario planning and horizon scanning (Amanatidou et al., 2012; Meissner et al., 2017), thus providing useful contributions to practice as well as theory.

Moreover, rapid changes in technology are known to provide significant cognitive and organisational challenges for managers (Raffaelli et al., 2019; Singh et al., 2019). Integration of *Information Systems* and *Cognitive* views may therefore afford deeper insight into how changing ES technology affects the way managers conceptualise and consider the environment in their analysis and decision-making.

Area 4: ES Outcomes

We have already identified the *Capability, Learning and Innovation* view as an area worthy of significant further development. Existing research in this view has demonstrated that ES underpins a number of organisational competences, capabilities and processes. The *Capability, Learning and Innovation* view tends to treat ES as one variable in a wider set and the areas of management theory apparent in this view are relatively diverse. Developing ES-

focused research further in these areas, however, can provide a deeper understanding of the impact of ES on organisational performance and competitive advantage. Thus we frame this fourth area for future research as *ES Outcomes*.

A key area of theory requiring development is the nature of ES in relation to dynamic capabilities. ES has already been identified as a fundamental component of entrepreneurial and marketing capabilities (Frazier and Huddleston, 2009; Taipale-Erävala et al., 2015). Further ES research using the dynamic capabilities framework would clarify and extend understanding in this area and, by extension, demonstrate more clearly how ES contributes to organisational performance. There is also an opportunity to examine more explicitly the role of ES in organisational ambidexterity. It has already been demonstrated that ES can assist organisations in balancing exploration and exploitation (Bierly et al., 2009); thus ambidexterity provides another lens through which the nature of ES outcomes can be viewed.

Research concerned with innovation as an outcome of ES should also be pursued further, affording deeper understanding of how ES enables the organisation to take advantage of new opportunities (Cousins et al., 2011). An ES perspective could also yield further insight into how some organisations are able to spot and capitalise on disruptive opportunities better than others (Jenssen and Nybakk, 2009; So-Jin and Sawyerr, 2014) and how ES can best support rapid and disruptive innovation. An opportunity also exists to examine the ways in which ES changes at different stages in the innovation process (Börjesson et al., 2006).

Finally, while the theoretical foundations of dynamic capabilities, ambidexterity and innovation may be distinct, ES is a critical area that runs across them. For example, knowledge search aspects of innovation (Martini et al., 2017) relate to the sensing aspects of dynamic capabilities (Liao et al., 2009). ES can assist in balancing exploration and exploitation (Paliokaite and Pacesa, 2015), thus underpinning both aspects of ambidexterity

(Bierly et al., 2009). Our proposals for *ES Outcomes* research are aligned with existing studies integrating ambidexterity and dynamic capabilities perspectives, which have called for further investigation of the managerial capabilities that underpin ambidexterity (O'Reilly and Tushman, 2008) and proposed an integrative framework explaining how firms adapt to continuous environmental change (Birkinshaw et al., 2016). Overall there is a clear need for further investigation of ES in all of these contexts.

Area 5: ES Integration and Practice

Just as ES theory has developed significantly over the period covered in this review, so has ES practice. Managers in the early period of ES research were faced with different issues, used different technologies and had different considerations to those operating in the present day (Laamanen, 2017). ES research has to a limited extent taken account of evolving practice through fragmentation into a number of different perspectives. The final area for future research, *ES Integration and Practice*, cuts across all five views in the typology and integrates the four other areas of future ES research proposed above. We propose that this area should serve to integrate the different perspectives into a holistic framework that acknowledges complexity, systems, interpretation, response and outcomes.

This final area of ES research is more speculative and less structured than the first four areas, requiring an integrative approach to deal with both how ES happens and propose how it might improve in the future. Therefore research in this final area should be concerned with how technology can facilitate better development of structured and unstructured systems that capture, analyse and provide timely information to decision makers in a way that supports their thinking. Such research also needs to address the detail of how these systems and activities facilitate development of capabilities, foster innovation and improve organisational performance. Without this fifth area of research, our agenda for the future may perpetuate the

fragmentation inherent in the field (Durand et al., 2017; Hambrick, 2004; Oxley et al., 2010) that we seek to avoid.

Research Questions

Table 3 presents a set of potential questions grouped around the five areas for future research. These research questions are posed in broad terms and represent potential paths forward for researchers rather than individual pieces of research. There is significant scope for both quantitative and qualitative investigation in all of these areas.

INSERT TABLE 3 HERE

The five proposed areas, along with their suggested questions, are designed to consolidate ES research and move it away from an increasingly fragmented path. Through integration of ideas across the views identified in our typology and acknowledgement of the relationships between our agenda and other areas of current interest in the strategic management field, it is possible for ES research to make significant and meaningful contributions to both theory and practice in future.

Discussion and Conclusion

The objective set out at the start of this paper was to consolidate ES knowledge and propose future areas of research that take better account of contemporary theory and practice. We have demonstrated through our analysis increasing levels of fragmentation in ES research, a situation likely to continue because of the broad nature of the ES concept and its fundamental contribution to many other organisational processes. Our typology of five overarching research views, however, provides some order to the field in its current position. In addition, the agenda proposed here sets a future direction that may guide researchers to examine ES in

a more focused and directed manner. Each of our five areas for future research relates to a number of areas of both contemporary theory and practice.

In the introduction we acknowledged the current debate around fragmentation in the strategic management field (Oxley et al., 2010). Our study aligns clearly with current priorities, as proposed by Durand et al. (2017), by providing consolidation and synthesis to ES research and identifying cross-cutting areas for future research.

Further, this review builds upon and differs from earlier reviews of ES and related literature in a number of ways (Choo, 2001; Costa, 1995). Our intentionally broad definition of ES has allowed us to capture a wide pool of literature and develop a holistic view of how ES research has evolved and fragmented over time. The typology of ES research therefore provides more comprehensive coverage than previous reviews, which were restricted to research now categorised as taking an *Upper Echelons* view (Costa, 1995) or *Upper Echelons* and *Cognitive* views (Choo, 2001).

Indeed, existing reviews of ES research do not explicitly acknowledge the role of technology and struggle to examine the way in which ES relates to contemporary areas of theory. Our study supports the view put forward in recent reviews of related areas that ES is important (Iden et al., 2017; Wood and McKelvie, 2015) by showing its relationships with other areas of research and demonstrating the need to integrate diverse perspectives into future theoretical developments concerned with ES.

Moreover, the proposed research agenda relates closely to themes critical for the future of the wider field, such as the roles played by different organisational actors in strategy, the importance of digital systems and the increasing relevance of cognitive and psychological issues (Laamanen, 2017). By acknowledging its multi-faceted nature and multiple levels of activity, the *ES Complexity* area is clearly aligned with increasing use of multi-level analysis

in strategic management research (Kassotaki et al., 2019; Kouamé and Langley, 2018; Walrave et al., 2018).

The *ES Systems* area acknowledges the impact of digital transformation in organisations, an area of increasing interest to management scholars (Singh et al., 2019; Warner and Wäger, 2019), and positions future ES research as part of the contemporary debate on the use of analytics and big data (van Rijmenam et al., 2019). The *ES Interpretation and Response* area allows future ES research to more fully acknowledge the cognitive impacts on managers of technological change (Raffaelli et al., 2019) and is in line with calls to integrate management cognition more fully into other areas of theory (Buyl et al., 2011). The *ES Outcomes* area moves future research on ES and performance into a place where contributions to debates on dynamic capabilities, ambidexterity and innovation can be made clearer and more integrated.

The overall contribution of our proposed agenda is to move ES research forward from increasingly incremental contributions related to context and better align future ES studies with current debates in the strategic management field. Prior to the present study, there existed a danger that ES remained loosely defined, with research taking a foundation view becoming increasingly incremental and more emergent views fragmenting even further. Our final proposed area, *ES Integration and Practice*, is therefore designed to integrate across the four preceding areas and prevent further fragmentation.

Our work also has implications for practice. In general terms, our analysis provides an organised route-map through which managers can consider their ES activity at individual, team and organisation levels. An appreciation of relevant factors such as management characteristics, scanning processes and types, digital systems and cognitive issues may assist in identifying gaps in the organisation's ES strategy. Further, our review suggests that, even in the age of increasing deployment of automation, artificial intelligence and big data

analytics in ES, issues such as individual characteristics, organisational structures, cognitive and psychological factors cannot be disregarded. Finally, at present no standard approach exists for developing an ES strategy that takes all individual, technological and organisational elements identified here into consideration. Our review, therefore, can provide a foundation on which practitioners can build a more comprehensive approach to ES that capitalises on its multifaceted nature, integrating activities that take place at various levels and in various forms across the organisation.

Our study is not without limitations. A trade-off between breadth and depth exists in our framing of ES, the search terms we employed and the inclusion and exclusion criteria used to define the literature set. The broad approach, however, has allowed us to capture the present state of the field in a more comprehensive way than prior work has been able to do. The nature of the selection method, particularly the use of a pragmatic but imperfect quality filter, means the not every investigation of ES will have been captured. Thus, while we may have reviewed a representative set of relevant prior research, further investigation of ES literature using co-citation analysis or similar might provide a useful complement to this review. In addition, our study did not include conceptual papers on ES or include forms of literature outside English language peer-reviewed journals. Despite these limitations, however, our review has demonstrated how future research can provide a more detailed view of how ES works in organisations, better address the role of technology in ES, and develop a deeper understanding of the mechanisms by which ES contributes to organisational performance and competitive advantage.

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Tables

Table 1: Overview of the Literature Selection Process

Action	Change	Remaining Total
Initial search	-	4,355
Apply subject filter	-3,687	668
Remove duplicates	-101	567
Apply CABS quality filter	-119	448
Remove non-empirical works	-124	324
Remove Cs	-136	188
Remove Bs	-68	120
Add ins from citations	+9	129
Add ins from Google alert	+3	132
Final Set for Review		**132**

Table 2: Themes, Groupings and Overarching Views

Theme	Grouping	Overarching View
Functional/Educational Background Entrepreneurial Orientation of Managers Organisational Context Effect Country of Origin Effect	Individual and Contextual Influences	Upper Echelons (46)
Strategic Uncertainty Uncertainty and Context	Perceived Environmental Uncertainty	
Scope and Strategy Scope and Size/Life Cycle Stage Scope and Performance	Scope of Scanning	
Personal vs Impersonal Information Sources Internal vs External Information Sources	Mode of Scanning	
Emergence of ES Units Quality of ES Units	Early ES Processes	Planning and Process (34)
Standardisation of ES Environment and ES Processes Ubiquity of ES Processes Foresight Techniques Context Specific Approaches	Design of ES Processes	
ES Units and Information Management ES Units and Performance	Impact of ES Processes	
Individual Scanning within Units	Organisational/Individual Links	
ES and Exploration	Ambidexterity	Capability, Learning and Innovation (20)
ES and Absorptive Capacity ES and Organisational Learning	Absorptive Capacity	
ES as Capability ES as Competence	Dynamic Capability	
New Product Development Opportunity Recognition ES and Stages of Innovation	Innovation	
EIS Need EIS Design and Implementation EIS Use EIS Effectiveness	Executive Information Systems (EIS)	Information Systems (17)
Automated Scanning Automated Analysis Changes in ES Technology	Advances in ES Technology	
Perception Vs Reality Role of ES in Perceptual Accuracy	Management Perceptions of Environment	Cognitive (15)
ES and Mental Models ES and Ambiguity Interpretation/Action	Sensemaking	

Table 3: Suggested Research Questions by Area

Future Research Area	Potential Research Questions
ES Complexity	How does individual ES at multiple levels contribute to organisational scanning processes in organisations? Does scanning behaviour differ in different parts of organisations? What determines the design of ES processes in organisations in terms of individual, institutional and environmental influences?
ES Systems	How are changes in technology affecting the nature and design of organisational scanning processes? What is the impact of changes in technology on individual ES behaviour? How do organisations use AI to automate gathering and analysis of ES data? In what ways can technology support the development of both organisational and individual scanning?
ES Interpretation and Response	How does ES behaviour relate to individual decision-making? Is managerial distrust of automated ES justified and how can it be overcome? How do structured and systematic ES systems impact on management cognition? Does increasing use of technology in ES change the ways in which managers conceptualise and make decisions about the environment? Is technology able to assist managers in making more accurate assessments of the environment?
ES Outcomes	How does ES facilitate the development of dynamic capabilities in organisations? Is ES a competence or a capability in its own right? Does ES differ for explorative and exploitative activities? In what ways does ES facilitate organisational ambidexterity? How does ES enable some organisations to spot disruptive opportunities better than others? Does ES behaviour differ at different stages of the innovation process?
ES Integration and Practice	How can technology help integrate structured and unstructured ES? In what ways can ES systems best provide timely information to decision-makers? How do appropriate ES systems and behaviour relate to the development of dynamic capabilities/ambidexterity? How does conduct of ES in terms of technology, process, structure and participation relate to organisational performance?

Figure Captions

Figure 1: The Emergence and Development of ES Research Views over Time

Figure 2: From Typology to Research Agenda

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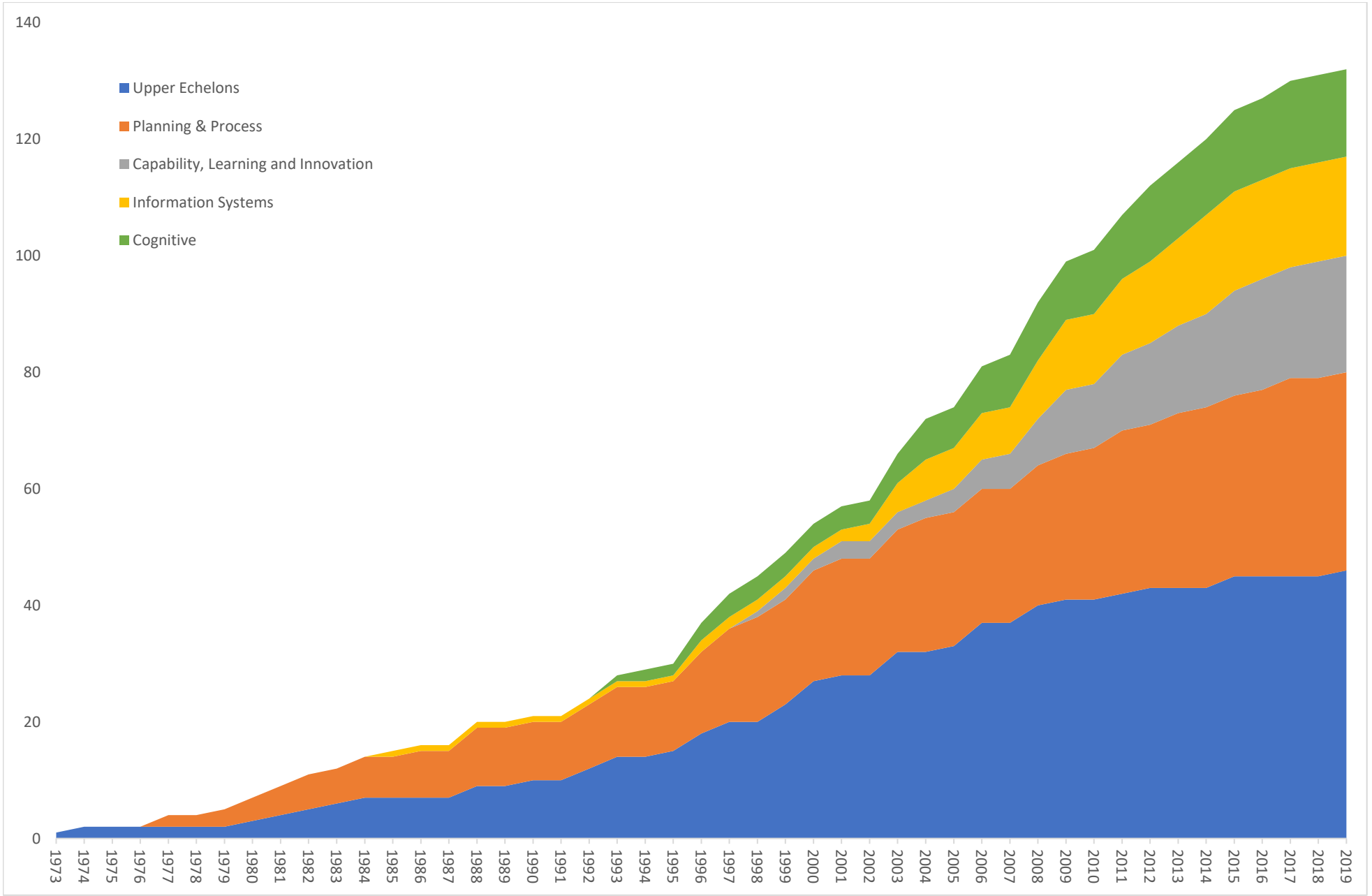

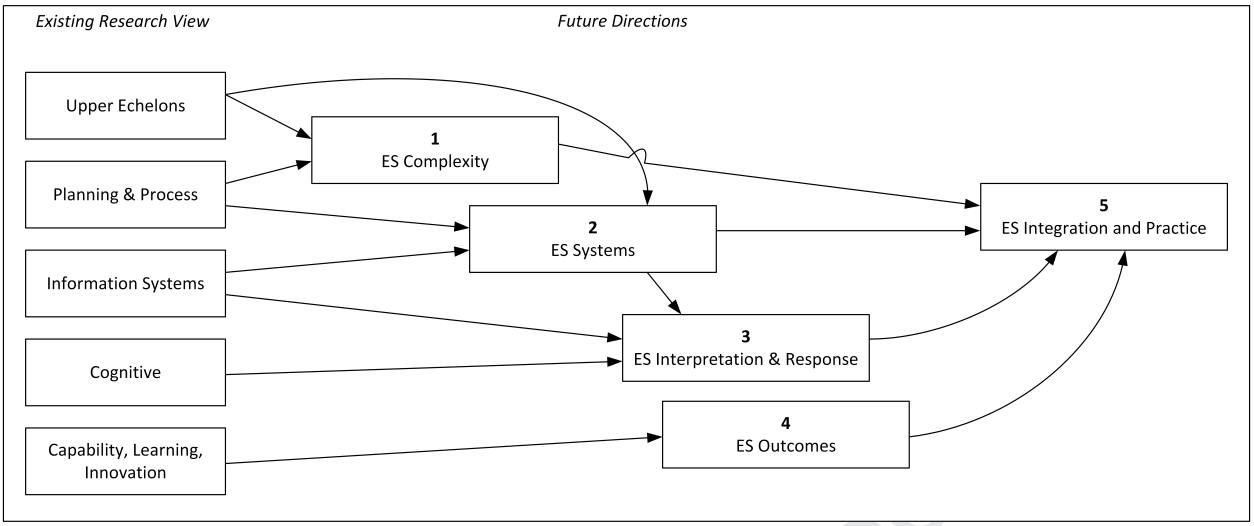

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