Putting the system back into training and firm performance research

Garavan, Thomas N.; McCarthy, Alma; Lai, Yanqing; Clarke, Nicholas; Carbery, Ronan; Gubbins, Claire; Sheehan, Maura; Saunders, Mark N.K.

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Putting the *System* back into Training and Firm Performance Research: A Review and Research Agenda

Garavan, T.N., McCarthy, A., Lai, Y., Clarke, N., Carberry, R., Gubbins, C., Sheehan, M. and Saunders, M.N.K.

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Abstract

Research investigating training and firm performance is currently at an inflection point; capable of recognising previous achievements but also having a focus on the future. Based on our review of 207 quantitative papers over a 40-year period, we find that the field has converged in terms of theory and methods. Important insights have been generated yet there is scope to better understand the complex, interrelated and dynamic nature of the relationship between training and firm performance. We propose that open systems theory (OST) provides the potential to move the field forward and encourage researchers to investigate interactions and linkages between training and performance components, the role of temporal dynamics in inputs and processes, reverse causality, and to broaden conceptualisations of firm performance. We consider six principles of open systems theory, highlight productive avenues for future research and identify methodological challenges and implications.

Keywords

Training, firm performance, open systems theory, future research directions

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

PRACTITIONER NOTES

What is currently known about training and organisational performance?

- A significant body of research on the training-firm performance relationship exists, however, there is insufficient diversity in the use of theory and research methods .
- There are limited insights into the long-term impacts of training on firm performance, how changes in the level of training investment influence firm performance, and how firm performance influences future investment in training by organisations.
- Evidence of a causal link between training and firm performance is yet to be established in the research.

What does this paper add to the field?

- We use open systems theory (OST) to integrate current findings and highlight future research avenues.
- We utilise six principles of OST: congruence, internal interdependence, emergence, equifinality and capacity for feedback to generate novel and, as yet, unanswered questions about training and firm performance.
- We suggest methodological solutions to operationalise the six OST principles in research studies.

Implications of review findings for practitioners

- The need to continually align training with changes in internal and external inputs.
- Ensuring that internal organisational processes are supportive of employees utilising the knowledge, skills and abilities (KSAs) developed through training to contribute to firm performance.
- Ensuring strong fit between the training content, learning needs and training participants' skills levels.
- Utilising feedback for firm performance outcomes to shape and influence organisational decision-makers about future training investments.
- Use different training strategies, such as investment in specific and general skills, to achieve the same firm performance outcomes.

INTRODUCTION

Over the past four decades, the main focus of training and organisational performance research has been to provide practitioners with evidence that training pays (Cifalinò & Lisi, 2019). This strategic turn in HRM research (Jackson, Schuler & Jiang, 2014), or what has become known as the "business case" (Garavan, McCarthy, Lai, Murphy, Sheehan & Carbery, 2020) in the context of training, has prompted major growth in training-firm performance research but concomitantly produced a mixed set of research findings. Research has highlighted positive direct and indirect relationships (e.g., Kim & Ployhart, 2014; Riley, Michael & Mahoney, 2017; Morley, Szlavicz, Poor, & Berber, 2016; Choi & Yoon, 2015), negative relationships (e.g., Deng, Menguc & Benson, 2003; Fey, Bjorkman & Pavlovskaya, 2000) and non-significant relationships (e.g., Arunprasad, 2017; Aragón, Jimenez & Valle, 2014; Black & Lynch, 1996). While the pursuit of the business case agenda has led to significant growth in publications, it has not contributed to the robustness of findings generated for practitioners (Gubbins, Harney, Van der Werff, & Rousseau, 2018).

While contributing to the popularity of training in organisations, the strategic focus, framed as the "business case" (ATD, 2018; CIPD, 2017), has been accompanied by major theoretical, conceptual and methodological convergence. Researchers have been motivated to uncover positive direct relationships between training and firm performance with insufficient attention given to the complexity of the relationship (Garavan *et al.,* 2020). The research base has narrowed in terms of the use of theories with a dominant focus on human capital theory, the resource-based view (RBV) and, to a lesser extent, social exchange theory to explain the training-firm performance relationship.

Primacy has been given to the implications for financial performance with the result that significantly less attention has been given to non-financial outcomes of training.

However, the most fundamental narrowing is that researchers have conceptualised the training-firm performance relationship as linear and static, with little attention given to how the relationship changes over time. Consequently, a number of important questions of interest to both researchers and practitioners arise including: (a) how does the impact of training on firm performance change over time?; (b) how does the performance of the firm impact future investments in training and performance?; and (c) what issues should training practitioners focus on to ensure that the factors "in the middle" (i.e., the mechanisms that link training to firm performance) are managed?

To better understand and generate answers to these questions, we propose using open systems theory (OST) (Katz & Kahn, 1978) to help researchers conceptualise and understand how the training-firm performance relationship occurs as part of a larger system incorporating the internal and external context of the organisation (Post, Sarala, Gatrell & Prescott, 2020). OST, we argue, can be used to revitalise the well-established stream of training and organisational performance research, which provides a parsimonious model to address questions, such as those highlighted above, that researchers and practitioners need answered. Schleicher, Baumann, Sullivan, Levy, Hargrove and Barros-Rivera (2018) suggest that OST can help researchers organise the key interrelated components of a HR system and identify novel research directions. Additionally, OST can help researchers shift away from focusing on specific elements of the system to understanding the dynamics of connectivity (Kauffman, 1993). A fundamental principle underpinning OST is the notion that "the whole is more than the sum of the parts" (Post et al., 2020, p.365) with the system being the unit of analysis and conceptualised as an open system (Katz & Kahn, 1978), in this case training in organisations. Therefore, in the context of training and firm performance, the training system comprising inputs, processes and outputs is the focus of our review.

In this paper, we utilise OST to integrate the disparate findings on the training-firm performance literature and identify avenues for theoretical and practice-focused research. Our paper has three objectives: (1) to integrate disparate research findings informed by the OST perspective; (2) to use OST to capture and model the training-firm performance link; and (3) to utilise key principles of OST to guide future research on training and performance. In so doing, we develop Garavan et al.'s (2020) meta-analysis in two significant ways. First, Garavan et al. (2020) utilised only three OST principles (adaptation, equifinality, congruence) to explain moderators of the relationship between training and firm performance and this paper now extends this work and integrates the implications of all six OST principles. Through this integration and extension, we are able to develop original research questions by highlighting fully the interdependence between components of the systems and, as part of this, elements of the systems that act as mediators and moderators of the relationship. Second, we examine the role of emergence in the context of the amplification of individual knowledge, skills and abilities (KSAs) to the firm level. Third, recognising the lack of individual studies that have investigated these issues, we use the adaptation and capacity for feedback loops (both central OST principles) to develop suggestions on how to investigate these issues. More broadly, the application of these principles in particular have the potential to move the field forward and answer questions, such as those posed above, that are important to researchers and practitioners. We therefore engage with these principles in detail and discuss the methodological challenges that arise in operationalising them in research.

Our review is structured as follows. First, we justify and explain the methodology used to select, categorise and review existing quantitative studies on the training-firm performance relationship. Second, we discuss the key principles of OST and outline how we developed our OST model and summarise the key findings to emerge from our review. Third, we discuss the

implications of the six OST principles for future training-firm performance research. Finally, we highlight the methodological challenges that this research agenda presents for researchers in the field. Our discussion acknowledges that the application of OST presents researchers with significant methodological challenges which may help explain the paucity of research addressing these issues in the existing literature case.

LITERATURE SEARCH AND CODING OF EMPIRICAL PAPERS

Systematic reviews offers a comprehensive pre-planned strategy for focusing on policy and practice questions, including the effectiveness of particular interventions, such as training, with the emphasis of integrating research evidence transparently and informing action (Denyer & Tranfield, 2009, Rojon, McDowall & Saunders, 2011). It is particularly suited where, despite a large amount of research on a topic, key questions remain unanswered (Petticrew & Roberts, 2006). Our systematic review, focusing on training and firm performance, uses a broad conceptualisation of training to include that which focuses on current skill (Tharenou, Saks & Moore, 2007) and future skill development (Sitzmann & Weinhardt, 2018). We define training that focuses on current skills as having a job or task focus and also in terms of Becker's (1964) conceptualisation as being specifically unique to the firm. In contrast, training for future skills has a more developmental and career oriented purpose and represents general training that has application outside of the organisation.

Following Denyer and Tranfield's (2009) adaption of systematic reviews for management and organisational sciences, we first formulated our review questions: 'What relationships between training and firm performance have been explained by quantitative studies?' Next we began our database searches (outlined in Figure 1) using Business Source Complete, Emerald, Google Scholar, JSTOR, PsycInfo and Web of Science. The year 1979 was chosen as our starting date because Tharenou, Saks and Moore (2007), in their seminal meta-analysis of training and organizational performance, reported that the first study on the link was published by Miron and McClelland in 1979. Given the more restrictive nature of inclusion criteria in meta-analytical studies, we checked to ascertain whether earlier studies had been published, but found none that were pertinent.

INSERT FIGURE 1 ABOUT HERE

To identify the core body of research on training-firm performance, we undertook six keyword searches. The first combined the term "training" with " firm performance". To avoid overlooking papers that may have used alternative conceptualisations of training, terms "development" and "firm performance" "learning and development" and "firm performance" "human resource development" and "firm performance" and "ability/skill enhancing HR practices "and "firm performance" were included as alternatives. These keyword searches produced a total of 4255 articles. The first and third authors reviewed the full list of articles to exclude duplicates and practitioner papers reducing the number of papers to 2510. There was high inter-rater agreement at this step with Cohen's Kappa of 0.891 (McHugh, 2012).

Next, two of the authors screened titles and abstracts of these 2510 articles to determine whether they focused on training and firm performance. Where assessments diverged, we re-analysed more carefully to establish the extent to which they dealt with training and firm performance. This resulted in a further 1004 articles being excluded and a reduction in the list of papers to 1506. There was high inter-rater agreement at this step with Cohen's Kappa of 0.796.

We then screened the remaining articles by evaluating the full text utilising three exclusion criteria. First, we excluded articles that did not report quantitative empirical findings on the training-firm performance relationship. This reduced the sample to 1165 papers. Second, we excluded papers that did not conduct studies in workplace settings, reducing the sample to 796. We

then excluded articles that did not report correlations between training and firm performance defined as collective human resource, operational and financial performance (Tharenou et al., 2007). This step reduced our sample to 248 papers. Finally, we screened each of these paper's methodologies for their relevance and quality (Petticrew & Roberts, 2006). We excluded papers where there was no/inadequate description of the sample included in the study; the measures of training and/or performance were not described; and where tables of statistics were not provided to support the results description. This step reduced the number of relevant empirical studies to 207, which we included in our analyses. Each of these papers was re-read and coded according to our open systems informed model of inputs, processes and outputs which we describe in the next section and set out in Figure 2. Content analysis adopting a systematic codification process was used to organise the data around components and subcomponents (Duriau, Reger & Pfarrer, 2007), making reliable and valid inferences from text (Krippendorff, 2013).

For each component of the framework we have developed (presented in Figure 2), we commenced with a broad description and the types of sub-components that might be included. As we reviewed each article, we refined what should be included in each component. Where points of disagreement arose, we resolved them through frequent discussion between the lead researcher and two other members of the research team. On four occasions these discussions resulted in the addition of new subcomponents to the component of the model under review. At the end of this process, our inter-rater agreement on a sample of 60% of the analysed papers was 0.910. Table 1 summarises the descriptive information for the components and sub components for these coded papers.

INSERT TABLE 1 ABOUT HERE

AN OPEN SYSTEMS FRAMEWORK OF TRAINING-FIRM PERFORMANCE

Open Systems Theory and the Training-Firm Performance Link

OST provides both a vocabulary and a framework for describing the structure and operation of any system (Barabási, 2016). As an approach to understanding the link between training and firm performance, it is best viewed following Harney (2018) as a conceptual framework within which it is possible to map the key components and sub-components. This approach is also consistent with Nadler and Tushman (1980). The systems perspective emphasises that interrelated parts of the training system cannot be understood or investigated by focusing on those parts in isolation (von Bertalanffy, 1968). Rather, OST envisages a set of inputs from the external and internal environment of the organisation, a set of transformation processes and resultant outputs.

The idea of applying OST to training is not new, however, many of the applications occurred early in the development of training as an area of academic study. Scholars such as Hinrichs (1976) proposed the idea that training was a system and emphasised instructional design, trainee characteristics and organisational conditions, or the work environment, as components of the training system. Baldwin and Ford (1988) made use of open systems theory to bring coherence to the training transfer literature highlighting specific organizational inputs and processes leading to effective training transfer outcomes. Building on these seminal papers, we argue that open systems theory articulates six important principles that can enhance our understanding of the training-firm performance link.

The first principle relates to **congruence** or the fit between the components of the system, and the congruence hypothesis which is about understanding the fit between characteristics of the external and internal context and training processes (Nadler & Tushman, 1980). Second, open systems theory emphasizes the concept of **adaptation,** suggesting that scholars should investigate the extent to which training adapts to changes in external inputs (Schleicher et al., 2018). The

adaptation principle suggests, for example, possibilities to investigate both levels of training investments and the timing of these investments in response to external factors.

Third, OST proposes the concept of **internal interdependence** (Kast & Rozenzweig, 1972), or the interconnectedness or interdependence of system components. This principle raises important questions regarding how interactions between different system components impact training investments, the types of investments undertaken and how and why they link to firm performance. Fourth, OST highlights the concept of **emergence** which relates to higher level outcomes arising due to interactions between system components. Within training-firm performance research, there are few such attempts to link macro and micro perspectives and study the emergent processes that link them. Ployhart and Moliterno (2011) highlight the need to engage with the concept of emergence or more specifically the cognitive, affective, behavioural processes that enable individual KSAs to be linked to unit or organisational level human capital.

Fifth, the concept of **equifinality** holds that firms can achieve the same end state 'from differing initial conditions and through different means' (Harney, 2018:114). Garavan et al., (2020) recently explored this principle in the context of moderators of the training-firm performance link using it to help resolve some of the inconsistencies in the relationship between specific or general training and firm performance. More broadly, Harney (2018) suggests that it may have value in accounting for the variety and diversity of training practices implemented in organizations. The principle of equifinality, therefore, suggests a need to move away from a universalistic perspective that pervades training-firm performance research and emphasises the value of configurational thinking (Harney, 2018). Finally, the concept of **feedback loops** within OST argues that the firm performance outcomes of training will influence future training investments and subsequently firm performance. Such investigation of the capacity for feedback is nascent in both the HRM and training-firm performance studies. One exception being Shin and Konrad (2017) who utilized OST and, in particular, the feedback principle to investigate reverse causality between financial performance and the future use of high performance work practices.

Developing Our Open Systems Informed Model

To understand the relationship between training and firm performance within an OST perspective, we analysed and synthesised the 207 studies using an inputs-processes-outputs framework. This framework, presented in Figure 2 draws on ideas derived from three open systems-based models: Nadler and Tushman (1980), Baldwin and Ford (1988), and Schleicher et al., (2018). We have developed a mid–range model that combines the high-level external and internal factors, while specifying in more micro detail the process components relevant to training, and conceptualised the outputs in a more causal way. In so doing, we move beyond these existing conceptualisations in a number of important ways. Firstly, Baldwin and Ford's (1988) application of OST is only at a micro-level to understand the specific elements relevant to training transfer. Nadler and Tushman, (1980) used a high level of abstraction to organise variables relevant to an organisation as a system. Finally, Schleicher et al., (2018) focused on conceptualising performance management as an open system and engaged in analysis mostly at the macro-level context.

Training inputs comprise the "why" of training and are vital to explaining its impact on firm performance. External context inputs focus on factors in the external environment or, what are called macro environmental influences, and include global and cultural context; environmental characteristics; and industry characteristics (see Table 2). Internal context factors include organization design, structure and task characteristics, industry or sector, capital intensity and resources, business strategy, HRM practice characteristics, and technological intensity. We envisage that these external and internal context inputs represent distal and proximal factors.

Training processes pertain to both the training content or "what" of training and the "how" of training in organisations as well as the organisational processes that facilitate training and the

interdependencies between these elements and the characteristics of trainees. Training content includes types of training practices implemented, coverage or amount of these practices, who is trained and the resources allocated to implement these practices, the quality of the training delivered and its perceived effectiveness by trainees. The organisational processes are concerned with how training is implemented and which lead to training outcomes. Schleicher et al., (2018), for example, specified three emergent processes: climate, culture and leadership; organizational learning and knowledge sharing; and team cohesion, trust and collaboration in the context of performance management which are relevant to the training process (see Table 3).

Training outputs comprise firm level outcomes and, drawing on Thanenou et al., (2007), we categorise these outcomes into three sub-components: (a) collective or firm level human resource outcomes such as KSAs, employee motivation/affect, withdrawal behaviour, and positive work behaviours; (b) operational performance or internal performance outcomes such as productivity, product/service quality, and innovation and (c) external performance outcomes including both financial (ROE/ROA, sales, profitability and market performance) and non-financial outcomes such as the reputation of the organisation and impact on the institutional environment Our model depicts the six principles that are the focus of the paper and, while we discuss the model in linear fashion, we are not suggesting that the relationship is linear in nature.

INSERT FIGURE 2 ABOUT HERE

Key Findings using our Open Systems Model

Given that our primary focus is on discussing the six principles of open systems theory in terms of deriving a research agenda, the next section provides a summary of the key studies in the training and performance literature that have focused on each of six OST elements as presented in Figure 2. We provide detailed analysis of our findings in Tables 2-4 and here we briefly provide a summary of the key trends.

INSERT TABLES 2-4 ABOUT HERE

The Input Components of our OST Informed Framework: Studies and findings from the training-performance literature

Table 2 summarises our findings on the input components of the OST framework. Researchers have investigated the impact of external context factors using a small number of theoretical perspectives, including institutional theory, resource dependency and economic theories but not in a way that allows researchers to capture change or adaptation in these inputs. These studies have investigated the role of global and national context inputs including cross-country differences (Ahmad & Schroeder, 2003), internationalisation (Deng et al., 2003), and country of origin (Kwon & Rupp, 2013). Examples of other environmental characteristics investigated include economic conditions (Kim & Ployhart, 2014), market uncertainty (Miller & Lee, 2001), market demand and change (Sung & Choi, 2018; Sung & Choi, 2014a), and sector differences (Harel & Tzafrir, 1999; Kwon & Rupp, 2013). Other external context factors examined include industrial market characteristics (Aragón Sánchez, Barba-Aragón, & Sanz-Valle, 2003) and export intensity (Beugelsdijk, 2008). Studies to date have predominantly used cross-sectional designs and outside-inside theorising.

Researchers have studied a comprehensive range of internal context factors primarily using a contingency perspective with relatively little utilisation of the configurational perspective which engages with the congruence and internal interdependence principles of OST. The contingencies investigated in the internal context include organization design, structure and task characteristics focusing on, for example, organisation size (Horgan & Muhlau, 2006), single versus multiple establishments (Black & Lynch, 1996), ownership types (Aragón-Sánchez et al., 2003), union

density (Tzafrir, 2005), and workforce characteristics (Jiang, Wang & Zhao, 2012). Other internal context factors studied include different industries and sectors (Glaveli & Karassavidou, 2011; Jiménez-Jiménez & Sanz-Valle, 2005; Chowhan, 2016). Capital intensity and resources are another internal input factor that has been examined in the literature focusing on R&D capital (Ballot & Taymaz, 2001), physical capital (Riley et al., 2017) and technology investment (Berk & Kase, 2010), among others (see Table 2). Strategy characteristics investigated as internal inputs include innovation strategy (Aragón-Sánchez et al.. 2003), strategic integration or fit (Audea, Teo & Crawford, 2005), strategic orientation towards HR (Choi & Yoon, 2015), CSR strategy (Liu, Li, Zhu, Cai & Wan, 2014) and the strategic primacy of training beyond other HR practices (Kooji, Guest, Clinton, Knight, Jansen & Dikkers, 2013).

HRM practice characteristics investigated include complementariness between training and other HR practices (Buch, Dysvik, Kuvaas & Nerstad,, 2015), HR strength (Guan & Frenkel, 2019), HRM strategy (Horgan & Muhlau, 2006), HRD/training strategy (Ubeda-García, Claver Cortes, Marco-Lajara, & Zaragoza-Saez, 2014), and presence of a HR department (Wickramasinghe & Liyanage, 2013). The majority of studies have investigated no more than one contingency in the same study thus leading to fewer insights on how contingencies interact with each other as part of the overall system. Additionally these studies do not consider the impact of change in these contingencies or their impact on training.

The Process Components of our OST Informed Framework: Studies and findings from the training-performance literature

Table 3 summarises our findings on the process components of our OST framework. Researchers have investigated sub-components of the context and processes dimension of our model: training content; organisational processes; and individual characteristics of trainees. Further details are presented in Table 3. Research on training content dimensions makes use of a narrow set of theoretical perspectives including learning theories, individual differences and human capital theories. Few studies make use of these theories to study change in content and process components. Examples of types of training investigated in this category include training on-the-job skills and multi-skilling (Ahmad & Schroeder, 2003), on-the-job and off-the-job training (Aragón-Sánchez et al., 2003), general and specific training (Arunprasad, 2017), team training and cross-training (Cappelli & Neumark, 2001), service-related training (Ellinger, Ketchen Jr, Hult, Elmadağ & Richey, 2008) and internal versus external training (Laursen & Foss, 2003). Studies have also investigated the training intensity and extensiveness (Gurbuz & Mert, 2011); the importance or emphasis given to the training provided (Choi & Yoon, 2015); and the commitment and dedication given to the training provided (Aragón & Valle, 2013).

Other training content dimensions that fall under the process component of our model are amount or coverage of training investigated in studies include total expenditure on training (Díaz-Fernández, Bornay-Barrachina, & Lopez-Cabrales, 2017), the ratio of total expenditure on training to total payroll / sales (Barrett & O'Connell, 2001) and general level of investment in training (Berk & Kase, 2010), number of employees trained (Harel & Tzafrir, 1999), the percentage of employees trained (Estebán-Lloret, Aragon-Sanchez & Carrasco-Hernandez, 2016), the number of training hours (Cho, Woods, Jang & Erdem, 2006), training days (McNamara, Parry, Lee & Pitt-Catsouphes, 2012) and percentage of training hours during and outside of work (Aragón-Sánchez et al., 2003) and quality of training in terms of effectiveness.

The second process dimension focuses on organisational processes which, in the context of our model, can be considered emergent enablers (Kozlowski & Klein, 2000:55). The factors examined under this category include climate, culture and leadership, organisational learning, knowledge management/sharing and team cohesion, trust and collaboration. Examples of studies found in the literature include work climate and environment (Gelade & Ivery, 2003),

organizational fairness (Kooij et al., 2013), procedural justice (Tremblay, Cloutier, Simard, Chenevert, & Vandenberghe, 2010), transformational leadership (Barling, Weber & Kelloway, 1996), leadership commitment (Burton & O'Reilly, 2004), organizational culture (Lau & Ngo, 2004) and team leadership (Santos, Caetano, & Tavares, 2015). Examples of behavioural dimensions investigated include organizational learning (Aragón et al., 2014), organizational learning orientation (Gutiérrez-Gutiérrez, Barrales-Molina & Kaynak, 2016), knowledge sharing (Buch et al., 2015), and knowledge integration (Gutiérrez-Gutiérrez et al., 2016). Examples of affective emergent processes include supportive leader / manager / supervisors (Coetzee, Mitonga-Monga, & Swart, 2014), perceived supervisory support (Buch et al., 2015), co-worker supports (Bashir & Long, 2015) and teamwork processes (Ely, 2004).

The third process dimension focuses on characteristics of the trainees including demographics, KSAs, and motivation and commitment. Researchers have used a number of theoretical perspectives, including human capital theory, learning motivation theory, the AMO model and individual differences theory. Research findings offer insights on gender (Akrofi, 2016; Yang, Chen & Yang, 2013), age (Nasurdin, Ahmad & Tan, 2014), job tenure (Bell & Grushecky, 2006), organizational tenure (Dysvik, Kuvaas & Buch, 2016), working hours (Boselie, 2010), job contract type (Piaralal, Mat, Piaralal & Bhatti, 2014), wage level (Tessema & Soeters, 2006), employee skills (Katou & Budhwar, 2006), employee / manager ability (Aragón & Valle, 2013) and job readiness (Lee, 2015). Examples of psychological characteristics investigated include employee / manager motivation (Tessema & Soeters, 2006), employee loyalty (Glaveli & Karassavidou, 2011), work engagement and personal role engagement (Fletcher, 2016) and employee enthusiasm for training (Park & Jacobs, 2011).

The Output Components of our OST Informed Framework: Studies and findings from the training-performance literature

Table 4 summarises our findings on the output component of our OST framework. The investigation of human resource performance is primarily and theoretically underpinned by the use of three theories - the RBV, social exchange theory and human capital theory. Researchers have given priority to the investigation of collective human resource performance outcomes such as management skills (Audea et al., 2005), increased knowledge, skills and experience (Cobblah & Van der Walt, 2016), and human capital (Raineri, 2017). Examples of motivational and affect outcomes including organizational commitment (Kooij et al., 2013), job satisfaction (García, 2005), employee involvement and engagement (Odle-Dusseau, Hammer, Crain & Bodner, 2016), employee loyalty and motivation (Wright, McCormack, Sherman & McMahan, 1999; Hassan, Nawaz, Abbas & Sajid, 2013). Examples of negative HR performance outcomes and withdrawal behaviour, including absenteeism (Kampkotter & Marggraf, 2015), turnover (Shaw, Delery & Gupta, 1998), intention to leave (Faems, Sels, de Winne & Maes, 2009) and poaching of trained employees (Beynon, Jones, Pickernell & Packham, 2015). Examples of positive work behaviours include organizational citizenship behaviours (Gavino, Wayne & Erdogan, 2012), work role behaviours (Fletcher, 2016), customer oriented behaviours (Peccei & Rosenthal, 2001) and in-role and extra-role behaviours (Tremblay et al., 2010).

Operational performance outcomes have also received attention with insights on outcomes such as subjective labour productivity (Abdullah, Uli & Tari, 2008), objective labour productivity (Birdi, Clegg, Patterson, Robinson, Stride, Wall & Wood, 2008) and industry specific work productivity (Gelade & Ivery, 2003), customer satisfaction (Ely, 2004), product quality (Murray & Raffaele, 1997), service quality (Glaveli & Karassavidou, 2011), radical and incremental innovations (Beugelsdijk, 2008), product and process innovation (Dostie, 2018) and technological and administrative innovation (Jiang et al., 2012). The investigation of external outcomes has predominantly focused on financial outcomes and includes return on capital employed (D'Arcimoles, 1997), return on investment (Meschi & Metais, 1998), return on assets/ return on

equity (ROA/ROE) (Darwish, Singh & Mohamed, 2013). Examples of sales performance outputs include sales level (Birley & Westhead, 1990) and sales revenue and growth (Altinay, Altinay & Gannon, 2008). Examples of profit outputs include profitability (Aragón Sánchez et al., 2003), gross profit (Chatteerjee, 2017) and abnormal returns (Riley et al., 2017). Examples of market performance outputs include option value (Berk & Kase, 2010), economic performance (Meschi & Metaiss, 1998) and financial failure (Burton & O'Reilly, 2004). Researchers have, however, scope to investigate the link between from human resource to operational and external outcomes and focus on mediators of the relationship in addition to contingent conditions.

OPEN SYSTEMS THEORY PRINCIPLES AND FUTURE RESEARCH ON TRAINING AND FIRM PERFORMANCE

Although the business case perspective in training research has contributed significantly to its revitalisation and theoretical growth , the field has narrowed conceptually and methodologically. Our rationale for advocating the use of OST is, therefore, twofold: First, we see major potential in terms of using an open systems framework to direct researchers to more explicitly investigate interrelationships between different components of the training system. Second, we also see the potential of using OST to investigate the temporal dynamics of the relationship and to better understand how changes in both the context and process components of the model impact firm performance. While Garavan et al. (2020) utilised three OST principles to meta-analyse existing finding on the training-firm performance relationship, this paper has a broader scope and moves beyond a quantitative meta-analysis to engage qualitatively with the full research base, utilises an extended OST framework incorporating six principles, and proposes research questions aimed at employing the six principles to inform future research studies. Accordingly, instead of doing more of the same, we argue that researchers should grasp the research opportunities that are presented by OST to jumpstart the field in new directions. Our analysis of what we found in the literature reveals that many of the key principles of OST have, to date, not been operationalised in empirical studies. We use the insights revealed in our description of the systematic review findings in the previous section to consider each component of Figure 2 in an integrated fashion through discussion of the implications of the six OST principles for future research. We present our future research directions in Table 5.

Congruence. We start with the congruence principle (Nadler & Tushman, 1980). As we have already highlighted, it has given emphasis to the various components of a training system or what Schleicher et al. (2018) describe as helping the system "exist in a state of relative balance" (p.2231). Congruence is conceptualised as 'fit' or the consistency of each component with each other. A central proposition of the congruence principle is that a training system will be more effective in terms of outcomes when there is a greater fit between the system components. The concept of congruence is expressed in the HRM literature in the configurational perspective which argues that HR consists of integrated systems of interrelated practices (Jackson et al., 2014; Jiang et al., 2012). Two types of fit are emphasised. First, vertical or external fit emphasises the importance of fit with the external environment, strategy and other organisational contingencies (Kepes & Delery, 2007; Lengnick-Hall, Lengnick-Hall, Andrade & Drake, 2009) and thus reflects one dimension of congruence. Wright and McMahon (1992) and Han, Kang, Kehoe and Lepak (2019) emphasize the importance of horizontal fit and the need for organisations to implement training practices that horizontally align with each other, and configurational theory highlights the importance of achieving the highest level of horizontal fit possible.

Our review findings highlight the lack of attention to the investigation of congruence and point to significant opportunities to explore this principle from a vertical perspective. First, there is scope to better understand how internal inputs impact configurations of training practices with, for example, the fit between training and task characteristics, technology intensity and strategy. We observe similar research opportunities when it comes to understanding fit between external inputs

such as national culture, environmental uncertainty and industry characteristics in response to changes in the internal and external context. Researchers have not yet engaged with the consequences of firms deviating from an ideal training configuration, and whether such deviation has a negative impact on firm performance and the implementation of future training practices. In this way, researchers have an opportunity to better understand how differential investments in job categories align with strategy.

The congruence principle suggests important horizontal fit questions related to how training fits with HR philosophy and policies. An important requirement of horizontal fit is that firms have a set of mutually supportive training practices such that the effectiveness of the whole system is greater than the sum of the individual parts (Kehoe & Collins, 2017). The content fit and the intensity of use of different training practices is an important area for future research. We need to understand how the implementation of different configurations of training practices align or fit with other HR practices and the impacts of this fit on firm performance. There is also scope to understand how clusters of training practices result in synergistic benefits for firm performance. Cifalinò and Lisi (2019) highlight opportunities to better understand horizontal inter-functional fit, which emphasises the alignment between training delivered across different areas of the business; and horizontal intra-functional fit which emphasises the fit of training delivered in the same business units. An unanswered question concerns the extent to which one training practice is enhanced or diminished in terms of firm performance by other training practices. Are there positive synergies between different training practices? For example, will firms gain more performance benefits for job or task training when it is combined with career-focused training? Gardner, Harris, Li, Kirkman and Mathieu (2017) proposed that interactions are best investigated by selecting a small or limited set of training practices. Therefore, researchers could identify two or three training practices that are most important to the achievement of strategic goals and also investigate the interactions and congruence between these practices.

Adaptation. The adaptation principle gives primacy to the idea that system inputs and outputs must achieve balance with the environment (Van Assche,Verschraegen, Valentinov & Gruezmacher, 2019). Therefore, training content and process need to adapt to change in both external and internal changes in inputs. The review findings highlight that there are few insights in current empirical investigations which shed light on this issue. Researchers have scope to investigate how changes in the types of work undertaken, changes in the work organisation and the employment relationship, impact training investments over time and subsequent performance. What is the impact on training of changes in work arrangements such as the use of temporary staff, contracts and project-based work? We need to generate insights into how these dynamics impact the focal relationship.

We suggest a number of other possible avenues for research in adaptation. Research should investigate whether and how changes in strategies influence the type of training undertaken, its intensity and coverage. Central to investigating these questions is the need to capture change over time and to understand which training practices are essential to ensure that the system is balanced. OST opens up the possibility that at different times, or at different stages of firm growth, there will be different training needs. Therefore, training practice which is important at the start-up stage may be less important for an established firm. In addition, Lepak, Jiang, Kehoe and Bentley (2018) have argued that employee reactions to training may be influenced by time such that some practices can have a greater performance impact at later rather than earlier stages of career.

An interesting question that remains unanswered concerns the short and long-term adaptations in training that are made in response to significant environmental changes. OST gives particular emphasis to the notion that a training system is something that is complex and adaptive and that it is continually responding to different unexpected internal and external context changes

in a dynamic manner. Researchers should investigate how short-term complex business environment changes, which are increasingly common, impact training and its effectiveness.

Internal Interdependence. The concept of internal interdependence, as we emphasised earlier, envisages that the process component and its sub-components that transform inputs into outputs are linked to each other (Ennen & Richter 2010; Van Assche et al., 2019). Our framework highlights numerous potential interdependencies yet our findings highlight that research on this principle is, at best, nascent. We envisage fruitful lines of investigation with respect to internal interdependencies. First, our model suggests that there are important internal interdependencies between the training content and people (trainee characteristics) sub-components. Person or trainee characteristics point to the potential value of the AMO model (Boxall, 2013) in explaining the mediating role between the content of training and firm performance. In a similar vein, the organisational processes sub-component may act as mediators or moderators of the link between training content and firm performance.

An interesting, and as yet unanswered question, in the context of internal interactions concerns the interactions between the formal and informal dimensions of training. To what extent do they support one another and what is their relative importance to firm performance? There is evidence from the performance management literature that the informal aspects may be more important than the formal aspects (Pulakos & O'Leary, 2011; Garavan et al., 2020). The investigation of these questions requires researchers to have greater conceptual clarity on the concepts of formal and informal training and various internal interdependencies related to training design and delivery.

Emergence. The emergence principle provides multiple opportunities for researchers. Emergence is conceptualised as a system concept that arises through the unpredictable interaction of system components . Scholars have conceptualised emergence as both a positive and negative feature of systems in respect of its impact on outcomes. The concept of emergence is now given particular prominence in human capital resource theory (Nyberg, Moliterno, Hale & Lepak, 2014; Eckardt, Crocker & Tsai, 2020) and it postulates that individual KSAs developed through training are transformed and amplified over time to the collective level through the influence of context factors. These context factors that emerged in this review include organisational climate, culture and leadership processes, organisational learning and knowledge sharing and reteam cohesion, trust and collaboration. We implore researchers to give attention to the emergence principle because it helps to link micro organisational processes to the amplification of individual KSAs to the organisational level.

We suggest that one possible line of investigation concerns leadership processes at multiple levels within the organisation. Leaders at all levels play a major role in influencing the utilisation of KSAs. Nishii and Wright (2008), for example, gave specific emphasis to the role of leaders in executing HR practices and they are considered central to the implementation of intended training practices. Likewise, Jackson et al. (2014) highlight the role of line managers and training professionals in enabling implementation and utilisation of KSAs. Researchers can also begin to explore the role of team-working processes, the sharing of knowledge and collaboration across business units in enabling the KSAs developed through training to emerge at the organisational level in firm performance outcomes. Ployhart and Moliterno (2011), for example, highlighted that activities which increase interdependence between employees will be beneficial to the emergence of KSAs to the firm level.

Equifinality. Katz and Kahn (1978) proposed that "the general principle which characterises all open systems, is that there does not have to be a single method for achieving an objective (p.171). Equifinality postulates that organisations can utilise multiple paths to achieve firm performance outcomes. The review findings reveal that there are no studies which have

empirically tested and compared different training strategies in the same study. Garavan et al. (2020) provide tentative support for the concept of equifinality where they found that investments in general or specific training were equally beneficial for firm performance. However, this finding was derived from a meta-analysis and we are not aware of studies that investigate this principle in an individual study. Relevant research questions related to equifinality include: What are the relative performance impacts of classroom versus structured on-the-job training for firm performance? Do they lead to similar performance outcomes? Is informal training equally beneficial for firm performance as formal training? Can different types of specific training lead to similar firm performance outcomes? What are the trade-offs organisations will make when deciding to train or not to train? The concept of equifinality challenges the one best way or universalistic HRM paradigm (Kaufman, 2019) which has found favour in the literature and potentially challenges the congruence hypothesis which argues that there is an ideal fit between, for example, external and internal inputs and training configurations. The equifinality principle suggests the potential for multiple and dynamic fits.

The equifinality principle also potentially broadens the repertoire of outputs that can be investigated. Harney (2018) argues that OST logic does not necessarily give emphasis to particular types of training or functionalist and unitarist type firm outcomes. Harney (2018) also emphasises the potential to broaden the scope of outcomes to consider outcomes related to organisational resilience, health, CSR, organisational reputation and impact on the institutional environment. Guest (2017) has raised the importance of focusing on employee wellbeing and firm performance outcome while Jackson et al., (2014) in their aspirational framework for strategic HRM focus on outcomes such as including legitimacy, social responsibility, legality and compliance, environmental sustainability, strategic collaboration, organisational trustworthiness and reputation.

Capacity for Feedback. A central tenet of OST is the input-process-output model and the importance of feedback loops (Cummings, 2014). Harney (2018) emphasises that these feedback loops play a major role in identifying the gap between intended and actual outcomes. Research to date has taken an outside-in approach where the primary interest is on studying how context influences training and firm performance. Yet there is major potential to investigate how performance feedback impacts dimensions of external context. For example, where organisations invest in training in areas such as safety and health and bullying and harassment awareness, this can influence national policy and practice in the external environment and shape the work on regulatory agencies. An extension of this line of thinking concerns how performance feedback impacts the diffusion of particular training practices and their future adoption in organisations. It would also be useful to investigate these issues as they dynamically evolve over time.

Researchers can also investigate other functions of feedback loops. Lyneis and Sterman (2016) highlight that feedback loops help regulate the system, enable it to achieve balance or result in the amplification of change. They found strategies frequently fail because organisations did not consider short and long-term feedback loops. Feedback loops can help a training system to retain balance while responding to external and internal inputs as they change. An intriguing question that could yield insights concerns how the training system can be flexible while responding to multiple equilibria and how this impacts performance. How does positive and negative firm performance feedback impact future training investments? How does negative performance feedback impact the cognitions of key decision-makers concerning training and their commitment to future training? The research undertaken by Shin and Konrad (2017) is an example of the type of study that training researchers should undertake. Reverse causality remains something of a holy grail, however, the feedback loop concept brings it to the fore as a priority issue.

Methodological Implications for Training-Firm Performance Research using an Open Systems Model.

We observed throughout our systematic review that many of the ideas suggested by OST have not surfaced in the literature. In addition, our review findings highlight that the methodologies used to investigate the training-firm performance relationship are not a good fit with the methodological challenges imposed by the six principles of OST that we discussed in the previous section. We acknowledge that proposing changes in methodology that the operationalisation and measurement of OST principles is problematic, nuanced and extremely difficult to capture using the repertoire of research methods that researchers currently use. Therefore, researchers need to use methodologies that enable both zooming out where they investigate the wider context within which these relationships occur over time, and zooming in where they capture the details of the linkages and interactions between components of the systems model (Nicolini, 2009; Schad & Bansal, 2017). The investigation of context is central to the operationalisation of OST principles. Both Cooke (2018) and Johns (2018) have given particular emphasis to the use of OST which elevates this attention. An essential requirement related to the use of methodologies is to capture the unfolding implementation of training over time and its implications for firm performance.

The open systems model highlights the need for researchers to link context explicitly to training activities and outcomes. This introduces significant additional complexity given the requirement to consider training as something that is dynamic and highly dependent on context. Cornelissen (2017) notes that researchers will need to use a much broader repertoire of methods if they are to capture complexity. Open systems researchers (e.g. Klein, Solinger & Duflot, 2020; Bansal & Song, 2017) have suggested methodologies such as system mapping, the modelling of system changes and the use of case studies that surface contextual dimensions. Schad and Bansal (2018) propose that given the emphasis on complexity, surprises and unintended consequences that are central to systems perspectives, researchers should make use of qualitative comparative analysis (QCA) (Fiss, 2007; Misangyi, Greckhamer, Furnari, Fiss, Crilly & Aguilera, 2017). They advocate this approach because it makes use of a set-theoretical, configurational approach and helps researchers to surface causal complexity. Boon, Den Hartog and Lepak (2019) have proposed that researchers can investigate congruence or fit using cluster analyses and profile deviation to better understand the consequences of firms deviating from an ideal cluster of training practices.

Investigation of the training-firm performance relationship has relied almost exclusively on the use of quantitative methods. We argue that in order to advance our understanding of the relationship through OST, researchers must look on the other side of the methodological fence. In particular, they need to consider the use of qualitative research methods to more systematically understand the complexities of the links between components of the system and to use these insights for quantitative focused investigations, where appropriate adopting a mixed methods approach. Qualitative research methods can be particularly valuable to deepen our understanding of the dynamics of the relationship between components of the system and the issues that underlie many of the quantitatively established relationships found in the current literature. For example, researchers can use qualitative research methods to deepen our understanding of the role of external context inputs such as environmental complexity and uncertainty in explaining variations in investment in training over time and its impact on firm performance.

OST foregrounds a pressing and significant challenge within the field – the conceptualisation and measurement of training (Garavan, McCarthy, Sheehan, Lai, Saunders, Clarke & Carbery, 2019). Scholars need to give attention to providing a clear differentiation between formal and informal training and to develop appropriate scales or indicators of these concepts. In existing studies, researchers generally ask organisational respondents to report the percentage of employees trained or the amount of money invested in training. These measures are deficient in that they fail to capture the types of training undertaken, the timing of the training, the quality of the training implemented and the coverage of the training. Researchers need to measure more than the mere existence of training and, rather, focus on how it is implemented. The measurement of fluctuations in training activity is central to OST. These dynamics cannot be

revealed using cross-sectional designs (Grice, Ramsey & Chaney, 2015). We do, however, acknowledge that the repeated measurement of training has implications for the type of measures used, their brevity and the need to consider alternatives to self-report measures.

CONCLUSIONS

Against the backdrop of an open systems theory as our guiding framework and using the six OST principles, this paper systematically reviewed the extant research on the training-firm performance relationship. We set three objectives for the paper: (1) to integrate disparate research findings informed by the OST perspective; (2) to use OST to capture and model the training-firm performance link; and (3) to utilise OST principles to guide future research on training and performance. Using the six principles of OST, we highlight gaps in the research base and propose important new insights and research questions. We also pointed out significant methodological challenges in operationalising these principles in empirical studies. We hope that the review findings and future research directions will result in a renewed endeavour by researchers to develop greater theoretical insights to our understanding of the training-firm performance relationship.

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Figure 1: Steps in the Review Process

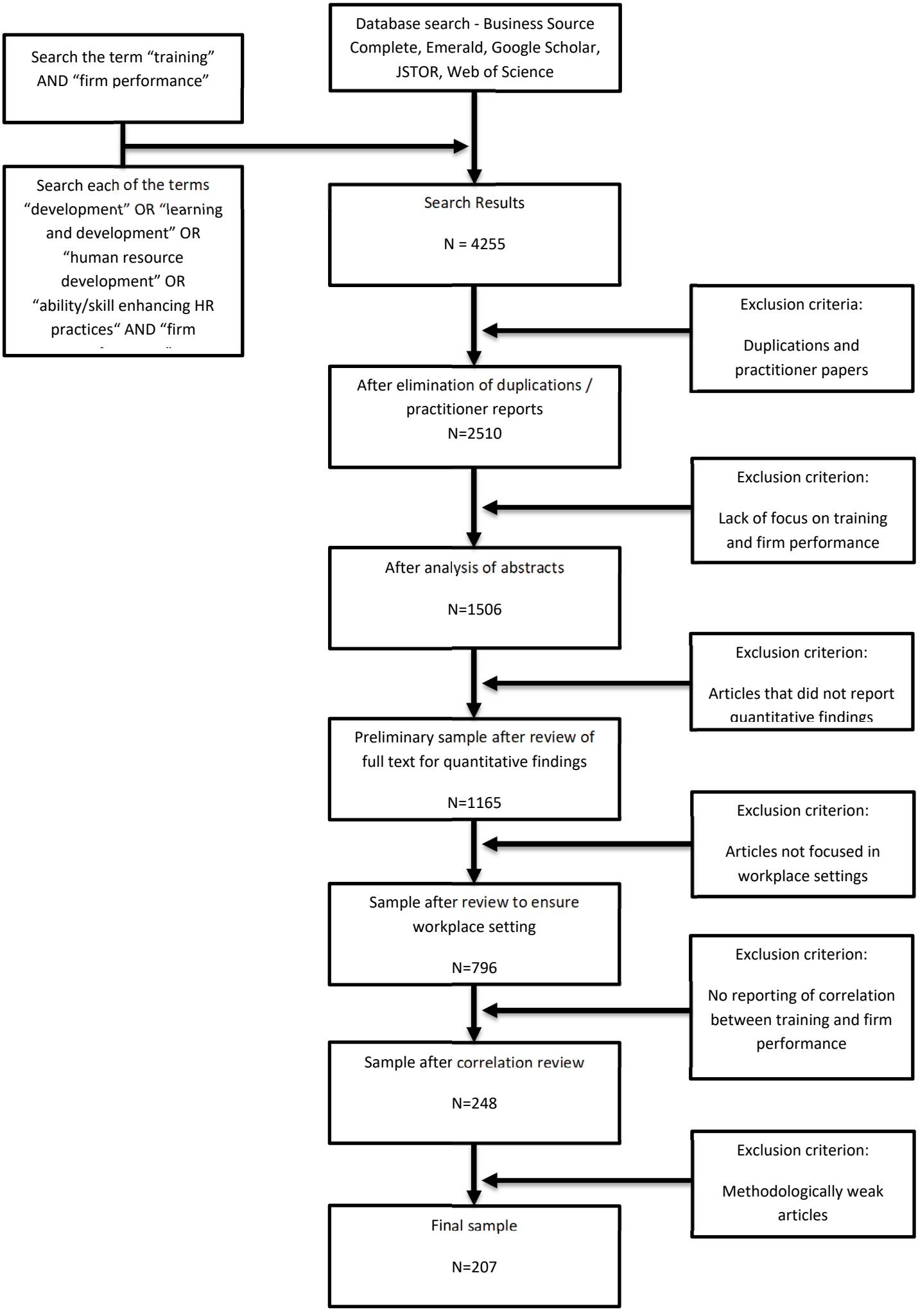

Figure 2: Open Systems Based Framework of Training & Firm Performance

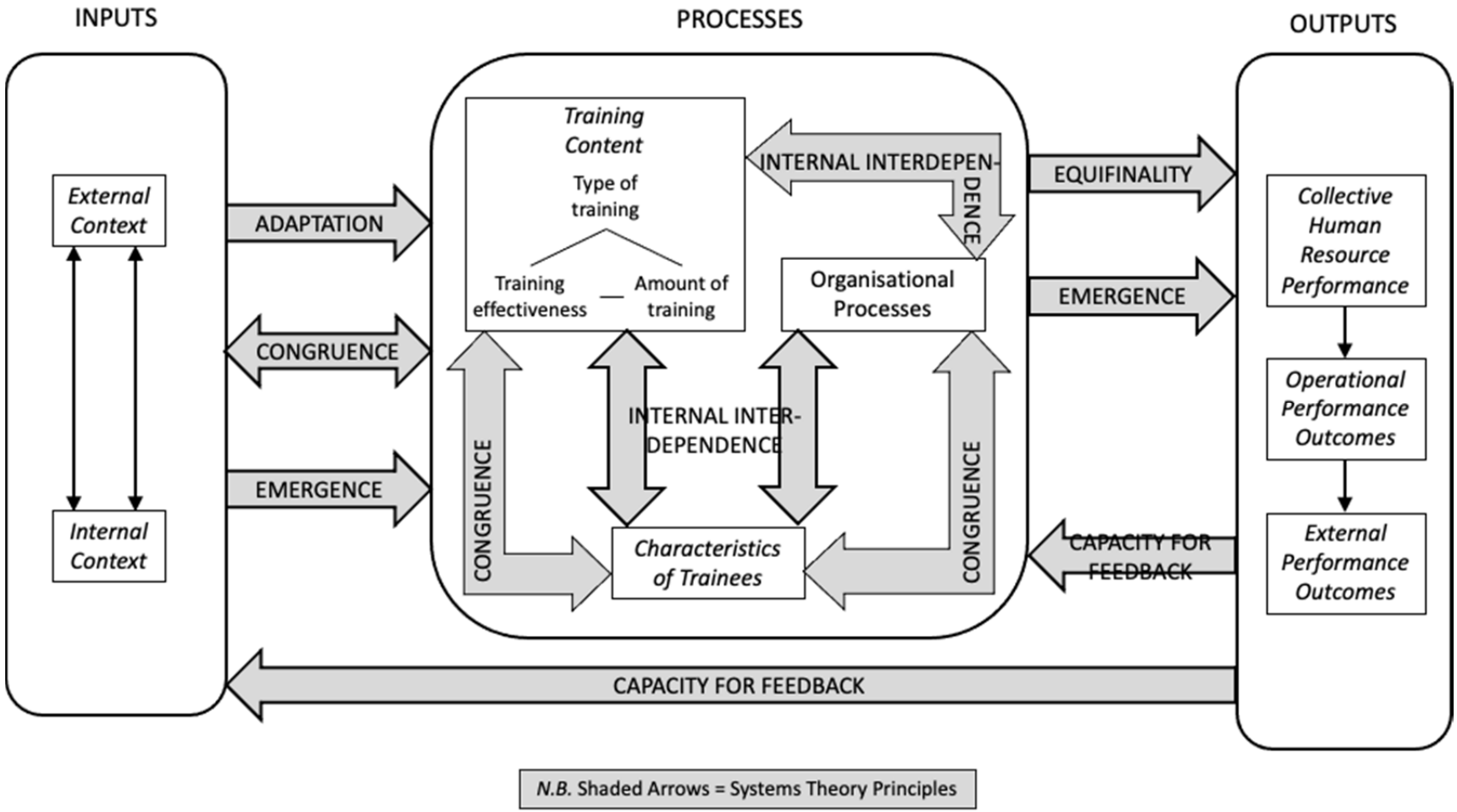

Table 1: Descriptive Information on Coded Articles

			Components and *Subcomponents*															
			Inputs				**Processes**						**Outputs**					
Categories	**All empirical studies**		***External Context***		***Internal Context***		***Training Content***		***Emergent processes***		***Trainee characteristics***		***HR Performance***		***Operational Performance***		***Financial Performance***	
	k	%	k	%	k	%	k	%	k	%	k	%	k	%	k	%	k	%
Total studies	207	100	39	100	195	100	207	100	36	100	85	100	90	100	103	100	82	100
Study settings																		
Field (primary)	161	77.8	26	66.7	151	77.4	161	77.8	35	92.1	74	86.1	79	88.8	70	68.0	60	74.1
Field (secondary)	46	22.2	13	33.3	44	22.6	46	22.2	3	7.9	12	14.0	10	11.2	33	32.0	21	25.9
Study focal participants																		
Executive, top management	82	39.6	14	24.6	79	29.5	82	29.1	14	24.6	21	16.0	24	18.2	47	32.2	42	39.6
HR director/managers	61	29.5	18	31.6	58	21.6	64	21.6	8	14.0	21	16.0	25	18.9	39	26.7	27	25.5
Employees	69	33.3	11	19.3	66	24.6	69	24.5	24	42.1	57	43.5	53	40.2	24	16.4	12	11.3
Line managers/supervisors	22	10.6	3	5.3	20	7.5	22	7.8	8	14.0	18	13.7	16	12.1	7	4.8	3	2.8
Customers	3	1.5	-	-	3	1.1	3	1.1	1	1.8	1	0.8	2	1.5	3	2.1	1	0.9
Others	7	3.4	1	7.8	6	2.2	7	2.5	1	1.8	2	1.5	3	2.3	3	2.1	1	0.9
Not specified	38	18.4	10	17.5	36	13.4	38	13.5	1	1.8	11	8.4	9	6.8	23	15.8	20	18.9
Data sources																		
Archival	30	14.5	6	13.3	28	12.3	30	12.3	4	8.9	11	10.9	12	11.5	19	15.3	21	19.8
Experiment	5	2.4	-	-	3	1.3	5	2.1	1	2.2	2	2.0	1	1.0	2	1.6	4	3.8
One-time survey	163	78.7	33	73.3	155	68.3	163	66.8	30	66.7	71	70.3	78	75.0	75	60.5	61	57.6
Quasi-experiment	3	1.5	-	-	2	0.9	3	1.2	2	4.4	2	2.0	2	1.9	1	0.8	-	-
Time-lagged	43	20.8	6	13.3	39	17.2	43	17.6	8	17.8	15	14.9	11	10.6	27	21.8	20	18.9
Training Terminology used																		
Training	147	71.0	23	63.9	140	67.6	147	67.4	29	65.9	56	61.5	58	61.7	79	69.9	60	68.2
Learning & development/training	5	2.4	1	2.8	5	2.4	5	2.3	-	-	4	4.4	1	1.1	2	1.8	2	2.3
Training & education/schooling	7	3.4	2	5.6	7	3.4	7	3.2	2	4.6	1	1.1	-	-	5	4.4	3	3.4
Training & development	26	12.6	3	8.3	24	11.6	26	11.9	4	9.1	12	13.2	15	16.0	12	10.6	12	13.6
	7	3.4	1	2.8	6	2.9	7	3.2	1	2.3	6	6.6	6	6.4	2	1.8	2	2.3
Knowledge/skill/competency																		

practices																		
Development/HRD/HCD	26	12.6	6	16.7	25	12.1	26	11.9	8	18.2	12	13.2	14	14.9	13	11.5	9	10.2
Components studied as:																		
Independent Variables	196	94.7	38	30.7	187	33.3	196	33.5	39	29.8	83	32.3	87	33.1	99	33.1	75	33.5
Mediators	63	30.4	8	6.5	59	10.5	63	10.8	21	16.0	39	15.2	38	14.5	33	11.0	24	10.7
Moderators	66	31.9	20	16.1	65	11.6	66	11.3	16	12.2	25	9.8	26	9.9	34	11.4	25	11.2
Dependent Variables	196	94.7	38	30.7	187	33.3	196	33.5	39	29.8	84	32.7	87	33.1	99	33.1	75	33.5
Tested component interactions	65	31.4	20	16.1	64	11.4	62	11.1	16	12.2	25	9.7	26	9.9	34	11.4	25	11.2

Table 2: Taxonomy of Open System Subcomponents and Subcategories: Inputs Component

Subcomponent	Subcategory	Variables and Sample Research
External Context	Global and Cultural Characteristics	• Cross-country difference (Ahmad and Schroeder, 2003) • Internationalization (Deng et al., 2003) • National culture or cross-cultural difference (Cho & Yoon, 2009) • FDI status (Chi et al., 2008) • Country of origin (Kown & Rupp, 2013) • Globalization (Lui et al., 2014)
	Environmental Characteristics	• Market competitiveness (Delaney & Huselid, 1996) • Market growth (Gooderham, Parry & Ringdal, 2008) • Business environment (Harel and Tzafrir, 1999) • Industrial productivity (Kaminski, 2001) • Economic condition (Kim & Ployhart, 2014) • Customer affluence (Litz & Stewart, 2005) • Market uncertainty (Miller & Lee, 2001) • Market demand (Sung & Choi, 2018) • Market change (Sung & Choi, 2014a)
	Industry Characteristics	• Industrial market characteristics (Aragón Sánchez et al., 2003) • Export intensity (Beugelsdijk, 2008) • Foreign owned ventures vs joint ventures (Chen & Jermias, 2016)
Internal Context	Organization Design & Structure and Task Characteristics	• Organization size (Horgan and Muhlau, 2006; small firms only Altinay et al., 2018; large firms only, Guerrero & Barraud-Didier, 2004) • Union density/influence (Tzafrir, 2005) • Single or multiple establishment (Black & Lynch, 1996) • Family ownership (Aragón Sánchez et al., 2003) • Hierarchical levels (Beugelsdijk, 2008)

Industry/sector	• Workforce characteristics (e.g. % of female workers, age composition, Jiang et al., 2012; % of part-time and temporary staff, Gooderham et al., 2008)x • For profit-making industry only (Chowhan, 2016) • For manufacturing vs non-manufacturing (Jiménez-Jiménez & Sanz-Valle, 2005) • Specific sector (e.g. manufacturing, Abdullah et al., 2008; non-manufacturing industry, Dermol & Čater, 2013) • Specific industry (e.g. banking industry, Glaveli & Karassavidou, 2011)
Capital Intensity & Resources	• R&D capital (Ballot et al., 2001) • Physical capital (Riley et al., 2017) • Investment in fixed assets (Barrett & O'Connell, 2001) • Technology investment/capital (Berk & Kase, 2010) • Materials capital (Boon & Vander Eijken, 1998) • Capital intensity (Koch & McGrath, 1996) • Training grants from external source (Holzer, Block, Cheatham & Knott, 1993) • E-commerce/IT budget (Yang et al., 2013)
Business Strategy	• Innovation strategy (Aragón Sánchez et al., 2003) • Knowledge strategy (Arunprasad, 2017) • Strategic integration or fit (Audea et al., 2005) • Business strategy (Birley & Westhead, 1990) • Strategic orientation towards HR (Choi & Yoon, 2015) • Marketing strategy (Liao, Chang, Wu & Katrichis, 2011) • Strategic flexibility (Gutiérrez-Gutiérrez et al., 2016) • CSR (Liu et al., 2014) • Information processing and decision-making strategy (Miller & Lee, 2001)
HRM practice Characteristics	• Strategic primacy of training above and beyond other HR practices (Kooji et al., 2013)

	• Complementariness between training and other HR practices (Buch et al., 2015) • HR strength (Guan & Frenkel, 2019) • General HR capability and commitment (Karami, Jones, & Kakabadse, 2008) • Presence of HR department (Wickramasingh & Liyanage, 2013) • HRM strategy (Horgan & Muhlau, 2006) • HRD/training strategy (Ubeda-García et al., 2014) • Task characteristics (Liao, 2006) • Training transfer environment (Saks & Burke-Smalley, 2014)
Technological Intensity	• Technology intensity (Díaz-Fernández et al., 2017)) • Technological capability (Chatterjee, 2017) • Degree of technology newness (Koch & McGrath, 1996) • Technological change (Sung & Choi, 2014a)
Legitimacy	• Firm performance (e.g. sales levels, Glaub et al., 2014) • Organizational legitimacy (Estéban-Lloret et al., 2016) • Industrial relations environment (Holzer et al., 1993)

Table 3: Taxonomy of System Subcomponents and Subcategories: Processes Component

Subcomponent	Subcategory	Variables and Sample Research
Training Content	Type of Training	• Training on job skills and multi-functions (Ahmad & Schroeder, 2003) • On-the-job and off-the-job training (Aragon Sanchez et al., 2003) • General and specific training (Arunprasad, 2017) • Transformational leadership training (Barling et al., 1996) • Team training and cross training (Cappelli & Neumark, 2001) • Management development/training (Choi & Dickson, 2009) • Service related training (Ellinger et al., 2008) • Internal and external training (Laursen & Foss, 2003) • Training extensiveness/intensity (Burbuz & Mert, 2011)) • Training emphasis/importance (Cho & Yoon, 2009) • Training dedication and commitment (Aragón & Sanz Valle, 2013)
	Amount of Training	• Total expenditure on training (Díaz-Fernández et al., 2015) • The ratio of total expenditure on training to total payroll/sales (Barrett & O'Connell, 2001) • Investment in training (Berk & Kase, 2010) • Number of employees trained (Harel & Tzafrir, 1999) • Percentage of employees trained (Estéban-Eloret et al., 2016) • Training hours (Cho et al., 2006) • Training days (McNamara et al., 2012) • Percentage of training hours during or outside working hours (Aragón Sánchez et al., 2003)
	Training Evaluation	• Training benefits (Dhar, 2015)

	Who is trained	• Improvement in knowledge (Birou, Green & Inman, 2019) • Training effectiveness (Delaney & Huselid, 1996) • Training evaluation (García, 2005) • Executive and top management team (Akrofi, 2016) • Managerial job group (Birley & Westhead, 1990) • Employee job group (bin Atan, Raghavan, & Mahmood, 2015) • Multiple job groups (Amin, Ismail, Rasid, & Selemani, 2014) • Not specified (Birou et al., 2019)
Organizational Processes	Climate, Culture & Leadership	• Transformational leadership (Barling et al., 1996) • Work climate/environment Gelade & Ivery, 2003) • Supportive leader/manager/supervisors (Coetzee et al., 2014) • Highly committed leaders (Burton & O'Reilly, 2004) • Social exchange, economic exchange (Jung & Takeuchi, 2019) • Organizational fairness (Kooij et al., 2013) • Organization culture (Lau & Ngo, 2004) • Team leadership function (Santos et al., 2015) • Procedural justice (Tremblay et al., 2010)
	Organizational Learning	• Organizational learning (Aragón et al., 2014) • Learning orientation (Gutiérrez-Gutiérrez et al., 2016) • Learning by doing (Harel & Tzafrir, 1999)
	Knowledge management / sharing	• Knowledge management (Abd Rahman, Ng, Sambasivan & Wong, 2013) • Knowledge sharing (Buch et al., 2015) • Knowledge integration (Gutierrez-Gutierrez et al., 2016)
	Team cohesion, trust & collaboration	• Co-worker supports (Bashir & Choi, 2015) • Perceived supervisor support (Buch et al., 2015) • Supervisor coaching (Ellinger et al., 2008) • Team process/work (Ely, 2004) • Trust (Gould-Williams, 2007)

Characteristics Of Trainees	Demographic Characteristics	• Gender (as a control: Akrofi, 2016; as a moderator: Yang, Chen & Yang, 2013) • Age (Nasurdin et al., 2014) • Job tenure (Bell & Grushecky, 2006) • Organizational tenure (Dysvik et al., 2014) • Job groups (Birdi, 2007) • Working hours (Boselie, 2010) • Job contract (Piaralal et al., 2014) • Marital status (Tabvuma et al., 2015) • Wage (Tessena & Soeter, 2006)
	Knowledge, skills, ability & competency	• Employee skills (Katou & Budhwar, 2006) • Employee/managers' ability (Aragón & Sanz Valle, 2013) • Human capital (Berk & Kase, 2010) • Owners' expertise (Chinomona, Mashiloane & Pooe, 2013) • Self-efficacy (Glaub et al., 2014) • Education level (Shen & Tang, 2018) • Job readiness (Lee, 2015) • Entrepreneurial business experience (Mahmood, Zahari, Yaacob & Zin, 2017)
	Motivation & Commitment	• Organizational/employee commitment (Zheng, Morrison & O'Neill, 2006) • Employees/managers' motivation (Tessena & Soeters, 2006) • Employee loyalty (Glaveli & Karassavidou, 2011) • Employee satisfaction (Feng, Wang & Prajogo, 2014) • Work engagement, personal role engagement (Fletcher, 2016) • Felt obligation (Frenkel & Bednall, 2016) • Employee enthusiasm (Park & Jacobs, 2011)

Table 4: Taxonomy of System Subcomponents and Subcategories: Outputs Subcomponent

Subcomponent	Subcategory	Variables and Sample Research
Collective Human Resource Performance	KSAs	• Management skills (Audea et al., 2005) • Increased knowledge, skills and experience (Cobblah & Van der Walt, 2016) • Employee competency (Potnuru & Sahoo, 2016) • Human capital (Raineri, 2017)
	Motivational/affect	• Organizational commitment (Kooij et al., 2013) • Job satisfaction (Garcia, 2005) • Employee involvement/engagement (Odel-Dusseau et al., 2015) • Employee loyalty (Hassan et al., 2013) • Motivation (Wright et al., 1999)
	Withdrawal behavior	• Absenteeism/attendance (Kampkotter & Marggraf, 2015) • Turnover rate/quit rate (Shaw et al., 1998) • Losing employees to competitors (Beynon et al., 2015) • Intention to leave/stay (Lam, Chen & Takeuchi, 2009)
	Positive Work Behaviors	• OCBs (Gavino et al., 2012) • Employee discipline (Horgan & Muhlau, 2006) • Job performance (Horgan & Muhlau, 2006) • Work effort (Dysvik et al., 2016) • Work role behaviors (Fletcher, 2016) • Knowledge sharing behaviors (Liu & Liu, 2011) • Customer-oriented behaviors (Peccei & Rosenthal, 2001) • In-role and extra-role behaviors (Tremblay et al., 2010) • Stress & quality of life (Okay-Somerville, Scholarios & Sosu, 2019) • Combined HR outcomes (Ubeda-García et al., (2014)
Operational Performance	Work productivity	• Subjective labour productivity (Abdullah et al., 2008)

Outcomes		• Objective labour productivity (Birdi et al., 2008)
		• Industry specific work productivity (e.g. clerical accuracy), Gelade & Ivery, 2003)
	Product/service quality	• Customer satisfaction/referrals (Ely, 2004) • Product quality (Murray & Raffaele, 1997) • Service quality (Glaveli & Karassavidou, 2011) • Service performance (Browning, 2006)
	Innovation	• Managers' innovativeness (Aragón & Sanz Valle, 2013) • Radical and incremental innovation (Beugelsdijk, 2008) • Number of firm patents (Díaz-Fernández et al., 2015) • Product/process innovation (Dostie, 2018) • Technological and administrative innovation (Jiang et al., 2012)
	Others	• CSR/Sustainable performance (Liu et al., 2014) • Combined operational performance (Hooi, 2019)
External Performance Outcomes	ROE&ROA	• ROA/ROE (Cho et al., 2006) • ROA & ROE (Darwish et al., 2013) • Return on investment (Meschi & Metais, 1998) • Return on capital employed (D'Arcimoles, 1997)
	Sales	• Sales level (Birley & Westhead, 1990) • Sales/revenue growth (Altinay et al., 2008)
	Profitability	• Profitability (Aragón Sánchez et al., 2003)

Market Performance	• Gross profit (Chatterjee, 2017) • Abnormal returns (Riley et al., 2017) • Option value (Berk & Kase, 2010) • Failure & IPO (Burton & O'Reilly, 2004) • Success index (Glaub et al., 2014)
Others	• Economic performance (Meschi & Metais, 1998) • Combined financial performance (Rhee, Zhao, & Kim, 2014) • Export growth and intensity (Deng et al., 2003)

Table 5: Recommended Directions for Open Systems Theory Informed Future Research on Training and Firm Performance

Focus	Suggested Research Questions
Inputs	• **External Inputs Key Issues:** o How do national cultural differences impact training processes and their link with firm outcomes? o What impact do levels of environmental complexity and change have on the training-firm performance link? o What impact do industry characteristics including industry change and sectoral differences have on the training configurations implemented and their impact on firm performance? o Are there country of origin effects and what role do country institutional differences play in moderating / mediating the training-firm performance link? • **Internal Inputs Key Issues** o How does organization strategy changes impact the configurations of training implemented and subsequent impacts on firm performance? o What are the impacts of changing levels of technological intensity have on the implementation of training practices and their subsequent impact on firm performance? o Does the implementation of training in conjunction with other HR practices increase or decrease the impact of training on form performance? o How does the strength of the organization's HR system moderate the firm performance impacts of training? o How do task characteristics and the strategic value of jobs impact the training-firm performance link?
Processes	• **Training Content: Key Issues** o How are trainees selected for participation in training and what are the impacts on the firm performance benefits of training? o What impact does current versus future skills training have on firm performance ? o How does the level of strategic emphasis / importance given to a particular training activity moderate the training-firm performance link? o What is the impact of greater coverage of training (number / % of employees) on the training-firm performance link? o What is the impact of the timing of training on firm performance?

	- What impact does the quality versus quantity of training impacts training-firm performance? - How does the strength of training in terms of including distinctiveness, consistency and consensus moderate the training-firm performance link? **Organizational Processes: Key Issues** - What impact does line manager support have on the effectiveness of training? - How do organizational processes impact the way employees are selected for training? - What impact does knowledge sharing and team work have on the use of KSA to enhance firm performance? - Does the level of trustworthiness within an organization moderate the training-firm performance link? **Trainee Characteristics: Key Issues** - What is the impact of employee motivation characteristics have on the utilization of KSAs to achieve firm performance? - How do individual ability characteristics interact with training content characteristics to impact firm performance?
Outputs	- How does investment in training impact non-financial external firm performance? - What is the impact of training investments on both proximal and distal firm outcomes? - What are the characteristics of the causal chain that links collective human resource outcomes to firm operational outcomes and external performance outcomes?
Congruence Hypothesis	- What are the links between different types of business strategies and configurations of training and how do these business strategies impact firm performance? - To what extent and why does horizontal fit between training practices and firm HR philosophy and policy impact the training-firm performance relationship? - What is the influence of national culture on the training-firm performance relationship? - How do training configurations develop over time respond to internal and external inputs and what is the impact on firm performance? - What are the consequences of deviating for an training ideal type of fit and how does it impact the firm performance relationship? - What are the impacts of different task characteristics and contractual relationships on training investments and firm performance?

	• What is the impact of characteristics business strategies on the training content sub-system and it impact on firm performance?
Internal Interdependence Principle	• To what extent do trainee AMO impact the effectiveness of training and perceptions of training quality? • To what extent does the implementation of one training practice enhance or diminish another practice in terms of its impact on firm performance? • What are the firm performance benefits of specific training combined with investment in general training practices? • Why are the links between the training content subsystem dimensions and how do they impact firm performance ?
Capacity for Feedback Principle	• How does firm performance feedback influence future training investments and subsequent firm performance ? • How can the training content subsystem be flexible while responding to multiple equilibria and their impact on firm performance? • How does negative feedback on firm feedback impact the cognitions of organizational decision makers in relation to future investments in training? • How does feedback on firm performance outcomes impact training processes, activities and emergent processes and subsequently future performance? • How does feedback from the training system influence the adoption and diffusion of training practices and their legitimization in the institutional environment?
Equifinality Principle	• To what extent do multiple paths in terms of training practices, lead to the same firm performance and why? • What is the relative firm performance value of class-room versus structured on-the -job training for firm performance? • To what extent is formal versus informal training equally effective in achieving firm performance outcomes? • What are the firm performance impacts of the decision to train versus not to train? • What is the impact of training on non-financial firm performance outcomes such as reputation, compliance, legality and environmental sustainability?
Adaptation	• How does the training content sub-system adapt to changes in context over time?

Principle	• What is the impact of sudden changes in context on the effectiveness of the training content subsystem? • What are the precise impacts of changes in strategy for the types of training undertaken, its intensity and employee coverage? • What are the different and changing demands on the training content sub-system of different stages of firm growth how do they impact firm performance? • What is the impact of changing employee reactions to training on firm performance?
Emergence	• What aspect of organizational processes facilitate and inhibit the emergence of individual KSAs to the collective level in organizations to impact firm performance? • How do cross-functional collaboration and knowledge sharing impact the emergence of individual KSAs to the collective level? • What role do leadership processes have on the emergence of individual KSAs to the collective level?