Acta Commercii - Independent Research Journal in the Management Sciences
ISSN: (Online) 1684-1999, (Print) 2413-1903

Apprentice selection: A systematic literature review from 1990 to 2020

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Dates:
Received: 28 Jan. 2021
Accepted: 27 May 2021
Published: 10 Dec. 2021

How to cite this article:
Puchert, J., Van Niekerk, R. & Viljoen, K., 2021, 'Apprentice selection: A systematic literature review from 1990 to 2020', *Acta Commercii* 21(1), a932. https://doi.org/10.4102/ac.v21i1.932

Orientation: Technological innovations and developments in methods of productivity have resulted in an increased demand for technically-oriented artisans. However, the supply of qualified artisans is insufficient to meet the demand.

Research purpose: This article is the product of a systematic investigation into the extent and nature of empirical literature related to human resource selection practices used for apprentices.

Motivation for the study: The authors noted inadequate research into the selection practices used for apprentices. This investigation was motivated by the need to systematically verify the extent and nature of the empirical literature on apprentice selection, both internationally and nationally.

Research design, approach and method: A systematic literature review of published empirical research articles (for the period 1990–2020) in scholarly databases was conducted. The literature was accessed through relevant databases within the business management, human resource management and industrial psychology fields. The literature was restricted to scholarly (i.e., peer reviewed journals), English full textual data. Twelve combinations of two clusters of key words were used in the search function. The first cluster was apprentice, apprenticeship and artisan, with the second cluster being selection, selection process, staffing and recruitment. Four exclusion categories were used to reject literature that were unrelated, dissimilar and unconnected with the purpose of the literature review.

Main findings: From the comprehensive review of the literature, 12 articles were found to have content related to the selection of apprentices. Five core themes, with 11 sub-themes, were identified from this literature. A research agenda is proposed with research questions identified for each theme.

Practical/managerial implications: This literature review has provided a synthesised summary of the available literature on apprentice selection. Through the provision of a research agenda, this article contributes by providing a foundation for further research in the field.

Contribution/value-add: This article adds to the current literature available on apprentice selection practices. This should alert researchers of the need to further explore this area to enhance knowledge and understanding of the best practices employed in the selection of apprentices.

Keywords: apprentice; selection; selection process; staffing; systematic literature review.

Introduction

Key focus of the study

Economic growth, improved innovation, enhanced entrepreneurship, and business productivity are interlinked with Science, Technology, Engineering and Mathematical (STEM) skills (Xue & Larson 2015). Industry has therefore become increasingly aware of the interplay between these STEM skills and their business success (Arvizu 2015; Kramer et al. 2015). Jobs have also become increasingly demanding given the replacement of routine tasks with advanced technology (Cedefop 2016; Giffi et al. 2015). Both internationally and within South Africa (SA), there has been an accelerated shift towards skills biased technical change (Hafni et al. 2020; Nomvete, Adams & Moloto 2020).

Despite the heightened need for these technical skills, there is a STEM crisis. Notwithstanding enhanced employment prospects and higher earnings, there is currently an international shortage of skilled trade workers (ManpowerGroup 2018; Schwab 2019). In the United States of America (USA) alone, 67% of manufacturing employers have stated that they are not able to fill technical jobs with mid-level skilled employees (Giffi et al. 2015). In SA, a large portion of technical vacancies are not filled because of a shortage of skill and educational requirements within the populace (Mateus, Allen-Ile & Iwu 2014; Peo 2013). A skills mismatch in the labour force is therefore explicit. It is also evident that this problem will worsen in the years to come if something

is not done about it (Qonde 2019). To stimulate growth in global economies, it is fundamental that the continuing skills shortages in the artisanal and technical fields be addressed (Pandor 2018; Waite & McDonald 2019).

Background to the study

The existing literature suggests that there is a quantifiable global demand for artisans (Schwab 2019). The shortage of technicians is growing more acutely daily; in certain sectors, it has been classified as a catastrophe (Heutter 2020; Kilcarr 2016). In SA, it is consistently reported that technical apprentices and artisans are scarce and critical amongst the national workforce (Government Gazette 2018; Pandor 2018). There is hence a deficiency of adequate technical abilities, specifically at the level of artisan (merSETA 2016; Nomvete et al. 2020; Vass & Raidani 2018). Given that only approximately 24% – 45% of learners are currently passing the trade test each year (Government Gazette 2015; Van Rooyen et al. 2010), there is a significant shortfall in the annual production rate of artisans (Duarte 2017).

This, unfortunately, is happening within a context where the country needs to strategically align its human resource (HR) practices in order to remain competitive (merSETA 2016; Nomvete et al. 2020). The competition can replicate certain assets and processes, such as operational technology and product design, but the HR asset remains unique (Breaugh 2013; Shatouri, Omar & Igusa 2012).

It currently costs over R500 000 (South African rand) to train an apprentice in a large firm (Hauschildt 2018). It is considered vital that the right individuals are accepted onto these apprenticeship programmes (Kilcarr 2016). Firms have been encouraged to invest in enhanced screening and selection techniques for learners partaking in an artisanal learning pathway (Government Gazette 2015; merSETA 2016). The national government has also recommended, besides implementing the minimum entry requirements, that aptitude and attitude testing be carried out to assist in the selection process of apprentices (Government Gazette 2015).

However, scant national research exists on the human resource selection (HRS) practices used for apprentices (Puchert, Dodd & Viljoen 2017a, 2017b). Specifically, there is an inadequate amount of empirical research on the profile of a successful apprentice and only modest outdated research on the profile of a successful apprentice applicant (e.g. Gump 2006; Mottram, Clarke & Downs 1980). The optimal steps to be used in the selection and training of apprentices also need to be documented, as only limited, and mostly outdated, international empirical research is available. There is, hence, a necessity for research on the profiling and selection of apprentices (Puchert et al. 2017a, 2017b).

As Horn (2016:144) stated, 'there is only anecdotal evidence about the process of apprenticeship selection'. Discussion of apprentice recruitment and selection often refers to the staffing of graduate apprentices rather than student apprentices (e.g. Mohrenweiser 2016; Smith et al. 2011). Mohrenweiser (2016:11) mentioned the scant research by stating, 'I am not aware of any empirical paper analysing a firm's demand for apprenticeship graduates or firms' recruiting strategy in regards to apprenticeship graduates.' Imdorf and Leemann (2012:59, 60) also concluded that there has been 'very little about the issue of recruitment and selection', and that with regards to apprenticeships the 'actual selection criteria applied . . . have hitherto hardly been subject to any investigation'. Forsblom et≈al. (2016:403) also added that 'few studies exist that systematically examine the selection methods of training companies' involved in apprenticeship programmes.

It is the opinion of the authors of this exploratory systematic literature review (SLR) that there seems to be inadequate consideration for the role of apprentice selection in the success of apprenticeship programmes. This statement has been validated through an extensive literature review. There is not per se an absence of information on selection practices for apprentices. This SLR has confirmed that there are 12 scientific and peer-reviewed articles on the selection practices for apprentices. However, other current literature on apprentice selection is organisation specific and found mostly in the form of advertisements by training firms.

Research purpose

It is therefore vital to systematically explore what scientific knowledge is available on the topic of apprentice selection. The primary purpose of this SLR was to establish the extent and nature of empirical research on the HRS practices used for apprentices. Specifically, the authors were interested in revealing what evidence exists on the optimal process and methods to be used in the selection of apprentices. Furthermore of interest was the extent and nature of the empirical literature documenting the challenges faced in the selection of apprentices and the recommended strategies to use to overcome these challenges.

Research design

Research approach

This study aims to 'comprehensively locate and synthesise research on a particular question or problem, using organised, transparent and replicable procedures at each step of the process' (Bless, Higson-Smith & Sithole 2013:52). The approach includes an audit trail of the decisions, procedures and conclusions taken by the authors, and this facilitated a transparent and unbiased process (Atkinson & Cipriani 2018). The approach followed in this study is a synthesis of the methods proposed by Tranfield, Denyer and Smart (2003) as well as Al-Tabbaa, Ankrah and Zahoor (2019). The approach comprised three steps, namely, (1) planning the review, (2) conducting the review, and (3) reporting and dissemination. The approach followed is depicted in Figure 1 and discussed under these three steps in the following subsections.

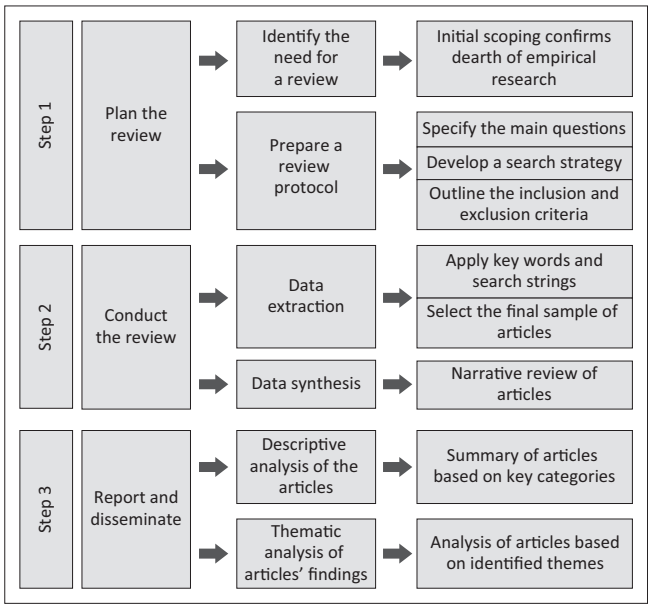
Research method

Step 1: Planning the review

According to Tranfield et al. (2003), the first step of planning a SLR entails determining the need for the review from a

scoping study. Prior research performed by the authors of this SLR had confirmed a consistent need for more empirical research on artisans and apprentices, as documented in the background section of this article.

Next, a review protocol should be designed. A part of establishing this review protocol is formulating the research questions to be answered in the SLR (Webster & Watson 2002). In relation to the confirmed broad need for more empirical research on artisans and apprentices, the authors' primary interest was within HRS, that is, to identify the main themes in apprentice selection. This drove the delineated research purpose for the SLR as documented previously. Initially, therefore, the authors conducted an Internet scoping search using the search string 'apprentice selection'. Over 53 300 000 results were found. These included documents in foreign languages, those detailing the selection process used for a television programme, industry reports as well as marketing paraphernalia. The authors were not satisfied that this strategy had identified relevant literature and hence implemented a structured review protocol with inclusion and exclusion criteria.



Source: Adapted from Tranfield, D., Denyer, D. & Smart, P., 2003, 'Towards a methodology for developing evidence-informed management knowledge by means of systematic review', *British Journal of Management* 14, 207–222. https://doi.org/10.1111/1467-8551.00375 and Al-Tabbaa, O., Ankrah, S. & Zahoor, N., 2019, 'Systematic literature review in management and business studies: A case study on university-industry collaboration', *SAGE Research Methods Cases*. https://doi.org/10.4135/9781526467263.

FIGURE 1: Steps in the systematic literature review.

TABLE 1: Search strings used in the systematic literature review.

Search string number	Key words, search string
1	Apprentice + selection
2	Apprentice + selection process
3	Apprentice + staffing
4	Apprentice + recruitment
5	Apprenticeship + selection
6	Apprenticeship + selection process
7	Apprenticeship + staffing
8	Apprenticeship + recruitment
9	Artisan + selection
10	Artisan + selection process
11	Artisan + staffing
12	Artisan + recruitment

The authors decided that the literature should be accessed through relevant databases associated with the business management, human resource management (HRM) and industrial psychology fields. These databases were EBSCOhost (Academic Search Complete, Business Source Complete, Eric, and PsycINFO®), Emerald, and ScienceDirect. These are referred to as the international databases in this article. The literature was restricted to scholarly (i.e., peer reviewed journals), English full-textual data published between 1990 and 2020. Newspapers, dissertations and periodicals were therefore excluded.

In this second stage of the planning, key words, search terms and search strings should also be determined (Tranfield et al. 2003). The authors used various combinations of two clusters of key words, used as Boolean phrases in the search function. The first cluster was apprentice, apprenticeship and artisan, with the second cluster being selection, selection process, staffing and recruitment. From these key words, 12 combinations of words, called search strings, were derived as depicted in Table 1.

According to Okoli and Schabram (2010), reviewers should indicate the practical reasons for excluding certain studies in their literature review. This allows the search strategy to be replicated by other reviewers and provides justification for the quality of the resultant literature review. In this SLR, four categories for rejecting a study were determined, which are defined and explained in Table 2.

These inclusion and exclusion criteria should be strictly employed in a SLR (Tranfield et al. 2003). In this review, the number and reasons for the inclusion and exclusion of sources were documented. The data was now ready to be extracted and synthesised according to the overall purpose of the SLR.

TABLE 2: Exclusion categories used in the systematic literature review.

Exclusion category	Description of category	Examples
Completely unrelated studies (CUR)	The identified purpose of the article's study was not related to the primary focus of the SLR, namely, the HRS practices of apprentices	Articles documenting the selection of guide dogs for blind people and the selection of students into tertiary studies.
Unrelated studies (UR)	These articles discussed the selection processes employed for non-manufacturing-oriented apprentices.	Examples included studies pertaining to the selection of doctors, nurses and clinical research officers.
Dissimilar studies (DIS)	These studies were also on non-manufacturing-oriented apprentices, but did not document content related to HRS practices.	For example, a study evaluating a surgical training programme for doctors was excluded.
Unconnected studies (UNC)	These articles centred on manufacturing-type apprentices but were not focused on their selection.	These studies investigated other issues such as wages, assessment, health and retention.

SLR, systematic literature review; HRS, human resource selection.

Step 2: Conducting the review

To ensure that the SLR could be easily replicated, the source and search string used were noted. The abstracts were initially reviewed to ascertain if the content was relevant to the purpose of the SLR. If it was evident that there was no linkage, the article was excluded, with the reason for the exclusion being recorded. If there was a possibility of linkage, the full-text article was sourced and reviewed in detail.

Initially, 284 articles made up the initial review sample. Across the 12 combinations of the key words, there were 51 duplications of articles and 225 were excluded for the four exclusion reasons documented in Table 2. The SLR analysis then resulted in eight articles being regarded as sufficiently associated with the purpose of this SLR and were accepted for data synthesis (see Table 3).

The planned review protocol had not yielded any research done specifically within SA. Al-Tabbaa et al. (2019) highlighted that defining the initial review sample and selecting the final sample in a SLR is by nature iterative. The authors therefore, targeted three relevant national databases for the national leg of the SLR. These were the South African Journal of Business Management, the South African Journal of Human Resource Management and the South African Journal of Industrial Psychology. These are referred to as the national databases in this article. Table 3 indicates that 40 articles were perused within these national journals, 20 of these articles were duplicates and 18 were excluded. Only four articles were accepted into this SLR.

Given the low number of articles generated through the search within these national journals, the authors decided to only input the 'selection' key word to validate the results obtained. This is in line with suggestions that an independent internet search can minimise the risk of unnecessary exclusion of articles as a result of the rigidity in the review process, which can then confirm the initial search results (Wilson et al. 2017). However, this search did not generate any novel articles for this SLR.

In total, 324 articles were initially reviewed in this SLR. Duplicate articles were excluded. The final SLR sample was extracted, which comprised of 12 articles that had a direct linkage with the research purpose of the SLR. Just over 3% of the initial sample of reviewed articles were therefore accepted into the final review sample for data synthesis. The reference lists of these 12 articles were then further scrutinised to check if there were further articles not yet revealed. However, this did not expose any articles that met all the specified inclusion criteria.

TABLE 3: Literature search tracking sheet.

Databases	Number of articles						
	Accessed	Duplicates	Excluded				Included
			CUR	UR	DIS	UNC	
International	284	51	169	33	6	17	8
National	40	20	11	4	0	3	4
Totals	**324**	**71**	**180**	**37**	**6**	**20**	**12**

CUR, completely unrelated; UR, unrelated; DIS, dissimilar; UNC, unconnected.

The researchers read and coded the final SLR sample of articles. Initially, the articles were catalogued based on pre-determined categories. These were: (1) names of authors, (2) publication year, (3) source, (4) number of citations, (5) search string, (6) perspective of the study, (7) context of the study, (8) sample characteristics, (9) method, and (10) key findings. Thereafter, to identify the main themes, the articles were coded using an open coding approach (Dufour & Richard 2019). This iterative process resulted in the core themes as well as the sub-themes being identified, which denotes specific subjects investigated by the research.

Step 3: Reporting and dissemination

In step three of a SLR, a two-phase report should be compiled. A descriptive analysis of the range of research found in the review, as well as the emerging themes and questions should be provided (Tranfield et al. 2003). In line with this recommendation, the data obtained from this SLR is described in tabular tracking sheets according to key concepts or categories. Firstly, a descriptive analysis of the pre-determined categories described earlier is depicted in Table 4 and Table 5. Secondly, a synthesis of the themes derived from the final sample of articles is provided in Table 6. On average, each reviewed article addressed three of the five core themes (a minimum of two and a maximum of five).

Discussion of findings

The review technique adopted in this SLR facilitated the establishment of patterns in the literature and allowed the authors to identify gaps that require further exploration. These are discussed in this section. Initially, general patterns in the literature are described. Following which, the main themes identified in the literature are discussed, ordered according to their degree of coverage, as depicted in Table 6.

Descriptive analysis of the results

The final sample of 12 articles is summarised in Table 4 where details are provided of publication dates, authors, database source, number of citations and search strings that resulted in the identification of the article.

Publication details

The 12 articles within this SLR were published across 7 years of publication. Given the long-standing research on the two topics, it is surprising that the first empirical study to investigate the selection of apprentices was only done in 2007. The dearth of empirical literature on this vital topic has, however, been noted by numerous other authors (Forsblom et al. 2016; Horn 2016; Imdorf & Leemann 2012; Mohrenweiser 2016). It is the authors' hope that this article will be the stimulus for further scholarly research into this topic, and that the increased publication trend started in 2017 will continue to gain momentum.

TABLE 4: Summary of final systematic literature review sample.

Date published	Authors	Database source	Journal name	Citations	Search strings used
2007	Smith	International	*Education + Training*	13	Apprentice + recruitment
					Apprenticeship + recruitment
2008	Hill and Dalley-Trim	International	*Youth Studies Australia*	9	Apprentice + selection
					Apprenticeship + selection
2010	Mummenthey and Du Preez	National	*South African Journal of Industrial Psychology*	18	Artisan + selection
					Artisan + selection process
					Artisan + recruitment
2011	Martin and Smith	International	*Adult Learning*	6	Apprentice + selection
					Apprentice + recruitment
					Apprenticeship + selection
					Apprenticeship + recruitment
	Ziegler et al.	International	*International Journal of Selection and Assessment*	51	Apprentice + selection
					Apprenticeship + selection
2012	Imdorf and Leemann	International	*Journal of Vocational Education and Training*	34	Apprentice + selection
					Apprentice + selection process
					Apprentice + recruitment
					Apprenticeship + selection
2016	Forsblom et al.	International	*Journal of Vocational Education and Training*	6	Apprenticeship + recruitment
	Horn	International	*Social Science Research*	15	Apprentice + selection
					Apprenticeship + selection
2017	Imdorf	International	*Journal of Vocational Education and Training*	19	Apprentice + selection
					Apprentice + recruitment
					Apprenticeship + selection
					Apprenticeship + recruitment
	Naidoo and Hoque	National	*South African Journal of Human Resource Management*	4	Apprentice + selection
					Apprentice + selection process
					Apprenticeship + selection
					Artisan + selection
					Artisan + selection process
	Puchert et al. (a)	National	*South African Journal of Industrial Psychology*	2	Artisan + selection
					Artisan + selection process
					Artisan + recruitment
	Puchert et al. (b)	National	*South African Journal of Industrial Psychology*	1	Apprenticeship + selection
					Apprenticeship + recruitment
					Artisan + selection
					Artisan + selection process
					Artisan + recruitment

Across the 12 articles, there are 23 authors. There were two common sets of authors. From the articles accessed through the international databases, Imdorf co-authored with Leemann on the 2012 article and was also the sole author of one of the 2017 articles. Puchert, Dodd and Viljoen wrote two of the 2017 articles sourced through the national databases.

The 12 articles from this SLR have harvested 178 citations. Just under half (n = 85, 48%) of these citations are from two articles: (1) Ziegler et al. (2011) at 51 citations, and (2) Imdorf and Leemann (2012) at 34. Interestingly, both of these articles evaluated selection processes employed for a range of apprenticeship types. There is a clear interest in the selection methods and processes that can predict the training success of apprentices. Future research should replicate the research performed by these two sets of authors to further investigate and substantiate the predictability of their findings.

A significant number (n = 5) of the 12 articles were written for journals focussing on industrial psychology and HRM topics. Four of the articles were published in vocational education and training journals, two in general education and training journals, and one in a social science journal. This highlights that the apprentice selection topic is of widespread interest.

The vast majority (n = 8) of the articles were sourced from international databases. Three of the four articles obtained from national databases, however, were the most recent empirical research carried out within the topic. From these national databases, seven search strings generated articles. The two search strings with the highest acceptance rate (i.e., all four articles each) were the *artisan + selection* and *artisan + selection process* categories. Only 5 of the 12 search strings analysed in the international databases generated articles that were accepted for further review. Here, the two search strings with the highest acceptance rate (i.e., seven of the eight articles each) were the *apprentice + selection* and *apprenticeship + selection c*ategories. None of the artisan-related search strings generated relevant articles for this SLR. Whilst the *apprentice* and *apprenticeship* related search strings were more successful in generating relevant articles, the national databases leant more towards search strings referring to the term *artisan*.

Context

In terms of research setting, five of the articles were conducted in Europe, four in SA, two in Australia and one in the USA. None of the articles allude to the location specificity of their findings. However, the findings from the European articles refer to the dual apprenticeship system, whilst the Australian, USA and South African research were conducted in out-of-school apprenticeship systems. As highlighted in a previous SLR related to the artisan field by Pret and Cogan (2019), future research in this field should explore if their findings are context-specific or whether they are generalisable to other contexts.

It is also noteworthy that none of the research found in this SLR stems from outside of western culture. This despite the apprenticeship system having a long history in both China (Risler & Zhiqun 2013) and India (Fazio, Fernández-Coto & Ripani 2016). Only the Imdorf and Leemann (2012) article referred to the role of culture in their findings. Future studies could explore the impact culture plays in the selection of apprentices. This could be from an organisational culture perspective and/or the culture of the applicants and recruiters.

Research approaches and method

There was a spread of research approaches adopted across the 12 articles within the SLR. As reflected in Table 5, three were pure qualitative studies, four were mixed, and five were quantitative. Interestingly, there are no national articles that had a qualitative approach. All the qualitative studies made use of the interview research method. The interview research method was also used in all four articles that employed a mixed research approach.

Of the seven articles that had interviews within the research methodology, only two contained information from interviews with the actual apprentices. These were the articles written by Hill and Dalley-Trim (2008) and Mummenthey and Du Preez (2010). Managers involved in the recruitment of apprentices were interviewed (i.e., Forsblom et al. 2016; Imdorf 2017; Imdorf & Leemann 2012; Martin & Smith 2011; Smith 2007) as were the trainers of the apprentices (i.e., Forsblom et al. 2016; Imdorf & Leemann 2012). The two aforementioned articles also contained information from the perspectives of managers, trainer providers and even training authorities. Their multifaceted approach to understanding apprentice selection from the various role-players perspectives is powerful, especially their inclusion of the apprentices themselves. Given that only two of the seven articles that used interviewing thought to consider the perspective of the actual apprentice in their studies is informative. Improving applicants' experience of any screening process is a core goal of most employers. It is therefore not surprising that more research is conducted on the experiential perceptions of applicants than any other aspect of selection (Schmitt 2014). This is because of the potential negative impact on the organisation's brand and reputation should applicants have a negative experience during the selection process (Anderson, Salgado & Hűelsheger 2010; Trindale 2015). Future research should

TABLE 5: Descriptive analysis of final systematic literature review sample.

Date	Authors	Perspective	Country	Sample	Method	Key findings
2007	Smith	Recruitment and development strategy	Australia	Six senior managers	Qualitative	Differential outcomes achieved in recruiting and developing apprentices based on the company's skill and experience.
2008	Hill and Dalley-Trim	Retention factors	Australia	Profile of 193 apprentices, 13 interviews	Mixed	The completion of the first year of apprenticeship was aided by school subject choice, work-related experience and a supportive home life.
2010	Mummenthey and Du Preez	Evaluation of learnerships	South Africa	4 stakeholder groupings	Mixed	Despite low satisfaction, the learnership system is an appropriate way to develop artisans
2011	Martin and Smith	Critical analysis of adult education	United States of America	3 training programmes	Mixed	Multiple hurdle selection approach was recommended.
	Ziegler et al.	Predictability of selection tools	Germany	771 apprentices	Quantitative	General mental ability, some specific cognitive ability tests and structured interviews were strong predictors of training performance.
2012	Imdorf and Leemann	Fairness and selection methods	Switzerland	9 interviews	Qualitative	Case study showed a fairer selection process (i.e., determined more by performance and less by applicants' social attributes).
2016	Forsblom et al.	Selection and dropouts	Switzerland	335 trainers and managers	Mixed	Apprenticeship dropouts were significantly less if job interviews and a company visit were used.
	Horn	Employment trends	Hungary	37 027 students	Quantitative	No significant differences between apprentices and non-apprentices' employment opportunities.
2017	Imdorf	Discrimination and hiring	Switzerland and Germany	81 owners or managers	Qualitative	Ethnicity and other discriminatory categories are used as trouble avoiding resources when hiring.
	Naidoo and Hoque	Success factors to employment	South Africa	51 artisans	Quantitative	Quality of workplace environment had a significant impact on permanent employment
	Puchert et al. (a)	Selection methods	South Africa	2463 applicants	Quantitative	Multiple-hurdle selection approach recommended, with secondary education type being a cost-effective preliminary screening method.
	Puchert et al. (b)	Selection methods	South Africa	1566 applicants	Quantitative	Recommended using type of secondary education as a selection tool for high volume low-level technical positions.

therefore highlight the applicants' perspective of the apprenticeship selection process.

The largest sample size used in the articles that employed a qualitative research approach was 81 (i.e. Imdorf 2017) and 135 (i.e. Mummenthey & Du Preez 2010) in the mixed method type articles. The next highest sample size of individuals interviewed was 18 (i.e. Forsblom et al. 2016), with the average sample size across the other four articles being eight individuals.

Recently, there has been considerable interest in the methods used by qualitative researchers to justify their sample size (Sim et al. 2018; Vasileiou et al. 2018). Data saturation is a commonly used method (Braun & Clarke 2019). However, authors have cautioned qualitative researchers to pay careful attention to the way they justify small sample sizes. Researchers should ensure their qualitative research is contributing robust and rigorous findings (Boddy 2016; Kindsiko & Poltimäe 2019), as the insufficiency of sample size could threaten the validity and generalisability of such studies (Vasileiou et al. 2018).

The method used to determine the sample size in the seven articles from this SLR that used interviews is not mentioned. From what is not written in this regard in these seven articles, it could be concluded that the small sample sizes were pre-determined based on convenience rather than on the achievement of saturation point in the analysis. The small sample sizes of these studies could be a research methodology flaw.

Another critique levelled at some of the articles within this SLR is the currency of their data. Three of the articles (i.e., Hill & Dalley-Trim 2008; Imdorf 2017; Smith 2007) are based on data from the 3-year period 2004–2006. The publication dates of two of the articles reveal that they were written shortly after data collection, whilst Imdorf (2017) concedes that he did a secondary analysis of the data. Are the results from these studies still relevant today? Given the noted widespread deficiency in qualified artisans (Pandor 2018; Qonde 2019), current research is vital. Recent relevant research is needed to provide ways to minimise the challenges inherent in addressing this shortage and highlight the tools to improve the throughput rates of enrolled apprentices.

The authors of two of the SLR articles (i.e., Forsblom et al. 2016; Imdorf & Leemann 2012) highlighted other research method limitations in their findings. The former set of authors encouraged quantitative longitudinal studies to confirm the predictive effects of their preliminary findings, with the latter set of authors indicating that statistically validated evidence is necessary to endorse their hypotheses.

Following a descriptive analysis of the 12 articles in this SLR, the next part offers a thematic analysis of the five main themes derived from these articles.

Thematic analysis of the results

Key selection criteria theme

Within the key selection criterion theme, two sub-themes were identified. As illustrated in Table 6, these were the personal characteristics of applicants and the academic marks obtained by these applicants.

The majority of the articles referred to the personal characteristics of the applicants as being a key determinant in the selection of an apprentice. What was specifically included within the definition of important personal characteristics did differ across the eight articles, but there were obvious similarities also.

Being internally motivated and committed was a strong theme. Martin and Smith (2011) documented a 'commitment hurdle' step where applicants were required to go to an unknown location. Those who completed this step had adequate self-confidence and motivation to make it through the apprenticeship process. Horn (2016) found that students who organised their own apprenticeship training (i.e. not organised through the school for them) were more motivated and more likely to be employed post-graduation than the school-organised apprentices. Imdorf and Leemann (2012) found that a short internship placement helped ascertain the applicants' motivational levels and that this aided with organisational fit. Ziegler et al. (2011) also concurred that the motivational and interest levels of applicants, determined through a structured interview, was a strong predictor of apprenticeship training success. A positive attitude, enthusiasm and passion for the work itself will lead to lower drop-out rates in apprenticeship programmes (Hill & Dalley-Trim 2008; Mummenthey & Du Preez 2010).

Smith (2007) coined the term 'stickability' as descriptive of the cluster of personal characteristics needed within an applicant who will be successful in an apprenticeship programme. These soft skills included punctuality, appearance, willingness to learn and reliability. Hill and Dalley-Trim (2008) added initiative, respect, resilience, teamwork skills and being mature in behaviour towards others and the job itself, to the list of personal characteristics that are likely to lead to applicants completing an apprenticeship programme. What Smith (2007) described as 'stickability' is termed 'a person with quality' by Imdorf and

TABLE 6: Themes in apprentice selection research.

Main theme	Sub-themes (ordered by frequency of occurrence)
Key selection criteria	Personal characteristics (8)
	Academic marks (8)
Research intention	Improve quality (8)
	Fairness (2)
	Retention (2)
Support strategies	Preparation workshops (8)
	Career guidance (3)
Selection methods	Aptitude testing (5)
	Interview (5)
Diversity	Gender (3)
	Race (2)

Leemann (2012). Along with all the personal attributes already mentioned, these authors also found that being adjustable, flexible and able to cope with a variety of situations as vital personal characteristics.

In contrast, Naidoo and Hoque (2017) established that a high work ethic did not have a significant impact on the attainment of permanent employment post-apprenticeship. This may be attributable to this study being the only quantitative study with a moderate size sample to have sought the opinion of apprentices. The other four articles that commented on this aspect were based on qualitative interviews with owners and/or trainers whose opinions on the importance of these personal characteristics may therefore be divergent. This should be further investigated.

Another sub-theme in terms of selection criteria was the use of academic subject choice and the marks obtained. Hill and Dalley-Trim (2008) made a strong case for subject choice at school. The types of subjects chosen were informative of the difference between continuing and non-continuing apprentices, with the majority having no vocationally-related school subjects discontinuing. Applicants for low-level technical positions with secondary education types inclusive of mathematics and/or science had enhanced success in the screening process and better chances of employability (Puchert et al. 2017a, 2017b).

The other articles that contributed to this sub-theme documented the use of academic marks as an initial screening mechanism. In the Smith (2007) article, attained school marks were one of four criteria used in choosing applicants for an apprenticeship. On average, employers ranked the use of school marks as being of moderate importance, with one of the six case studies stating it was a criterion of high importance. Both Smith (2007) and Horn (2016), however, confirmed that employers do not view school marks as the most important criteria, but merely one, of the criteria to be applied in the screening of apprenticeship applicants. Five other articles (i.e. Imdorf & Leemann 2012; Martin & Smith 2011; Puchert et al. 2017a, 2017b; Ziegler et al. 2011) discussed school mark attainment as a necessary initial screening step. This first step of a multiple hurdle selection process enabled a cost-effective means to achieve a significant drop in the number of applicants to consider. These findings could be further explored for clarification. Future research could verify which subjects, academic or vocational, are considered key selection subjects, and what would be regarded as the minimum marks for further consideration.

The second core theme pertained to research intention. As indicated in Table 6, three sub-themes emerged, namely, the improvement of the quality of apprentices, the fairness of the hiring practices employed, and the retention of apprentices during their development. These are discussed in the following sections.

Research intention theme

The intention behind the research of 8 of the 12 articles in this SLR was to investigate ways to improve the quality of the applicants for an apprenticeship. The majority ($n = 6$) of these articles were primarily focused on the selection process or methods used to create this outcome. Smith (2007), Martin and Smith (2011), Ziegler et al. (2011), Forsblom et al. (2016) as well as Puchert et al. (2017a, 2017b) explored this angle as a critical success factor or strategy that could be used to enhance the quality of apprenticeship applicants. On the other hand, for Mummenthey and Du Preez (2010) and Naidoo and Hoque (2017), the hiring process itself was only one of the many angles that were pursued to facilitate this outcome. Their research looked more holistically at the entire apprenticeship life cycle.

The articles written by Imdorf and Leemann (2012) and Imdorf (2017) also specifically looked at the hiring practices employed in apprenticeship programmes, but from the angle of investigating the fairness of these selection methods. Both pursued whether ethnic discrimination was being applied through the selection methods used by training companies.

The third and final sub-theme regarding research intention involves two articles whose focus was the retention of apprentices during their training and development. The selection methods used were discussed and the data from the selection process were part of the analysis, but not from the perspective of reducing the number of drop-outs during the programme. Hill and Dalley-Trim (2008) looked specifically at the factors in the first year of training that differentiated drop-outs from those who continued, whilst Horn (2016) took a more long-term approach and investigated the key factors that impacted on employability post the apprenticeship programme.

From this theme, then, one can conclude that the selection of apprentices, as a key HR practice, was only primarily investigated by half the articles in this SLR. Providing empirical research that added to the knowledge base of HRS was merely a by-product of the studies conducted by the authors of the other six articles. Four critiqued the apprenticeship programme from a training and developmental perspective (i.e. Hill & Dalley-Trim 2008; Horn 2016; Mummenthey & Du Preez 2010; Naidoo & Hoque 2017), and two (i.e., Imdorf & Leemann 2012; Imdorf 2017) looked at discrimination in hiring from the sociological viewpoint. Further research, specifically, on the impact of and optimal methods to use in the selection of apprentices is therefore needed.

The next core theme was the strategies employed to overcome the challenges experienced in the selection of apprentices. In order of frequency, these are preparation workshops and career guidance provided to the apprenticeship applicants.

Support strategies theme

The first theme noted that if applicants held certain personal characteristics, these were helpful in their selection onto the

programme, being successful on the programme itself as well as improving their employment opportunities post the programme. Employers used various strategies to better prepare the applicants for success and to assist them in developing these required turnkey attributes.

Some provided tutoring for applicants who did not make their cut-off standards in mathematics, literacy and other social skills as identified within one of the selection hurdles (Martin & Smith 2011). Subject choice and achievement in the subjects of mathematics and/or science were crucial for selection, making additional educational support in these subjects critical (Puchert et al. 2017a, 2017b). The mentorship provided within an apprenticeship programme had a significant impact on the permanent employment prospects of those apprentices. This mentorship was regarded as a critical success factor in the development of the appropriate work ethic skills (Naidoo & Hoque 2017). Smith (2007) recommended that applicants complete a pre-apprenticeship, as this would assist in ensuring that applicants had the required skills and a good understanding of the specific industry.

This strategy of preparing applicants for an apprenticeship is in line with literature outside of the artisan educational track. There is, in fact, a need to improve the way youth prepares for the world of work (Fox 2018; DuRose & Stebleton 2016). Potential employers need to consider various strategies, such as conducting orientation sessions and job application preparedness workshops, to enhance employability and better facilitate the transition of students into the workplace (merSETA 2016; Shankar, Cooper & Koh 2016). Future research should investigate the impact of such preparation workshops on apprentice selection.

The second sub-theme was the timely provision of career advice to apprenticeship applicants. Smith (2007) as well as Hill and Dalley-Trim (2008) found that the successful completion of apprenticeship programmes was linked to the applicants having clear knowledge and understanding of what their trade involved and the career path ahead of them. Naidoo and Hoque (2017) also established that training and development opportunities with a clear talent pipeline into management had a significant impact on apprentice retention. Apprentices make their decision to either continue or not based on an apprenticeship programme fairly quickly. Hill and Dalley-Trim (2008) documented that this decision was made within the first 90 days of the programme. Their research established that government initiatives to improve the career guidance offered to apprentice applicants helped lower the drop-out rate. More research is needed to corroborate the nature of the relationship between career guidance provision and the selection of apprentices.

As indicated in Table 6, the next identified theme looked at the frequency of selection methods employed in the hiring of apprentices. Two sub-themes that emerged from this theme are: aptitude testing and interviewing.

Selection methods theme

Five of the articles describing selection methods employed for the hiring of apprentices discussed the use of aptitude testing. All five articles described this method as a preliminary screening tool, used after the review of the application documentation, but before interviewing the applicant. Aptitude testing was used as a method to reduce the large pool of applicants to a more manageable size. General cognitive ability testing was used in the selection processes documented by Martin and Smith (2011), Ziegler et al. (2011), Imdorf and Leemann (2012), and Puchert et al. (2017a). The testing of special aptitudes was reported on in the selection processes outlined by Puchert et al. (2017b) and Ziegler et al. (2011).

Five articles mentioned the use of interviews as a screening mechanism for apprenticeship applicants. Martin and Smith (2011) provided a critical analysis of three pre-apprenticeship workforce training programmes. In two of these case studies, the interview selection method was the final hurdle to successful selection onto the programme. In the Ziegler et al. (2011) article, the structured interview was deemed a strong predictor of training performance and was also recommended as a final selection method for apprentices. These authors suggested that the unstructured interview format should not be used, and Forsblom et al. (2016) agreed with this. Structured, formal job interviews were highly recommended as a means to reduce the number of drop-outs in a programme. Informal interviews would not achieve the same level of connection with the apprentice applicant. Imdorf and Leemann (2012) also outlined a four-stage selection process with an interview as the second last stage. In this case study, however, a short placement within the firm was the final and determining selection method.

Smith (2007) did not specifically mention any selection method in his article. However, in their ranking of selection criteria, the senior management sample rated soft skills and management suitability (i.e., punctuality, appearance, reliability factors) as the top two criteria. Whilst not explicitly stated it would be appropriate to assume that these recruiters would have gleaned this information from interviews with the applicants. Recruiters are mostly interested in the attitudes, interests, fit, personality and portable social skills of applicants (Branine 2008; Fernández-Aráoz 2014). Interviews can determine the consistency of these characteristics against those required for the position (Azar et al. 2013; Straus, Miles & Levesque 2001). Interviews, therefore, are mostly used to establish if the applicant has the personal attributes and soft skills deemed as vital selection criteria, as discussed in the first theme of this SLR.

Whilst these six articles documented the various steps in the selection processes used in their case studies, none provided insight into the impact or value of each step on the final outcome of the selection process. As Forsblom et al. (2016) highlighted, no causal statements can be made from this research. A longitudinal study is, therefore, necessary to confirm the predictive effects of these various selection methods.

In the next subsection the final theme is discussed. As indicated in Table 6, there are two sub-themes within this theme.

Diversity theme

Discrimination was a key theme through some of the studies. Martin and Smith (2011) found a gender discrepancy in the selection practices employed in Britain. These authors specifically documented the low number of females recruited within the three case studies they investigated. They concluded that little effort had been made to recruit females into these programmes and only one out of five who was recruited had actually graduated.

In the research done by Hill and Dalley-Trim (2008), 24% of the apprentices were female. In the Forsblom et al. (2016) study the female portion was only 12%. Whilst these two articles did not specifically mention gender discrimination, it is implicit in their sample sizes.

This supports the notion that apprenticeships remain male-dominated (merSETA 2016; Qonde 2018). Furthermore, lower pay and less favourable career progression routes have been noted within traditionally female-dominated apprenticeships, such as healthcare, business administration and child care (Gambin & Hogarth 2015). Additional research into the selection-related strategies that can be applied to circumvent this gender discrimination challenge within the apprenticeship system is paramount.

Imdorf (2017) found that Swiss and German firms use nationality and ethnicity as a screening mechanism. Imdorf and Leemann (2012) suggested that outsourcing the selection process of apprentices, as employed by occupational training networks, was a more efficient and less discriminatory alternative. However, the authors of this explorative case study also noted that more evidence was needed to confirm that this was an equal opportunity model before it was replicated. As suggested by Imdorf (2017), more research is needed to understand the emerging patterns of ethnic discrimination in apprenticeship selection practices.

Conclusion and proposed research agenda

The most difficult positions to currently fill, internationally and within SA, are skilled trade positions (Deloitte 2018; Heutter 2020; Kilcarr 2016; Qonde 2019). They have dominated this top position since 2010 (ManpowerGroup 2018). Abounding literature indicates that firms with well-developed selection practices will have significantly lower employee turnover, higher productivity and overall financial performance (Hoffman, Kahn & Li 2018; Schmidt, Oh & Shaffer 2016). Furthermore, weaknesses in HRS processes could have dire and widespread consequences for a firm (Aladwan, Bhanugopan & D'Netto 2015; Ekwoaba, Ikeije & Ufoma 2015; Trindale 2015). Given these empirical findings, one is led to ask: why are there only a paltry 12 scientifically-based articles on the selection of apprentices?

This SLR has confirmed that there is a research gap that needs to be addressed, both internationally and nationally. It is hoped that this article will encourage researchers and practitioners to share their practical information on apprentice selection in a scientific manner and thereby stimulate further knowledge and improvement in this field. This is especially needed given the high demand for artisans, the lack of a national selection tool and the variable pass rates of apprenticeship programmes.

This SLR is based on a small number of studies. Rather than a weakness, the authors believe this is a strength. Other SLR authors have encouraged small sample sizes as this facilitates critical engagement with each article and its underpinning themes (Baldacchino et al. 2015; Korsgaard 2013). Through using strict search criteria the authors of this SLR ensured that the included 12 articles were relevant and focussed as well as of a high quality.

Several conclusions can be drawn from a review of the extant literature within this SLR. Furthermore, substantial clues for future research can be gleaned from a review of these 12 articles. These are summarised as research questions in a research agenda within Table 7.

A review of the general trends in the literature reveals that the quantity and quality of empirical work into apprentice selection requires improvement. The most recent articles were published in 2017, meaning that the actual data must at least be 6 years old. There is also a need for studies on apprentice selection from the business management discipline. Research in this regard should accurately predict emerging challenges in apprentice selection and offer potential solutions to this workforce problem. Research should also focus on the recent trends in apprentice selection, especially within the post coronavirus disease 2019 (COVID-19) pandemic era.

Additional qualitative research will provide vital information, especially from to date almost silent voice of the actual apprentice. The sample size of these future qualitative studies also needs to be carefully considered. Robust, replicable quantitative research, such as done by Ziegler et al. (2011) and Naidoo and Hoque (2017), is also needed. These studies should attempt to replicate the predictability of the same or other selection methods and processes. Studies need to be done to either verify or refute the findings established by these 12 articles. Longitudinal studies such as that done by Horn (2016) will provide substantial practical advice for the many stakeholders who have a vested interest in enhancing the number of skilled and qualified technical workers in the labour market.

In terms of providing advice and/or recommendations for the successful selection of apprentices, only six studies offered concrete findings in this regard. Most of the studies from this SLR recommended the use of a multiple-hurdle

TABLE 7: A research agenda for apprentice selection.

Theme	Key research questions
General trends	What are the apprentice selection research trends post-2017?
	Which selection methods and processes can predict the training success of apprentices?
	Are research findings in apprentice selection context-specific or, are they generalisable to other contexts?
	What role does culture play in the selection of apprentices?
	How could qualitative research from the applicants' perspective inform apprentice selection?
	Would larger samples in qualitative research provide similar results to those found in this SLR?
	How can recent data on apprentice selection advise the field?
	How would information from longitudinal studies on apprentice selection inform the field?
Key selection criteria	Are the personal characteristics or work ethic of applicants a key selection criterion?
	If so, how are these characteristics defined?
	Are the subjects completed by applicants a key consideration in their selection as apprentices?
	If so, what subjects are preferred? And why?
	What are the optimum minimum marks for previous education or training initiatives done by applicants?
Research intention	What is the best process to use in the selection of apprentices?
	What is the impact of various selection methods on the success of applicants on an apprenticeship programme?
Support strategies	How do preparation workshops impact on the selection of apprentice selection?
	What is the relationship between career guidance provision and the selection of apprentices?
Selection methods	What are the predictive effects of various selection methods on the successful completion of an apprenticeship programme?
Diversity	What are the emerging patterns regarding gender discrimination within apprenticeship selection practices?
	What selection related strategies can be applied to circumvent the gender discrimination challenge within the apprenticeship system?
	What are the emerging patterns of ethnic discrimination within apprenticeship selection practices?
	What selection related strategies can be applied to circumvent the ethnic discrimination challenge within the apprenticeship system?

SLR, systematic literature review.

selection process. However, whilst some recommended the use of certain methods (i.e., structured job interviews and cognitive ability tests), others suggested substituting more expensive psychological testing with secondary education as a screening measure. Future research needs to confirm the optimum selection criteria and selection methods to employ in the selection of apprentices.

And a final suggestion regarding future research. To validate the findings from this SLR, it is suggested that researchers conduct a similar SLR to establish if other studies are discovered. All evidence can have invisible biases created by untried assumptions and frames of reference. The researcher has a particular purpose in mind and this can skew their interpretation (Rousseau, Manning & Denyer 2008). A future SLR on this topic could investigate the topic within specific sectors or from different angles and with different key words or search strings.

Limitations

Authors on systematic research recommend that the review should not be limited to bibliographic databases and published journals. Unpublished studies, the Internet, conference proceedings and industry reports should also be considered in the review process (Tranfield et al. 2003). However, this SLR explicitly aimed to establish the extent and nature of peer-reviewed research that had previously been done on the subject matter. Nevertheless, non-empirical yet credible research might possibly have been overlooked through implementing this exclusion criterion. The specific keywords and search strings used to guide this SLR could also have contributed to omitting certain published work. Furthermore, the specific databases and journals selected for this SLR can also be regarded as a limitation.

According to Tranfield et al. (2003) as well as Okoli and Schabram (2010), an assessment of the quality of the studies reviewed should be completed before the final inclusion of articles into a SLR. However, no quality assessment of the articles was done in this SLR. All the articles that met the stipulated criteria were accepted if their purpose and sample were aligned to the study's objectives.

Acknowledgements

Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

J.P., R.v.N. and K.V. all contributed equally to the writing of this article.

Ethical considerations

This article followed all ethical standards for research without direct contact with human or animal subjects.

Funding information

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Data availability

The data that support the findings of this study are available from the corresponding author, J.P., upon reasonable request.

Disclaimer

The views expressed in this article are the those of the authors' and not an official position of their institutions.

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