



## **Are graduates as good as they think? A discussion of overconfidence among graduates and its impact on employability**

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### **ABSTRACT**

#### ***Purpose***

*The analysis critically examines overconfidence in numeracy among higher education (HE) graduates and its impact on their employability. The paper discusses the extent to which graduates, due to higher qualifications, overstate their numerical abilities.*

#### ***Design/methodology/approach***

*The paper is a review of the academic literature examining the theoretical significance of overconfidence in higher education. The review subsequently draws on practice and policy reports that evidence graduates' overconfidence in numeracy and basic skills.*

#### ***Findings***

*The article shows a significant interaction between the level of qualification and overstatement of numerical abilities. The analysis found that graduates do not*

*always have an important basic skill such as numeracy whose impact on work performance is significant.*

### ***Practical /implications***

*The findings are momentous for rethinking higher education curricula, employee development in organisations and government skills strategy. The article advocates more inclusive and interpretive research for a greater understanding of the issues and offer useful data to policymakers and higher education institutions in preparing graduates for work and decision-making. Further research in the field is required to enable the formulation of more authoritative conclusions.*

### ***Originality/value***

*A critical contribution of this reflection is to have linked the evidence from the academic literature with employer surveys about graduate basic skills to draw the attention to a vital issue affecting national and organisational productivity, thus, substantiating anecdotal evidence about graduate overconfidence. This reinforces the value of systematic literature review in research as it provides an opportunity for more informed policy formulation as well as extending the body of research.*

**Key words:** Overconfidence; Graduate employability; Numeracy skills; Basic skills; Higher education.

## Introduction

Graduate employability has been high on both government and the higher education (HE) agendas for the past two decades in the UK and the developed world generally (Harrison, 2017; Lowden, 2011). There are more and more concerns that while graduates acquire significant subject knowledge when they leave universities and colleges, an important proportion of these graduates may lack basic skills (Bauer-Wolf, 2018; Hill, Walkington and France, 2016; Lowden *et al.*, 2011; McMurray *et al.*, 2016). In a policy report commissioned by the Edge Foundation, Lowden *et al.* (2011) found that employers appreciate the range of analytical and critical thinking attributes that graduates bring to the workplace, but at the same time they voice that more ought to be done on practical and basic skills acquisition. Some areas considered to be areas in which graduates lack skills cover planning, information technology (IT), literacy and communication (Raybould and Sheedy, 2005; Shultz, 2008). This paper focuses on numeracy. Numeracy is a critical skill required if graduates were to typify other employer requirements such as project management, planning and ability to work with uncertainty (Black and Yasukawa, 2010; Raybould and Sheedy, 2005). However, an OECD study in the same year shows that United States (US) and United Kingdom (UK) graduates are weaker on literacy and numeracy than their peers from other developed nations. A study by Kuczera, Field and Windisch (2016) confirmed this picture, concluding that over 9 million adults in the UK have low basic skills, mainly in the areas of numeracy and literacy. Despite these figures, when graduates are interviewed, they appear to display confidence that is not congruent with the research evidence (Schulz and Thöni, 2016). The authors found that Political Science, Law, Economics and Business Administration graduates particularly over-rated their abilities. This leads to view the attitudes and responses of the graduates as an expression of overconfidence.

Overconfidence has emerged as an important area of investigation in cognitive psychology. It is an area within the much researched field of judgement and decision making which has fascinated and captivated the imagination of cognitive psychologists for a few decades now. Much of the literature on

judgement and decision-making acknowledges that while it is not always possible to teach people how to make decisions based on objective quantity (Ayton, 2005), it is important to understand people's own 'rationality' for choosing one solution over another. Psychological research in decision-making aims to bridge the gap between normative and descriptive approaches to decision-making, i.e. help people make better decisions. Overconfidence can present difficulties for learning in the sense that it can operate as a barrier to recognising personal development needs as was found in Anzalone's (2009) study among young learners in the USA.

The aim of the research is to examine the degree to which graduates' expressed level of confidence in numerical skills is exemplified in their capabilities in practice. The main question posed in this discussion is: Do higher education graduates overestimate their abilities to deal with numbers due to their higher level education experience? The central assumption of this paper is that graduates are likely to over-rate their basic mathematical skills and lean on their graduate status to legitimise such a claim; thus, in reality, their basic mathematical skills could be lower than their estimates of skills.

## **Literature Review**

### *Overview*

The article is based on systematic literature review of research largely published in the past two decades examining graduate overconfidence with regards to numeracy skills. For Pahlevan-Sharif, Murab and Wijesinghec (2019: 159), the value of a systematic literature review lies in the fact that it allows for policy formulation that is based on an array of arguments and not just on one narrow study, and in the same perspective it stretches "the boundaries of existing research". This is a significant endeavour in the context of knowledge creation as greater objectivity can derive from contrasting various findings and levels of evidence. Three main criteria were used for the inclusion of the literatures examined in this paper. These were:

- Definition or conceptualisation covering overconfidence and employability as concepts are generally approached in various ways, based on particular authors' empirical or theoretical standpoints;

- Participants: in college or university education context;
- Time frame: studies that have taken place in the past three decades, except Christensen-Szalanski and Bushyhead (1981) and Brunswick (1955). These two texts have been included despite being older because they represent two core theoretical perspectives on which the article rests.

We drew on PsycInfo, Google Scholar and LISA databases to source the main literature available in the field. These sources had the advantage of being specialist databases (PsycInfo) and providing both extensive worldwide coverage (Google Scholar) as well as local coverage (LISA). This article, thus, draws on multiple sources of secondary data, including academic literature, government policy documents and non-government organisation (NGO) reports. The first step was to identify core literature addressing the theoretical perspectives on overconfidence and assess its significance as a psychological construct; articles that specifically had the keywords that are central and recurrent in the research objectives: 'overconfidence', 'higher education', 'basic skills' and/or 'graduates' were first selected for detailed scrutiny. The second step was then to seek literature evidence about the way in which overconfidence affects higher education and employability outcomes. In this second step, since the research is concerned with the links between overconfidence and employability, the researcher sourced both academic literature and more practice-based and policy reports from various sources, e.g. government policy frameworks, key reports from the employer associations and charitable trusts. This two-step exercise was undertaken to draw a picture of overconfidence among higher education graduates and how such overconfidence could impair their further learning and development as well as employability. The review of the literature catalogued critical issues that should be resolved in order to ensure that a future process identifies and supports excellent basic skills integration in the HE curriculum and employee development, leading dynamic changes in academic–industry relationships. Such changes should engender dynamic capabilities (Teece, 2011). In addition to filtering the articles from the two-stage perspective, the PRISMA framework

saw the researcher catalogue the sources and proceed by eliminations. Of 222 articles that the searches revealed, 177 were retained for further analysis as a number of articles had similar findings (duplication). At the next level, the main elimination criteria centred on: date - use of the term overconfidence - higher education. Applying these criteria, sources older than 25 years were discarded due to the significant changes that have occurred in British and international HE in the past two decade. Sources that did not specifically make reference to the term 'overconfidence' were also excluded in order to focus the analysis. Finally, only literature sources that relate to research at postsecondary level education were considered. The application of these criteria led to the elimination of a further 50 articles. The 127 sources that were taken to the final level of scrutiny were further filtered based on geo-economic area, i.e. only research in the geo-economic context comparable the UK (mainly OECD countries) were included in this study for the purpose of consistency. The systematic literature review has limitations, in that, it is difficult to ascertain that all literature in the area has been accounted for. However, this article has attempted to cover the most significant authorities in the field. In total, the systematic literature review was adopted to provide a succinct summary of the multiple perspectives on overconfidence, thus offering a simple and intelligible framework for policymaking in academia and for further research in the field. The steps of the PRISMA framework are shown in Figure 1.

**FIGURE 1 HERE....**

### *Perspectives on overconfidence*

Studies of overconfidence have examined the dichotomy between what people claim to know and their actual knowledge about specific subjects. In other terms, these studies raise the question about whether people do suffer from over-inflation of self-value when rating their own knowledge concerning particular realities (Chiu and Klassen, 2010; Christensen-Szalanski and Bushyhead, 1981). For Harvey (1997), this means that people's judgements

and decisions are based on their own estimates or probabilities that particular outcomes will materialise. Such estimates are quantified by cognitive social science researchers with rates between 0 and 100per cent (which are referred to as full-range tasks) or often between 50 and 100per cent (which are referred to as half-range tasks).

Research using these rating scales found that, in general, when presented with two items and asked to choose the right answer and rate their level of confidence (or certainty) people tend to rate themselves higher than they could produce actual right answers. This is a bias that is, for Gigerenzer, Hoffrage and Kleinbolting (1991), a manifestation of overconfidence. A study by Borracci and Arribalzaga (2018) on medical students' confidence with surgical procedures showed an overconfidence of the weaker students who performed poorer in medical examination, further evidencing in more contemporary studies the negative effects of overconfidence. Research in the field also claims that the harder the question the less overconfident people become. This proposition implies that people are more overconfident for simple (easy) questions and are more realistic with estimates about their knowledge of more difficult questions. The result of overconfidence could also be complacency which leads the persons involved to devote less attention and effort. Within the context of overconfidence research, this has been termed the Hard-Easy Effect (Brunswick, 1955).

While traditional studies on overconfidence found that it generally has adverse consequences, more recent studies have attempted to examine possible positive correlation between overconfidence and performance (Gervais and Goldstein, 2007; Ifcher and Zarghamee, 2011; Yin, Li and Bao, 2019). Yin, Li and Bao (2019), particularly, found that overestimation can “lead to a higher contribution” depending on the status of the actors; conditional co-operators will have higher contribution and free riders will have lower contribution (p. 120). Borracci and Arribalzaga (2018) do not see significant detrimental effect of a moderate level of overconfidence or underconfidence which could be managed without heavy intervention.

### *Graduate overconfidence*

The significance of the study of overconfidence in education is evidenced in a number of studies. For instance, Anzoline (2009) found that overconfidence could impair learning in students because it creates a false sense of knowledge which leads the learner to disengage with the learning process. Similar findings appear in Gustavson's and Niall's (2011) study of graduates' confidence in research skills. In a large survey, the authors found that students who rated their research skills as expert level scored only 50 per cent in a research skills test administered; this was lower than the score of the students who rated themselves only as good. Chiu and Klassen (2010: 3) posit that overconfidence (which they refer to as overestimation of "one's potential performance or self-efficacy") can lead to poor preparation and lower performance. Ackerman and Wolman (2007) reported similar conclusions. In the context of employment and organisations, namely in the financial sector, the negative consequences of overconfidence have been examined by Menkhoffa, Schmidta and Brozynskiab (2006). These authors found that less experienced fund managers had higher returns than those with longer length of service because the latter group developed overconfidence and complacency over the years while the less experienced managers did not take anything for granted and, therefore, deployed greater diligence. De la Rosa et al.'s (2011) study of "Overconfidence and moral hazard" yielded some very similar results, asserting that "an overconfident agent disproportionately values success-contingent payments" (p. 429). This is consistent with Brunswick's (1955) 'hard-easy effect' because familiar tasks in people's experience are treated by the experienced agent as 'easy' tasks that can be completed with minimum effort. These studies demonstrate that overconfidence is a serious issue which has far-reaching negative consequences and, therefore, needs to be vigorously addressed at personal and institutional levels.

Overconfidence in higher education graduates is exemplified in several ways, e.g. decreased attendance, lack of enthusiasm for perceived easy tasks, statements about programme coverage at previous level, etc. Bowden, Abhayawansa and Bahtsevanoglou (2015) found a strong correlation between attendance and results in vocational education students entering higher

education. Students who held the view that their new courses would be similar to what they previously studied attended less and tended to have poorer results even if they had high credentials when joining higher education. These examples clearly demonstrate that overconfidence exhibited by students generally poses a problem for the higher education system and employers because it blurs potential support mechanisms to attain greater basic skills in graduates and improve their employability (see Nowell and Alston, 2007). In a survey by the National Association of Colleges and Employers (2018), employers in the UK highlighted significant overconfidence in graduates in several basic skills areas (see Table 1). In the same perspective, Matsouka and Mihail (2018) found significant differences between recruiters' assessment of graduates and graduates' assessment of themselves when it comes to skills. The study showed that employers saw significant gaps in the basic skills of graduates - an area that Tomlinson (2017) terms graduate capital. Graduates' own self-assessment tended to be over-optimistic.

**TABLE 1 HERE...**

As Table 1 shows, overconfidence in numeracy is more significant than that of any other key basic skills. Additionally, Black and Yasukawa (2010) found low levels of literacy and numeracy among adults, including graduates. Yet, Durrani and Tariq (2012) stress the significance of developing numerical skills in undergraduates, pointing out that such skills have become core employability skills and essential selection criteria in the modern labour markets and in the knowledge economy (Browne 2010). Given such critical findings with important implications, the need for sustained investigations into how greater numerical literacy could be developed by graduates is no longer argued. These findings are echoed by Hernández-Fernaud *et al.* (2017) and the Learning and Skills Council - LSC (2006). In the specific area of overconfidence in numeracy skills, very few studies have been conducted. The limited literature in the field highlights the significant detrimental effects of overconfidence in numeracy for both educational attainment and work performance. Table 2 summarises the

findings of some research on graduate overconfidence in academic studies and the labour market.

## **TABLE 2 HERE...**

Table 2 shows the negative consequences of overconfidence for learning and performance. These consequences are further discussed in the next section in relation to employability which, as argued earlier, has become increasingly linked to higher education curricula.

### *Impact of graduate numeracy overconfidence on employability*

Hillage and Pollard (1998) define employability not just in terms of being employed after graduation but also in terms of the graduate's ability to secure and hold on to a job in an increasingly competitive marketplace. With millions of graduates completing their university studies every year, the competitiveness of the aspiring professionals is no longer established only with the classification of their degree or the subject studied. Important extra-curricular activities undertaken and skills gained have become assets (Poole and Sewell, 2007) that employers seek in a good graduate. While soft skills feature high on the requirements of modern employers, Black and Yasukawa (2010), Durrani and Tariq (2012), Pegg *et al.* (2012), Tomlinson (2017) concluded that numeracy is equally high on the employers' prime list of graduate assets. Pegg *et al.* (2012), in particular, contend that since 2010, higher education institutions in England have been "required to articulate their position in relation to student employability through the provision of an 'employability statement'".

Adult basic skills, particularly in numeracy and literacy, have been the subject of debate in the UK for several decades. Kuczera, Field and Windisch (2016) put forward evidence which suggests that in excess of 9 million adults in the UK lack numeracy. This figure includes a sizeable proportion of those completing university education. In fact, Kuczera, Field and Windisch (2016), in a study conducted for the OECD, exposed the evidence that British graduates' level of

numeracy is below that of graduates from several competing nations in the developed world. This is despite the fact that Britain is one of the wealthiest countries within the OECD and the European Union countries. Faced with such apparent contradictions between reality and research findings, it is important to undertake further inclusive and interpretive research (Karadağ, 2017) which could be useful to policymakers and higher education establishments.

There has been sustained research connecting employability skills, especially numeracy, with productivity (Álvarez-González, López-Miguens and Caballero, 2017; Huselid, 1995; Keep, Mayhew and Payne, 2006). The Learning and Skills Council (LSC) which works with employers and communities to improve skills in England and Wales acknowledged that there are skills gaps in the UK. There is some consensus that investment in the development of basic skills is a pre-condition for steering and maintaining productivity (House of Commons, 2015; Kuczera, Field and Windisch, 2016; LSC, 2006). Other studies advocate a link between employee creativity, organisation innovation and performance. For instance, supporting the skills-productivity link, Dedahanov, Rhee and Yoon (2017: 343) contend that “in dynamic marketplaces, innovativeness is necessary to create and sustain superior performance” and this is partly through the effectiveness of a numerate and skilled workforce. Studying graduate level of basic skills in general – and numeracy in particular - is a momentous step in attaining greater organisational performance and national productivity. Huizinga *et al.* (2008) refer to studies in the health sector which posit that “patients with low numeracy skills had greater difficulty interpreting food labels” (p. 1966). The authors contend that numeracy does not have only economic or productivity benefits but also helps improve health, establishing a correlation between low numeracy and obesity, for example.

### *Criticality of numerical skills and role of higher education*

The ‘application of number’ is one of six critical key skills (communication, number application, IT, working with others, improving own learning and performance and problem solving) identified by employers in a research study

by Dench, Perryman and Giles (1998) for the Institute of Employment Studies (IES). Employers believe that these skills are inextricably linked to the individual's performance in the workplace (Matsouka and Mihail, 2018; Tomlinson, 2017; Tran, 2016). The concerns about numerical skills have been ubiquitous in various studies and reports in the late twentieth and the early twenty-first centuries. For example, Hazucha, Hezlett and Schneider (1993) found that the ability to analyse financial and numerical data was one of the critical skills for managerial effectiveness, confirming Kanungo and Misra's (1992) findings which established numerical skills as part of what the authors termed managerial resourcefulness. These findings are further supported by a recent study by Ghazal, Cokeley and Garcia-Retamero (2014: 15) who found that 'well-designed numeracy tests tend to be robust predictors of superior judgment and decision-making because they simultaneously assess mathematical competency and metacognitive and self-regulated learning skills'. Other studies such as those of Carvalho and Rabechini (2015), Maxwell (2009), Rees and Porter (2001) and Rajadhyaksha (2005); Schultz (2008), highlighted the gap between what employers need from graduates and the actual skills that graduates bring to the workplace.

The gap identified covers a wide range of skill areas which numerical skills are accepted to be significant part of. The reflection on these studies coalesces the analysis into an agreement about the dichotomy that exists between higher education providers and their clients. Numerical skills and other employability assets enable graduates to operate professionally within the managerial environment of the "learning age" (Maxwell. 2009). In the same perspective, Carvalho and Rabechini (2015) have emphasised the requisite for both soft and hard skills in contemporary management practice. These skills should be gained prior to entering management given the intense pressure that modern managers are under to deliver outputs and meet demanding targets.

Temple (2012) and Shaheen (2011) highlight the crucial role that higher education can play in upskilling the nation. The authors propose a skills-based approach to the curriculum in order to effectively support economic growth. Temple (2012) contends that modern universities need to rise above the

traditional teaching and research role to locate their new position at the heart of regional development and regeneration. In approaching this new role, universities need to focus on graduate employability (Álvarez-González, López-Miguens and Caballero, 2017; Hernández-Fernaud *et al.*, 2017) and create graduates who can articulate basic skills, including numeracy and literacy. In this context, Mason, Williams and Cranmer (2009) found that numeracy is one of the greatest graduate employability assets. To develop employability assets, the authors acknowledge the instrumentality of employer involvement in higher education curriculum design. From a utilitarian standpoint, employer involvement will render curricula relevant and enable universities to demonstrate their embeddedness in society and the locality (Purcell, 2008). A critical partnership between higher education providers and employers is one parameter that can increase confidence in higher education's ability to meet societal demands. Johnson and Peifer (2017) found evidence of decreasing confidence in university graduates, though this varies according different social contexts. In another study about public faith in higher education institutions, Hunsaker and Thomas (2014) also supported the view that there was decreasing public confidence in the higher education system. This implies that perceptions and expectations of higher education (HE) have experienced dramatic changes in the past three decades, which compels HE providers to re-examine their offering, the curriculum and the type of graduates they generate.

In a damning report on higher education, Decatur (2017) goes further to reveal a crisis of confidence in higher education. Such a crisis derives from the perceived disconnect between higher education and its societal customers, chiefly employers (Harrison, 2017) but also parents whose expectations of the system have increased with regards to the employability of their graduate daughters and sons. Keep (2014), thus, foresees a greater and more dynamic role for universities and colleges in embracing skills-based higher education which is aligned with the actual demands of the economy and the wider society. The universities' role in graduate practical and basic skills development is increasingly being demanded by multiple stakeholders in the wider societal context: parents, employers and governments (Harrison, 2017; Kuczera, Field

and Windisch, 2016; Lowden, 2011; Yamamoto and Holloway, 2010). Stakeholders' demands have perhaps been behind increased academic research studies in graduate employability in recent years, with key studies such Matsouka and Mihail (2018), Tomlinson (2017), Tran (2016) and Collet, Hine and Plessis (2015), etc. advocating for more targeted higher education curriculum which can remedy numeracy and basic skills deficiencies bemoaned by employers.

## **Discussion**

The analysis started with the hypothesis that graduates are likely to over-rate basic mathematical skills and that their real basic mathematical skills can be lower than their own skill estimates. The critical findings emerging from the analysis, supported by the literature examined, establish that the performance of graduates in work can be lower than expected and that in general the performance of graduates may not be commensurate with their own estimates.

The findings confirm Harvey's (1997) view that people make judgements based on their assessment of themselves, with possible subjectivity, i.e. the confidence level expressed may not be reflected in the outcome of practical tests. In Hack-Polay's (2018) experiment, the graduates estimated their numerical capabilities almost 20per cent higher than their actual test performance (confidence estimate = 71.5per cent compared with just 57.5per cent average achievement in a basic numeracy test). The results show overconfidence in number skills among graduates. Overconfidence was based on Christensen-Szelanski and Bushyhead's (1981) theorisation, which asserted that in reality people do not know as much as they claim. This is also evident in Malmendier and Tate's (2015) study of overconfidence in forecasting among CEOs. When presented with two elements of choice and asked to evaluate themselves in terms of certainty about answers, people are biased, which means that they rate their level of confidence higher than their actual performance is worth (Gigerenzer, Hoffrage and Kleinbolting (1991). In the context of this study, the findings support Gigerenzer, Hoffrage and

Kleinbolting's (1991) theory. However, while Gigerenzer, Hoffrage and Kleinbolting's framework could form an interesting starting point for the study of overconfidence, it cannot be an axiomatic prescription for our understanding of the phenomenon of overconfidence.

The analysis of a basic numerical test experiment (Hack-Polay, 2018) showed that most wrong answers were recorded among graduates. If this is confirmed in a larger scale test, such findings would be congruent with Brunswik's (1955) Hard-Easy theory. The author argues that the extent of overconfidence is associated with the intricacy of the task, suggesting that overconfidence decreases as the questions to be answered presents a greater degree of complexity. In other terms, people tend to become more objective about the assessment of their own capabilities when the questions that they are asked to answer become harder. In a similar assessment, Sieck and Arkes (2005) investigated managerial decision-making and found that managers tended to be more complacent in decisions relating to routine matters as opposed to decisions about novel operations and situations.

The fact that graduates are overconfident could signify that graduates use the graduate status to legitimise and overrate their abilities. Similarly, Sieck and Arkes (2005) believe that more attention ought to be paid to the development of managers vis-à-vis routine decision-making. It can be argued that despite graduate status, managers cannot be exempted from numeracy, literacy and leadership development programmes in work settings or educational environments. Within the same line of argument, Bullough, Renko and Myatt (2013) contend that the continuous development of managers provides the opportunity for growing resilience and a greater entrepreneurial spirit.

The analysis in this article confirms the decreasing confidence in mass higher education and supports studies of employers' perception and concerns about graduate employability as found in a growing body of research (see Harrison, 2017; Hunsaker and Thomas, 2014; Temple, 2012). These findings were corroborated in a recent study by Matsouka and Mihail (2018). The authors found a sharp divergence of views between graduates and employers. While

the former believed that they were knowledgeable and skilled, the latter found them ill-equipped for the workplace and lacking fundamental skills. Of these fundamental skills, Durrani and Tariq (2012) believe that numeracy is critical since it is increasingly tested by recruiter during the selection process. Further evidence in support of the employers' argument comes from Tomlinson (2017) who found that graduates have shortcomings in some essential basic skills and, thus, suggested that, in order to transition to work effectively, graduates require a range of skills which, combined together, will form solid graduate capital. If graduate skills for employability are not thought strategically and embedded in the HE curriculum (Durrani and Tariq, 2012), the system is likely to experience further lowering in the confidence that businesses and parents have in higher education (Decatur, 2017).

The case for the embeddedness of employer requirements in higher education curricula, in other terms close collaboration between higher education and industry, is being increasingly lauded (Collet, Hine and Plessis, 2015; Durrani and Tariq, 2012; Tran, 2016). Tran (2016) particularly explain that the input from industry is essential to develop a curriculum that equips graduates adequately for the labour market. After all, the labour market is the ultimate customer and receiver of higher education products (graduates) and the need to work to the customers' requirements is axiomatic in the contemporary labour market. Collet, Hine and Plessis (2015) highlight the difficulties in creating the ideal graduates. The authors argue that the complexity, volatility and high dynamics of the modern labour market render the work of educational providers challenging. However, the authors recognise that the challenges should not deter higher education from adapting to change. The dynamics of the labour market command a degree of agility and frugality in the higher education system. Collet, Hine and Plessis (2015) hold the view that stakeholders in the system (students, academics and industry) should have a dialogue in order to arrive at a shared language that defines the evolving nature of graduate skills and employability. Tran (2016) and Durrani and Tariq (2012) are particularly unequivocal that such skills should no longer be divorced from the higher education curriculum but embedded in it to create a wholesome graduate.

## **Conclusion and implications**

### *Conclusion*

The analysis has produced interesting thoughts that largely corroborate the perspective that graduates overestimate their basic and employability skills, including numerical skills. This shows evidence of overconfidence, i.e. a discrepancy between graduates' rating of their confidence and the actual performance in a simple numerical test. The analysis can be credited for being one of the few that establish a link between graduate numeracy skills and employers' perception that graduates have deficiencies in the area. Being a graduate may lead people to overstate their general knowledge and numerical abilities. The findings support the assumption made in the introduction and Gigerenzer, Hoffrage and Kleinbolting's (1991) overconfidence theory that generally people pretend to know more than they actually do. Overconfidence in basic skills, particularly numeracy, can hinder the development of the graduate both within the university context and in the workplace. In fact, overconfidence can impair the graduate's ability and responsiveness towards learning and continuous professional development in specific areas. The discussion found that productivity in the labour market and the economy as a whole is contingent upon enhanced adult basic skills in which higher education institutions have a significant role to play (Collet, Hine and Plessis, 2015; Matsouka and Mihail, 2018; Tomlinson, 2017). Research evidence points to the conclusion that effective remedial actions to address issues of graduate basic skills necessitate a multidimensional and integrated framework involving government, higher education and employers.

### *Policy and practical implications*

There are policy implications of the study affect higher education institutions, employers and government. The findings have critical curriculum and policy implications for British higher education institutions in terms of learning and teaching. They prompt universities and higher education colleges to assess their current provision and establish how basic skills (particularly numeracy)

could be more effectively embedded in the curriculum, from the point of entry to completions of degree programmes (Durrani, 2012; Tran, 2006). A perspective to consider would be create incentives for students to improve their attendance at basic skills curricular activities without the burden of formal examination or assessment; this could be done by rewarding attendance as an integral part of the assessment strategy.

The study also has policy implications for human resource managers in organisations. Given the evidence presented in the literature, this analysis and the findings of the survey by Kuczera, Field and Windisch (2016) exposing lower levels of numeracy among graduates, higher education curricula could make room for teaching numeracy by embedding it into curriculum design and delivery throughout the degree programmes. Employer input in curriculum design will also enhance the ability of higher education institutions to effectively address the skill gap (Mason, Williams and Cranmer, 2009; Purcell, 2008). Fallows and Steven (2000) contend that higher education has responsibility in employability skills development to “equip graduates with the skills to be able to operate professionally” (p. 76) – see also Temple (2012). Attaining a level of skills that match professional requisites requires the input of organisations in terms of feedback about areas of critical skill deficiency in graduates as well as practical suggestions that would assist teaching institutions. A greater HE involvement in skills development would reinforce the view about the increasingly changing nature and landscape of higher education (Harrison, 2017).

However, it is a simplistic view to place the entire onus on HEIs. It is equally important that organisations consider sharpening the numeracy and hard skill levels of their graduate employees through systematic training programmes in the early period following hiring and through continuous professional development (CPD). Such early engagement with training needs and continuous follow-up could prepare the graduate workforce for routine and complex decision-making (Bullough, Renko and Myatt, 2013; Sieck and Arkes, 2005), particularly in managing projects, forecasting and managing change.

The findings emphasise the critical importance of training and development in organisations (Harrison, 2011) generally. The results indicate that there is a need for equal emphasis on graduate employee training in organisations (Hill *et al.*, 2016; Lowden *et al.*, 2011; McMurray *et al.*, 2016; Schulz and Thöni, 2016). The assumption that the graduate employees' higher qualifications could exempt them from basic professional development activities has been rejected by the findings. Learning and development provision requires democratisation in order to grow a more productive workforce.

The implications for government are inextricably linked to funding. With overstretched academics and resources in universities, any move to develop graduates' practical and numeracy skills will necessitate more financial and people investment (Lowden *et al.*, 2011). Understaffing in many universities means that academic staff are increasingly involved in administrative tasks that take them away from their core role, i.e. teaching and research. With adequate levels of funding to secure administrative support, lecturers would have sufficient time to design and implement an effective strategic basic skills framework (see Keep, 2014). It is also imperative to invest in training and development for the academic staff tasked with helping to enhance students' basic skills (Harrison, 2017). In Teece's (2011: 1396) perspective, this creates dynamic capabilities, enabling the organisation to "create, extend, or modify its resource base".

#### *Further research*

Future studies could consider testing a large sample of graduates in order to arrive at more confident generalisations. Future studies could involve experiments that use a diversity of numeracy tests. These could aid the quantification of the actual numeracy skills gap that both employer surveys (Hunsaker and Thomas, 2014; Karadağ, 2017; Kuczera, Field and Windisch, 2016) and this study have uncovered. Such an approach to research can contribute to restore confidence (Johnson and Peifer, 2017) in the expanding higher education system. In addition, such research will assist tertiary education institutions in creating the necessary dialogue between stakeholders in view to develop learning platforms and programmes that shape graduates (Collet, Hine

and Plessis, 2015) who are not only competitive locally but also in the increasingly ruthless international labour market. Further research in the field would enable the formulation of more authoritative conclusions (Karadağ, 2017). Further, the dominant methodology in the field has centred on one-time test of the graduates. It would be significant for future research to attempt a longitudinal study of groups of graduates to strengthen the validity of the tests. The use of qualitative methodology in the form of interviews with lecturers will be a significant way of establishing whether the performance of graduates presents some regularities that diverge from the quantitative test results. This will offer a useful way of triangulation.

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