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## Technical report

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# *Human capital* metrics and analytics:

assessing the evidence of  
the value and impact of  
people data

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# Human capital metrics and analytics: assessing the evidence of the value and impact of people data

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# Foreword

As the professional body for HR and people management, the CIPD has a role and responsibility in building the capability of HR professionals to understand the workforce, and importantly to provide evidence of the value and contribution of people in modern organisations. While still relatively adolescent, HR analytics and reporting (and the many pseudonyms the practice goes by) are fundamental to the success of the profession as it looks to become influential in helping the leadership of organisations to make more effective decisions. Without a capable and evidence-based function, the quality of HR and business decisions that impact on the workforce may come into question.

This technical report examines current HR analytics practice through the lens of published academic literature, and forms an important part of the evidence base for the HR profession. Complementing this report is an additional assessment of human capital theory, which considers the academic perspective on the value of the workforce, and how organisations report people data (McCracken et al 2017). These technical assessments form part of the academic evidence for the HR profession, the implications and synthesis of which forms part of the CIPD discussion report *Human capital analytics and reporting: exploring theory and evidence* (Houghton 2017).

As the profession moves towards utilising evidence in its different forms, and builds its capability in appreciating the value and implications of data in modern business, it is important that a clearly articulated evidence base can be accessed and utilised by HR professionals of all seniorities and capabilities. This report represents a crucial step towards better understanding of the quality of evidence for the value and contribution of human capital metrics, and the data which describes the very nature of the workforce.

**Edward Houghton**

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# Executive summary

## Purpose: key questions

The purpose of this report is to investigate how published academic literature considers the value and impact of human capital metrics and analytics. The report looks to consider three main questions:

- How does academic literature report on the theory and practice of using HR data and/or human capital analytics?
- What is the role of standards and regulation in guiding the use of human capital metrics?
- How do academically published case studies describe human capital analytics in practice?

## Summary of findings

The widespread use of human resource information systems and enterprise resource planning software, alongside the increasing ubiquity of employee attitudes surveys, means that there are ever increasing volumes of human capital (HC) related data being generated by organisations. As a concept and language, human capital has also become established within organisational discourse. Organisations view their employees as a human resource to be invested in. In an organisational context, human capital is typically defined as the value-creating knowledge, skills, abilities and other characteristics of workers (KSAOs).

This report is based on a literature review that sought to identify theory and evidence on the use of HC metrics by organisations located in academic research and grey literature. A large number (more than 600) different HC metrics are described in the literature. Although there have been some attempts to standardise metrics – so that the HR profession can become familiar with a common core – there is no widely recognised standard.

Theory and evidence on the use of HC metrics also suggest such standardisation may be undesirable; what is important, if HC metrics are to add value, is for organisations to develop their own metrics to help answer the mission-critical challenges and opportunities they face.

One common use of HC metrics is in workforce scorecards, where strategic analysis has been undertaken to identify metrics that are critical to performance. Red/amber/green (RAG) rated scorecards are then used to monitor and manage these key metrics. HC metrics are also used to provide descriptions of workforce and workforce characteristics, to evaluate the efficiency of HR processes, and to gauge the contribution of human capital to organisational performance. There is little demand for or appreciation of HC metrics from investment analysts. Consequently, attempts to embed a standardised approach to human capital reporting within company reports to shareholders have achieved only limited progress.

Attempts to use HC metrics to capture the economic value of human capital to firms, for example by calculating the return on investment (ROI) on human capital investments, have met with only limited success. It is difficult to get consensus on the assumptions on which ROI analysis should be grounded because it is difficult to measure or predict how workers

will respond to investments in their human capital. 'Soft' metrics seek to measure worker attitudes, behaviour and competencies. However, 'soft' metrics are often problematic.

For example, data gathered through appraisal is subject to a number of biases on the part of managers who collect it, which means that unless a lot of care is taken over collection, the data will have little value.

The report identifies 56 case studies which report on the use of HC metrics and analytics by organisations. However, most of these case studies can be seen as promoting or disseminating an idea or approach rather than providing rigorous evidence on the causes and effectiveness of use of HC metrics and analytics. Survey evidence suggests that the diffusion of HC metrics and analytics through organisations has been slow, and that problems of integrating data from different data sources, getting agreement to share data within organisations and overcoming problems with data governance have contributed to the lack of progress. There is a lack of high-quality survey evidence on the HC metrics being used by organisations and the purposes for which HC metrics are being used. There is also a lack of high-quality qualitative case study evidence that seeks to understand the praxis of adopting HC metrics and analytics.

Finally, the existing literature gives only cursory consideration to the ethical consequences of the metrification of human resource management. There is evidence that HC metrics and analytics can be used to make work both radically worse and considerably better for employees. It is in all of our interests to better understand how HC metrics and analytics can contribute to raising rather than lowering job quality.

# Introduction

Discussion of human capital (HC) measures and metrics has increased in HR circles for four key reasons:

- 1 The use of measures around workforce morale and motivation have become commonplace as a result of the commercialisation of tools that measure employee morale and motivation (often described as employee engagement surveys), with commercial organisations that provide these surveys making the case that they are leading indicators of organisational performance (Harter et al 2002, 2006).
- 2 The widespread adoption of human resource information systems (HRIS) to automate key HR processes and activities to cut costs and boost efficiency has created large amounts of data with which to measure the effectiveness of those processes and activities (Angrave et al 2016, Parry 2011).
- 3 Related to this, a large number of other business processes have also been automated or are now routinely tracked by information systems. Enterprise resource planning software provides a means of integrating and analysing these data to facilitate more data-driven decision-making. Other areas of management (operations, finance, marketing) which have a longer history of engagement with data, analytics and decision tools have moved quickly to exploit these developments. The traditionally less numbers-driven HR profession has been left behind. Arguably the HR profession will need to do more to engage with measures and analytics if it wants to maintain credibility and strategic influence in the C-suite (Angrave et al 2016, Rasmussen and Ulrich 2015).
- 4 Finally, new normative theories of management posit that measures of workforce morale and motivation, human capital and other business processes and operations can be combined to deliver a new, data-driven approach to strategic management which will allow organisations that implement these ideas to gain sustainable competitive advantage (for example Boudreau and Jesuthasan 2011, Cascio and Boudreau 2011, Huus 2015, Boudreau and Ramstad 2007, Sesil 2014, Hoffman et al 2012).

This report is a technical assessment of published academic literature which details the value and impact of human capital metrics and analytics. The report looks to consider three main questions:

- How does academic literature report on the theory and practice of using HR data and/or human capital analytics?
- What is the role of standards and regulation in guiding the use of human capital metrics?
- How do academically published case studies describe human capital analytics in practice?

The report begins by offering an overview of the foundational concepts of human and social capital that provide the intellectual underpinnings from measurement, commonly described in practice as 'human capital metrics' (HC metrics) or 'HR metrics'. It then examines theory and definitions of HC metrics in practice and reviews the evidence on their implementation by organisations, before considering the theory and evidence for the standardisation of HC metrics. The report concludes by recommending ways by which research may inform the development of the HC metrics body of knowledge.

# 1 Definitions of capitals relevant to human capital metrics

To understand human capital metrics theory and practice, it is important to appreciate how human capital is conceptualised with regards to management, strategy and human resources management. In this chapter the relevant theories of human and social capital are discussed.

## Human capital

Human capital has been defined as the knowledge that individuals acquire during their life and use to produce goods, services or ideas in market or non-market circumstances (OECD 1996, p22). The term was popularised by Gary Becker, who developed economic theory to explain how investments in human capital (schooling and work-related training and learning) contribute to the productivity of individual workers, and by extension the marginal productivity of firms that employ them. The marginal productivity of firms then determines the wage structure, which influences the incentives that firms and workers have to invest in developing workers' human capital (Becker 1975). Despite the widespread use and appeal of Becker's conception of human capital, his approach has been criticised for being overly reductionist. According to critics, it reduces workers to a commodity defined by their marginal productivity, by extension denying or ignoring their agency. It also reduces society to a system of economic production, ignoring that societies are also systems for social reproduction with power structures and inequalities that the powerful and wealthy seek to reproduce at the expense of those without power or wealth (Bowles and Gintis 1975). From the perspective of human capital metrics in organisational practice, Becker's methodological individualism means that firms are treated as a black box, because Becker largely ignores the way that social context shapes the development of social capital within a firm. This is limiting if we want to use Becker's ideas as a conceptual underpinning for studying HC metrics in practice, because they have very little to say about the causal relationships within organisations (the very thing that organisations are seeking to use HC metrics to understand).

Nevertheless, the idea of human capital has crossed over into popular management discourse. Organisations conceive of their workers as human capital, who they invest in while seeking to maximise the returns on their investments. For example, the utilities company SSE produces a Human Capital Report, which defines human capital thus: '*The human capital of a company ... is the sum of the current and future economic valuation of the skills and capabilities embodied within all the individuals that make up the total workforce of the organisation*' (SSE 2015). Consequently, management theorists have sought to develop ideas that facilitate the study of human capital within the black box of the organisation. In an organisational context, human capital is taken to mean value-creating skills, competencies, talents and abilities of the workforce (Elias and Scarborough 2002, 2004), which is increasingly abbreviated to knowledge, skills, abilities and other characteristics (KSAOs). One recent review article has argued that, in an organisational context, human capital should be referred to as human capital resources to differentiate organisational human capital (which is the value-creating agglomeration of the KSAOs of many workers) from individual-level human capital of workers studied by labour economists (Ployhart et al 2013). A number of recent books have sought to theorise and explain how the

contribution of human capital to organisational performance can be measured and modelled through the development of HR analytics programmes (Boudreau and Ramstad 2007, Hoffman et al 2012, Huselid et al 2005, Huus, 2015, Lawler et al 2004).

## Social capital

French sociologist Pierre Bourdieu was one of the foremost critics of Becker's approach to human capital. For Bourdieu capital takes many different forms: social, cultural, economic, symbolic. Possession of different forms of capital then determines the location of an agent (which could be an individual worker or a firm) within a social field. The social field is a 'field of power' in that different agents seek to advance their interests using their capitals to do so. Bourdieu therefore used the notion of 'capitals' in a different way from Becker. While Becker conceives of human capital as a property of the individual which affects economic outcomes, Bourdieu sees capitals as products of a social system which become attached to individuals or organisations, which then have a role in reproducing that social system over time. In this context Bourdieu defines the social capital of organisations as *'the totality of resources (financial capital and also information etc.) activated through a more or less extended, more or less mobilizable network of relations which procures a competitive advantage by providing higher returns on investment'* (Bourdieu 2005, p195).

A number of American social scientists (Buchanan 1986, Coleman 1988, Putnam 1995) also popularised the term at around the same time as Bourdieu, but conceptualised it differently. Social capital is seen as a key determinant of human capital formation, a property of a community or neighbourhood and the individuals within it, which shapes the human capital that individuals are able to acquire. Putnam sought to explain the term through the use of popular phrases such as 'birds of a feather flock together' and 'it's not what you know, it's who you know'. Both Buchanan's and Putnam's analysis was grounded in a nostalgic concern that the dense networks of social capital that had defined American society since the nineteenth century (de Tocqueville 2000) were being eroded, with significant economic and social consequences, particularly for poorer Americans. Management research into the role of social capital in value-creation within organisations has drawn on ideas from network theory (Granovetter 1973), studying the nature and content of social ties between individuals within and around organisations and the ways in which these ties lead to outcomes such as innovation and sales (Adler and Kwon 2002).

Note that while Bourdieu's conception of social capital is conceived as part of a wider critique of Becker's approach, there is no such tension between the way that Buchanan, Coleman and Putnam use the term; indeed, the latter version of social capital can be seen as a complement to Becker's approach. It is not then that there are inherent tensions between ideas of human and social capital, but between social scientists who conceive of human and social capital in individualistic terms and who are interested in how it contributes to economic outcomes (Becker, Coleman) and those, typically working in a Marxian tradition, who reject methodological individualism and stress instead the importance of studying a social and economic system in its entirety, including the study of social reproduction alongside the study of economic production (Bowles and Gintis, Bourdieu). Empirical management scholars interested in studying the role of social capital in value-creation have implicitly accepted the critique of Becker's methodological individualism by grounding their research in network theory.

### Other capitals in an organisational context

A recurring critique of the ideas of social and human capital from management scholars is that the terms are too broad to be useful in empirical research, so more precise definitions of the value-creating components of social and human capital should be developed and utilised. This has led to the use of terms such as KSAOs and also of attempts to identify and define other intangible forms of organisational capital. These include intellectual capital (IC) – the use of knowledge and skills by workers to create value (Swart 2006) – and knowledge capital, which Hoffman et al (2012, p139) conceive as comprising organisational knowledge, best practices and proprietary methodologies.

## 2 Human capital measures, metrics and definitions: what does the HR literature tell us?

The purpose of this section is to summarise key literature on the theory and practice of HC measures and metrics. This section first describes some of the metrics and their uses. We find a large number of metrics have been put forward, but there is no consensus on which metrics should be considered the most important. Therefore, we then present and evaluate different theoretical approaches for using metrics, before presenting a review of the evidence on how metrics are being used in practice. A detailed account of the methods used to conduct this review of the evidence is shown in Appendix 3.

### Describing human capital metrics and measures

There are a vast number of different human capital measures and metrics described in the literature. A flavour of what leading experts in the field consider to be key metrics can be found in the draft guidelines produced by the Society for HRM (SHRM) for the American National Standards Institute (ANSI – the guidelines were never implemented, a point we return to in section 3).

**Table 1: Proposed ANSI guidelines on reporting on human capital**

1 Spending on human capital	2 Ability to retain talent	3 Leadership depth	4 Leadership quality	5 Employee engagement
a) Total amount spent on employee (salaries + benefits + taxes)	a) Voluntary and total turnover	a) Percentage of defined positions that have an identified successor	a) Index of questions about leadership from employee survey	a) Index of questions on employee engagement from employee survey
b) Total amount spent on support of employees	b) Turnover broken down by job type	b) Percentage of open defined positions filled internally	b) Response rate and methodology of survey	b) Response rate and methodology of survey
c) Total amount spent in lieu of employees	c) Industry standard formula of FTE terminations/FTE			
d) Total amount invested in training and development				
e) Total headcount and total full-time equivalent (FTE) headcount				

Source: Bassi et al (2015, p75)

Metrics cover five key areas: spending on human capital; ability to retain talent; leadership depth; leadership quality; and employee engagement. These metrics suggest a number of different purposes. 'Spending on human capital' covers essentially descriptive metrics that can be used for tracking labour costs over time or in comparison with industry benchmarks. Ability to retain talent and leadership depth both measure the sustainability of human capital, so can be used to assess the long-term viability and sustainability of an organisation. Leadership quality and employee engagement measures allow assessments of key employee attitudes that are widely held to be predictive of behaviour that contributes to organisational performance (for example Harter et al 2002). However, these metrics constitute barely a fraction of those that have been described in the literature. For example, the *Human Capital Metrics Handbook* (HCMI 2013) provides descriptions of over 600 different human capital measures. It is clearly not practical to describe all of these measures here (and to do so would simply reproduce the handbook). Instead, we provide a broad overview of the questions and issues that measures are being used to address, while Appendix 1 includes a table containing an extensive set of HC measures as they relate to different areas of HR activity.

### Descriptive measures and measures of activity

First, HC measures may be used purely descriptively, to provide an accurate portrait of an organisation and people-related activities. How many people are employed? What do they do? How much are they paid? How many are quitting? What skills do they have? The answers to questions such as this can then inform the development of HR and operational policies and practices, for example, 'how many more workers do we need to recruit to deliver a new product or service?', 'what recruitment channels are likely to be the most effective?', and so on. The essential point about this approach is that HC measures are used in an essentially ad hoc way, with data being called on to address problems and issues as they arise in a largely un-strategic manner.

Data quality is a key issue for this type of HC measure. Data quality depends on data governance: the protocols put in place to ensure that accurate data is recorded in a timely fashion and the processes for regular checking and monitoring to ensure that these protocols are followed. Reports from the practitioners (for example, CAHRS 2014a, 2014b) suggest that establishing good data governance is hard, and can be a major impediment to the adoption of metrics-based approaches to HR.

#### Use of descriptive measures in scorecards

Descriptive HC measures may also be used in a more explicitly strategic way as part of a 'scorecard' approach to strategic management (Huselid et al 2005). Under this approach, strategic analysis first identifies key measures and metrics that are held to be important drivers of organisational performance, for example, team engagement scores or quit rates. Managers are then assessed against how well they achieve targets related to these metrics or measures. Key measures are likely to be reported through dashboards with a red, amber or green (RAG) rating used to identify which measures are performing in line with expectations, in need of monitoring or in need of urgent attention. The effectiveness of this approach is likely to hinge on the quality of the initial strategic analysis: has it identified the right metrics to focus on? Poor-quality strategic analysis may result in too many measures being reported in dashboards, with the result that managers are unable to identify those which are most important and merit the most attention.

## Measures of efficiency and effectiveness

HC measures may also capture the efficiency or effectiveness of different people processes and activities. Note that in this context there may be important differences between efficiency and effectiveness. Measures of efficiency relate to the efficiency of HR processes and activities. For example, 'cost of recruitment per new recruit' measures the efficiency of the recruitment process. By contrast, measures such as 'new-hire failure rate' or 'percentage of new hires who become high-performers within 12 months' are measures of the effectiveness of recruitment and selection. Huus (2015) makes the case that measures of efficiency are conceptually different from measures of effectiveness. She conceptualises efficiency measures as 'HR statistics' and argues that they belong in the same class of measures as basic descriptive data on the workforce, providing measures of how efficiently the HR function services the organisation. Huus sees effectiveness measures as human capital metrics, more broadly focused on all people-related decisions and results. A similar distinction is invoked by Mark Huselid and his colleagues in their work on applying a scorecard approach to HC metrics (Huselid et al 2005). They differentiate between HR scorecards, which include key measures of HR activity that are critical to the business, and workforce scorecards, which are based on broader measures of human capital. Despite the conceptual distinction drawn between measure of efficiency and effectiveness, some HC measures may relate to both concepts. For example, a measure such as 'time to recruit' is a measure of HR efficiency, but it also represents information about the effectiveness of recruitment processes. If time to recruit starts to increase, it may have a detrimental effect on organisational performance, because key posts remain unfilled.

## 'Soft' HC metrics: uses and issues

Huus's (2015) and Huselid et al (2005) conceptualisation of HC metrics as broadly focused on people-related decisions and results suggests specific sorts of HC measures related to worker attitudes and behaviour: measures of leadership effectiveness, worker attitudes (for example engagement), behaviours, competencies, performance and culture, because these are held to be measures that explain variation in operational and customer metrics that are critical to organisational performance. These are considered 'soft' measures, because they are based on subjective perceptions and judgements rather than 'hard' measures of activity or performance. Descriptive measures may be brought together with these types of 'soft' performance measures to understand the contribution of different types of workers to an organisation, for example to look at performance or engagement by age or job tenure.

Recent research suggests that the use of this sort of 'soft' HC metric can be problematic. Measures of one type of soft measure, for example engagement, are typically based on well-designed and carefully validated scales developed by occupational psychologists. Despite this, gaps may open up between scientific and lay understandings of what such measures mean. Further, these gaps and misunderstandings may actually reflect the way that these measures are promoted by the companies that conduct the surveys. To take the example of employee engagement, psychologists see engagement as a psychological state that is at least in part a property of the individual (for example, Schaufeli et al 2002). However, popular engagement tools, such as the Gallup 12 (Harter et al 2006), do not measure engagement as a psychological state, but focus on subjective measures of aspects of work that are held to be antecedents of engagement. The extent to which individuals' responses reflect individual psychological dispositions to be engaged compared with actual objective working conditions are unclear (Guest 2014), but the interpretation of these scores often rests on the assumption that they accurately measure objective working conditions. This means that in psychological terms, engagement should be a measure of psychological state. Managers may also believe that this is what engagement measures, but commonly used

engagement measures are actually measuring subjective perceptions of aspects of working conditions. Reports from companies that provide engagement surveys typically suggest taking action to improve aspects of working conditions in order to boost engagement, but the subjective perceptions of working conditions captured in engagement surveys may reflect values and psychological processes unrelated to objective working conditions, so actions may not be effective. Despite this, engagement and other similar HC measures are considered to be useful because, even if it is not clear if engagement *causes* performance, engagement scores provide management with leading indicators of organisational performance (Harter et al 2002, 2006).

Subjective measures of worker performance and competencies, which form the basis of many measures of efficiency or effectiveness (for example, a measure such as 'percentage of new hires who become high-performers within 12 months' may be based on subjective appraisals of performance) are also problematic from a data quality perspective. There is a very strong body of evidence to show that a lot of variation in these measures is driven by idiosyncratic rater effects rather than real differences in competencies, behaviour or performance (Buckingham and Goodall 2015). In other words, managers who provide ratings of performance for the workers they manage have quite different ways of interpreting and implementing performance criteria, with the result that the final score awarded to the worker probably tells us more about their manager's approach to grading performance and the psychological biases underpinning their approaches than it does about how that worker's performance compares with the performance of workers assessed by different managers. This suggests that in situations where organisations make use of this sort of judgement-based HC metric, careful consideration needs to be given to issues of:

- training (to try to promote consistency of approach and to allow raters to understand their own biases)
- management of line managers who perform the assessments (to ensure they are doing it to standard)
- validation (for example, by having performance assessed by more than one assessor; comparing and contrasting results of subjective assessments with data on objective performance outcomes)
- analysis (interpreting results in the light of statistical analysis that accounts for variation due to rater idiosyncrasies).

Brock (2015) provides an interesting discussion of the extensive measures taken by Google to try to reduce the impact of rater bias.

### Human capital accounting measures

A key purpose of HC metrics is to capture the economic value of people to an organisation (Fitz-Enz 2009). This is supposed to enhance the business credibility of the HR function by creating an interface between people management activity and the finance-driven decision tools used by general managers. To this end, Fitz-Enz has proposed a number of different HC metrics related to common accounting and financial analysis measures. These measures are summarised in Table 2.

The problem with these types of metrics is that they are rather crude. To take a measure such as human economic value added (HEVA), this only shows the average amount of 'economic value added' per employee. It says nothing about how human capital has contributed to the creation of economic value. Therefore, as a measure, it provides no guidance as to the action that could be taken to enhance value (Froud et al 2000). If Company A has higher HEVA than Company B, we don't know why this is, or even whether the difference relates to differences in human capital compared with differences in other intangible assets.

Human capital accounting metrics are also very sensitive to the assumptions used to generate them. ROI is used as a tool for making investment decisions. It is therefore necessary to assign a probable change in future income to a project seeking investment, for example the value of extra sales generated by a new training initiative. The projected ROI will therefore depend on at best an educated guess, at worst a shot in the dark. The assumptions used to generate ROI are probably more important to decision-making than the final ROI number: are they credible or do they depend on an element of wishful thinking? Is it realistic to decide whether the assumptions are credible or not, or is there simply too little information to know (Levenson 2005)? Of course, there are situations where ROI might prove useful, for example if retrospectively calculated on a pilot project to decide whether to expand the project or not, but even here it cannot necessarily be assumed that the pay-offs to a pilot project will be directly comparable with a larger-scale rollout because more care and effort may have been put into making the pilot project work.

**Table 2: Human capital accounting formulae: enterprise-level metrics**

<b>Formula</b>	<b>Description</b>	<b>Purpose</b>
Human capital revenue factor	Revenue / number of full-time equivalent (FTE) employees	Very simple productivity measure
Human capital profit index	Revenue – purchased services per FTE	Portrayed as a measure of the leverage of human effort that resulted in profit
Human economic value added	(Post-tax profits – costs of capital) / FTE	EVA originally portrayed as a measure of the value added by management. HEVA is portrayed as the average amount of EVA per employee
Human capital cost factor	Total pay and benefits costs + pay costs for contingent workforce + costs of absenteeism + costs of turnover	Measure of the 'total' cost of human capital
Human capital value added	Revenue – (expenses – pay and benefits) / FTEs	Measures average profitability per FTE
Human capital return on investments ratio	Revenue – (expenses – pay and benefits) / pay and benefits  Alternative formula (Vienna index): HCROI = (EBITDA – financial capital costs) / human capital investment	Measure of profit in return for expenditure on pay and benefits

	EBITDA = earnings before interest, taxes, depreciation and amortisation	
Human capital market value (Tobin's Q)	Market value – book value / FTEs	Measures relationship between market value and replacement value. In one sense, a market view of intangible assets. Difficult to identify how much of this is down to human capital compared with other intangibles.
Return on investment of human capital initiatives formula (for example training)	(Revenue generated – costs of programme) / costs of programme	Measure of profit or return on any HR programme

Source: Fitz-Enz (2009).

Further, there may be a wide range of impacts from people management initiatives (changes to teamwork, innovation, cycle time, customer satisfaction, learning and knowledge management) which are difficult to predict or measure accurately. This means that there is a significant trade-off between time to calculate ROI and the level of precision of the calculation. The time and effort needed to undertake the calculations with high levels of precision is likely to be prohibitive. If the calculation lacks precision, it has little value (Levenson 2005). Even if high levels of precision are achieved, that precision may be spurious because of the complexities involved in modelling complex social processes. Estimating the ROI on a new piece of machinery or the refurbishment of a hotel is relatively straightforward, because the manufacturer of the machinery will provide information on the output it is capable of, while a hotel company is likely to have data on how previous refurbishments have affected room occupancy rates. However, it is much harder to predict how an intervention will affect worker behaviour and output, because of the problem of the indeterminacy of labour; a wide range of factors which are difficult to predict and control influence the extent to which workers are willing to co-operate with management in transforming their capacity to labour into goods and services. Overall, then, it has long been possible to calculate ROI on HR activities and initiatives (for example the ROI on training); however, this continues to be seen as a low-value activity (Rasmussen and Ulrich 2015), presumably because the assumptions underpinning such analysis are seen as overly subjective and imprecise, therefore lacking in credibility.

Levenson also considers cost–benefit analysis as a way of measuring the value of human capital interventions and initiatives. Cost–benefit analysis (CBA) has significant advantages over ROI. Because it does not collapse the underlying calculations down to a single rate of return, it is possible to see in detail the individual costs and benefits. However, it also suffers from similar problems; key benefits of people management initiatives are difficult to value, so a 'reasonable' approach to CBA would not include these in its calculations. However, this may result in the benefits of an initiative being significantly understated. Overall, accounting-based approaches to measuring human capital appear to have limited practical appeal. We will return to this point below when we consider issues related to standardisation in reporting of HC measures.

## Standardisation of HC measures and metrics

Should the 600 or more HC metrics that are described by the Human Capital Management Institute (2013) be reduced to a smaller standard set of HC metrics? The chief proponent for the development of a standardised approach to HC measures and metrics is Jac Fitz-Enz (for example 2009). For Fitz-Enz the main benefit of standardisation is that it will allow the HR profession to become familiar with the standardised set of metrics. Familiarity will allow metrics to be used more widely, meaning that HR becomes a more data-driven profession and that the credibility of HR with other, more data-driven areas of management increases as better decision-making leads HR to make a more positive overall contribution to delivering strategy and performance. For Fitz-Enz, the key value in metrics comes from watching how they change over time within the same organisation. This provides evidence as to the processes and management practices that are working compared with those losing effectiveness. Over time, HR professionals will develop understanding of the complex inter-relationships between difference measures and metrics. A number of sources in the grey literature argue that standardisation of measures and metrics is also desirable because it allows benchmarking; organisations can subscribe to services provided by management consultants to understand how their measures and metrics compare with other organisations in the same industry or they can compare the relative performance of different business units. However, Fitz-Enz is sceptical of the idea that benchmarking of HC measures and metrics is a useful or valuable activity. Although an early advocate of benchmarking (Fitz-Enz 1993), he argues that increasing environmental volatility means that it is harder to make meaningful comparisons, because organisations have become more heterogeneous in response to the changing environment. Consequently, benchmarking is only a valuable activity in response to tightly defined problems (Fitz-Enz 2009, pp241–5). Baron (2011) is also sceptical of standardisation, arguing that the development of good HC metrics depends on the context of the organisation.

## From HC metrics to people analytics

An alternative approach to the development of a standardised set of HC metrics focuses on the use of metrics as part of people analytics programmes designed to develop a data-driven understanding of the relationships between HC and organisational performance (Boudreau and Ramstad 2007, Cascio and Boudreau 2011, Boudreau and Jesuthasan 2011, Hoffman et al 2012). The underpinning assumptions of this 'analytics first' approach are that talent or people can be a source of competitive advantage, but to unlock this source of competitive advantage, HRM needs to develop as a decision science. To do this it is necessary to develop rigorous analytical frameworks and models. Boudreau proposes the LAMP (logic, analytics, measurement, process) model. The starting point here is a strategic goal or problem. The first task is to develop a logically based intuitive answer about what the best way of achieving this goal or solving this problem might be. This is followed by the 'analytics' phase of turning the intuition into research questions or hypotheses, and coming up with a research design to answer the question or test the hypotheses. Measures are then developed in the context of the research design in order to answer the question. Once the question has been answered, the management process to turn the insight into action may involve the regular monitoring and management of specific metrics that have been shown by the analysis to be important for performance. The overriding point is that metrics follow from analysis rather than following a standard template. Metrics and analytics are a tool for uncovering how people affect organisational performance rather than providing summary measures of the contribution of people to the bottom line.

## Empirical evidence on the use of HC measures and metrics

Having provided an overview of key thought leadership around the development and use of metrics, we now turn to evidence of how HC metrics are being used in practice. Case studies of HC analytics in practice are illustrated in Appendix 2.

### Case study evidence

We have attempted to classify the body of case studies summarising the use of HC metrics and analytics according to the purposes with which HC measures and metrics are being used in the organisations that the case studies describe. This is not necessarily a straightforward task, because the case studies do not always provide clear or precise information, and some case studies suggest multiple uses for metrics. Subject to this caveat, our analysis suggests that the most common use of metrics described in cases is as part of a wider strategic analysis linked to the use of scorecards, dashboards or similar frameworks (20 cases: Rasmussen and Ulrich 2015, Cantrell et al 2006, Whitaker and Wilson 2007, Boudreau and Jesuthasan 2011, Bassi and McMurrer 2005, Smith 2013, Haube 2015, Human Capital Management Institute 2016b, Re:Work 2016, Valuing your Talent 2016a); several of these cases suggested that metrics had been used as part of a rigorous empirical analysis, involving measures and metrics from multiple data sources in order to determine which measures should appear on the scorecard or dashboard (for example, Rasmussen and Ulrich 2015, Sparrow et al 2010, Ton 2009). Ten cases suggested that metrics had been used to improve processes and decision-making around recruitment and selection (Levenson 2011, Hoffman et al 2012, Hesketh 2014b, 2014c, Milne 2015a, Opower 2016, Human Capital Management Institute 2016d, Weisul 2016). Five provide evidence of metrics being used to make decisions about training and development and to identify the value of training and development programmes (Rasmussen and Ulrich 2015, Boudreau and Jesuthasan 2011, Russell and Bennett 2015, Herena 2016). Five provided examples of measures being used to make decisions about the size and shape of the workforce, including making decisions about redundancies (Chynoweth 2015, Hoffman et al 2012, Russell and Bennett 2015, Ton 2009, Green 2016). Seven showed metrics being used to identify ways of reducing voluntary turnover (Lewis 2016, Holbesche 2014, Weisul 2016, Milne 2015c, Hesketh 2014b, Knowledge@Wharton 2015, Green 2016). A further three provided examples of HC metrics being used to communicate company value to investors (Mouritsen et al 2004, Boudreau and Jesuthasan 2011, CIPD 2015). Three examined issues around workforce diversity (Boudreau and Jesuthasan 2011, Sparrow et al 2010). Two showed metrics being used to improve performance management systems (Hoffman et al 2012), one case study showed how metrics were used to track innovation (Holbeche 2014) and two showed how metrics were used to reduce absenteeism (Churchard 2013, Milne 2015b). Three case studies showed the use of metrics in addressing staff engagement (Knowledge@Wharton 2015, Andersen et al 2015, Herena 2016), one case study showed how metrics were used to improve succession planning (Hesketh 2014a), and one case examined how HR metrics were used to reduce loss of stock to damage and pilfering (Douthit and Mondore 2014). Finally, one case entailed the use of HR in combination with other organisational data to analyse the productivity of knowledge workers (Fuller 2016).

Just one of the case studies we identified met academic standards of rigour and objectivity. This study (Ton 2009) examined the relationship between staffing expenditure, quality (conformance to company policy and service quality), sales and profits drawing on longitudinal data from a US retail chain. It found that contrary to existing management

practice, seeking to reduce labour costs to a minimum level damaged sales and profits because service quality suffered. Rather than seeking to minimise labour costs, the retailer performed better when it sought to maximise productivity by ensuring minimum quality standards were met through higher staffing levels.

One further source of evidence on the use of HC measures and metrics deserves attention. Bock (2015) offers an extended narrative account of how HC measures and metrics have been deployed at Google, including accounts of how metrics and analytics were used to improve hiring processes and decisions, improve performance management, design effective pay and benefits packages and boost productivity. The exciting thing about this account is the way that it showcases the frontiers of what is possible: the routine use of HC metrics and advanced analytics so that HR can add value to the business. It is, however, at its heart a popular management book; it paints a picture of the uses and value of analytics with a broad brush. The resources, expertise, effort and management commitment needed to achieve Google's level of expertise is hinted at but not spelled out. Therefore the extent to which this level of analytics and metrics use would be replicable and/or cost-effective in other organisations operating in a different organisational context is not clear.

#### *Assessing the quality of case study evidence*

An important consideration when considering case studies, particularly on analytics topics, is that case studies are published in a variety of formats and structures. It's therefore important to understand what constitutes a case study. Good academic case studies provide a method for investigating theoretically interesting or important questions in a way which fully integrates analysis with the specific organisational context. Good case study research design is typically closely informed by theory. Cases are selected because they are theoretically interesting; they are likely to shed light on specific theories or causal mechanisms. Research designs often pair cases where something different happened with closely comparable organisations in order to understand the sources of difference. Alternatively, cases may be followed over a longer period of time to study the 'before' and 'after' of a change. The key point about both of these approaches is that research is designed to allow inferences about the causes of events to be made so that theory can be tested or developed. Of course, not all academic case study research conforms to the principles of good case study design; case studies may also be used to provide illustrative accounts or inspiring examples, which are largely descriptive in nature. Our systematic review of the literature revealed 56 examples of the use of HC measures and metrics that could be described as case studies.

It is important to note that, with a single exception (Ton 2009), they do not conform to principles of good case study design; they were not designed to test theory or understand causal processes. Rather, they appear designed to provide illustrative examples of the successful use of HC metrics and associated analytics. This means that from an academic perspective the cases typically suffer from several of the following weaknesses:

- 1 Case studies are based on samples of opportunity, organisations the authors are familiar with, rather than well-thought-through research designs that might test theory, for example by comparing similar organisations in the same industry sector that have adopted different approaches to measuring human capital.
- 2 This means that the cases can only be used to uncritically illustrate a normative theory and its benefits rather than to test or evaluate the theory.
- 3 This lack of criticality means that cases can appear as 'just so' stories. Cases do not provide detailed empirical evidence (for example in the form of quantitative analysis

or careful qualitative analysis that takes into account the views and judgements of multiple respondents from different parts of an organisation) of what the costs and benefits of following the theory are. Details of praxis are obscured, so it is difficult for the reader to come to an informed judgement about whether the ideas would work in their own organisation, and what the costs, benefits and difficulties might be.

- 4 Consequently, these cases do not provide adequate empirical evidence to assess the strengths and weaknesses of different HC measures and methods for analysing those measures in use in organisations.

A number of cases were also written by authors with a clear commercial interest in promoting the ideas discussed in the case (that is, they were consultants reporting on work done by their company).

### Survey evidence on the use of HC metrics

It is important to note that these case studies should not be taken as evidence of wider trends in the use of HC measures and metrics. Most of the cases discussed above are chosen because they are representative of developments that the author of the case wants to champion or promote, not necessarily because they are representative of wider trends and patterns. Surveys may provide evidence of wider trends. A number of management consultancies undertake surveys that aim to uncover the diffusion and uses of HC metrics (for example PwC 2014, Deloitte 2015). However, the population from which these surveys are drawn is not usually very transparent, and response rates may be low, suggesting that results could be subject to sampling and non-response biases. For example, Mercer conduct regular surveys of the use of HC metrics and analytics. However, the population for the survey is subscribers to one of Mercer's services. It is therefore not clear who respondents are or how representative they are of the broader population of organisations and businesses. Further, the response rate for the 2012 report was just 14% (WorldatWork and Mercer 2012). Nevertheless, the picture that emerges from these surveys is of limited use of HC metrics and analytics. PwC (2014) identify four key areas where HC metrics and analytics have strategic significance (capturing returns on investment; curtailing turnover of high-performing and high-potential employees; improving the quality of new hires; enhancing the strategic role of HR business partners), but also find that most CEOs do not have the talent-related information they need to make business decisions. Similarly, Deloitte (2015) described HR analytics as being 'stuck in neutral'.

The Centre for Advanced Human Resource Studies (CAHRS) at Cornell University hold regular HR analytics workshops where its corporate partners (typically large US-headquartered multinational enterprises) are invited to discuss developments in the field under 'Chatham House rules'. This is not strictly speaking survey evidence, but bulletins from these workshops suggest that with a handful of notable exceptions, as of two years ago (2014) CAHRS partners had not made significant progress in developing HC metrics and associated analytics programmes. Organisations faced a number of practical challenges: data quality and data governance, gaining access to non-HR data to conduct strategic analytics, integrating data from different data sources to conduct analyses, lack of skills – those with HR skills lack analytical skills and those with analytics skills lack business acumen and the ability to tell a story about their analyses to decision-makers (CAHRS 2014a, 2014b).

## Summary and conclusions on the current state of evidence

Overall, then, while there is no shortage of advice and guidance on HC metrics, evidence on the use of HC metrics is limited. However, the types of metrics that organisations use on a regular basis, and the uses to which these metrics are put, are not clear. Therefore, one area where further research would be valuable is in undertaking higher-quality survey work to get a more accurate measure of what metrics are being used, to what extent and for what purpose. Neither do the overwhelming majority of case studies provide good evidence on the conditions, approaches and behaviours that lead to the successful use of metrics and analytics. More rigorous and theoretically informed case study design in future research could rectify this limitation.

Finally, Ton's research hints at a tension within the practice of HR analytics, between the 'soft' version that she champions, with metrics and analytics being used as a tool to bring about mutual gains for worker and organisation, and a 'hard' version, where metrics lead to workers being portrayed as a cost to be minimised, contributing to the commodification of their labour. In this context, it is interesting that, with the exception of Ton (2009), who explicitly makes the case that analytics should be used to find ways of improving both job quality and the bottom line, issues of ethics are largely absent from the cases discussed above. For example, Hoffman et al (2012) cite with approval the case of Qantas, who completely reshaped their workforce, with large numbers of redundancies, after the introduction of key HC performance metrics led the airline to identify those employees and job roles that contributed less or more to its financial performance. The ethical and longer-term business consequences of commodifying labour in this way are not considered. Therefore a lack of consideration for the ethical and sustainability issues and considerations of using HC measures and metrics is another major omission in the existing literature.

# 3 Standards and regulation: formalising human capital measurement

In this section we explore the extent to which there have been moves towards standardisation of human capital measures and reporting. In presenting this analysis, we draw on the seminal work of Powell and DiMaggio (1983). Powell and DiMaggio analysed the factors that shape change and continuity within organisations. Part of their analysis focused on the tendency of organisations to become more alike, a process known as isomorphism. They distinguished between three sources of isomorphic pressure: regulation (coercive isomorphism), best practice guidance (mimetic isomorphism: organisations tend to adopt perceived best practice in response to an uncertain environment), and cultural (professional isomorphism: organisations do something because it is part of the professional norms of managers). Below we will review the extent to which regulation, professional norms and best practice guidance are creating pressure for a standardised approach to the reporting of HC metrics. We argue that the evidence suggests that isomorphic pressures are weak, so the emergence of standardised reporting of metrics is unlikely over the medium term.

## Regulation

The key form of regulation that might be expected to lead to standardisation of HC metrics are accounting standards. The rationale behind HC in company accounting statements is that people, along with other intangible assets including brand, customer relationships, processes and capacity to innovate, contribute to the value of a company, so should be accounted for alongside more traditional accounting measures and commentary. Successive UK governments have paid attention to reforming accounting standards, with the issue of how to report human capital management a recurring theme (Scraggs et al 2013, p4). The Kingsmill Review into women's pay and employment (DTI 2001) argued that good HCM is routinely under-reported in company results and recommended that a government inquiry should be established to consider how reporting of human capital could be improved. This resulted in an inquiry into HCM reporting by the Accounting for People Taskforce, which reported in 2003. This review concluded that companies should routinely report information on the size and composition of the workforce, retention and motivation of employees, the skills and competencies necessary for success and the training needed to achieve this, remuneration and fair employment practices, and leadership and succession planning. The report went on to recommend that HCM should be balanced and objective to enable comparisons over time and that, to do this, reporting should be based on commonly accepted definitions. To facilitate this, it recommended that the Accounting Standards Board should develop definitions of key metrics. Given an apparent lack of consensus over what good practice in HC reporting looked like, the recommendations were supposed to trigger the start of an evolutionary process rather than lead to a rigid regulatory framework. However, the recommendations of this report were not implemented.

The Accounting for People Taskforce was re-launched in 2010. Consequently, in 2013, new regulations to the 2006 Companies Act were introduced, requiring listed companies to

provide an enhanced business review as part of their annual report to shareholders, including information related to environment, employees, social and community issues (CIPD 2016). However, the accompanying guidance offered only an imprecise indication of the sort of people-related information that reports should include, so there is ample scope for organisations to ignore or downplay HC reporting while remaining compliant with the regulations. Despite the limited nature of the regulations, there is evidence of an increase in the quantity and quality of human capital reporting in response to the regulations (CIPD 2016). Note, though, that the style of reporting being promoted by these regulations is unlikely to lead to the development or emergence of standardised metrics. Reporting follows (and is expected to follow) a narrative style, rather than reporting quantitative measures that provide the basis for cross- or within-company comparisons. One recent review concluded that it is debatable as to whether investors and other stakeholders will be able to make informed decisions on the basis of such HC reports, because the tone and focus of most current reporting is on the positive aspects of human capital, with risks being downplayed and ignored in order to avoid reputational damage which could be detrimental to the share price (CIPD 2016, p9).

One area of the UK economy where HC reporting has made significant progress is in healthcare. This is in response to regulatory pressures. The Care Quality Commission (CQC) includes HC metrics in the data it evaluates when forming judgements about the quality of care provided by hospitals, care homes and other regulated health and social care providers. For example, the CQC monitors ratios of consultant to non-consultant doctors, the percentage of ward staff who are registered nurses, the ratio of nursing sisters and charge nurses (band 6) to band 5 nurses, with the results of these metrics used to compute an indicator of staffing risk. The CQC also monitors staff morale as measured by staff engagement surveys (CQC 2015). The National Institute of Clinical Excellence also puts forward a measure for calculating safe nurse staffing levels according to the care needs of patients being treated on a ward which it requires acute hospitals to use (NICE 2014), while NHS guidance requires trust boards to receive regular reports on safe staffing (NHS 2013). Within the NHS, HC metrics are beginning to be used to measure the efficiency of hospitals too; Lord Carter has recommended that hospitals should publish care (that is, nursing) hours per patient day as a comparative measure of efficiency (Carter 2016). There is also evidence that HC metrics (for example nurse staffing levels) are being used within ward performance dashboards, which are on public display within hospital wards.

In the education sector, a recent Department for Education report (2013) into the efficiency of the schools system identified typical percentages of primary and secondary schools' budgets spent on staffing, and the percentage within that typically spent on support staff. It also observed that high-performing schools tend to spend relatively more of their budget on teaching as opposed to non-teaching staff. There is anecdotal evidence that school managers and improvement specialists in academy chains and local authorities are now using these metrics (percentage of budget spent on teaching staff: percentage of budget spent on all staff) as diagnostic management tools.

### International comparisons

A number of other countries have introduced statutory reporting requirements that include an HR dimension (Scraggs et al 2013). Denmark has been identified as the country that has gone furthest in the direction of requiring companies to report on their HC. In Denmark it is mandatory to include an account of the formation of the intellectual capital in company

annual reports. Almost all Danish companies include HC reporting as part of this process. Companies have a degree of latitude over how they do this, but in contrast to the UK system, the Danish Government provided detailed guidance on what such reports must include. As a result, such statements are seen as management tools for generating value and a communication tool that is valued by investors and shareholders (Scraggs et al 2013, p14). The key difference between the Danish style of reporting – which is apparently valued as a decision-making tool by investors, prospective employees and customers – and the UK reporting style – where the value of reports as a tool for comparing companies is more questionable – appears to be the extra level of mandatory detail in the Danish reports, which provides a stronger basis for making comparisons. Specifically, the Danish guidance includes examples of what reports might look like for companies from different industrial sectors; what information should be covered in each section of the report, and what a useful structure looks like; information on the main challenges in developing Intellectual Capital (IC) statements; practical examples of how these challenges were overcome in other company reports; detailed guidance on the content, structure and presentation of IC statements, including an ideal model; information on benefits of IC statements; guidance on how to embed the development of IC statements in the organisation, for example who should produce it and how the process can be quality-assured (Scraggs et al 2013, p13).

In the USA, the Society for HRM led a working party on developing guidelines on reporting human capital for the American National Standards Institute (ANSI). The draft guidance suggested that spending on human capital, ability to retain talent, the strength of the leadership talent pipeline, leadership quality evidenced by employee survey data, employee engagement and a narrative analysis explaining metrics and disclosing risks should all be reported as standard. However, these proposals were not taken forward by ANSI as a result of opposition from the business community, with critics arguing that the standards would place too great a burden on companies while being of little value to investors (Cinquegrani 2012).

Overall, then, it seems unlikely that regulatory forces will cause greater standardisation of HC metrics. HC metrics are not sufficiently valued by the investor community for companies to want to provide them as a matter of course. Politically, the drive for greater reporting on human capital came from the Liberal Democrats, who left the Coalition Government in 2015 following the Conservative Party's victory at the General Election. In the absence of demand from investors and acceptance of HC metrics standards from companies, the current UK Government is unlikely to push for further regulation that would be perceived as a burden on business.

### Best practice

In the absence of regulatory pressure to adopt a particular management practice (in this case, HC reporting), Powell and DiMaggio's seminal analysis also suggests that isomorphic pressures can come from the tendency of organisations to adopt 'best practice' models in response to uncertainty (mimetic isomorphism). 'Best practice' ideas around HC reporting come from two sources: organisations such as the International Integrated Reporting Council (IIRC 2016), which advocate and provide tools to encourage firms to adopt integrated reporting (the UK and Danish examples discussed above are examples of this style of reporting); and thought leaders from management consultancies and IT service firms who promote best practice ideas linked to the products and services that their firms sell.

## Integrated reporting

The IIRC seeks to promote integrated reporting. An integrated report is a concise periodic communication in which companies explain how they create value over time. It includes analysis and explanation of strategy, governance, performance and prospects. The purpose of integrated reporting is to complement information on short-term financial performance in order to encourage investors and corporate managements to take a longer-term view of their companies' value (CIPD 2015, p11). However, case study evidence on the way in which HC reporting using this type of framework has been received by investors is not encouraging. In the case of Halfords, investment analysts seemed uninterested in information on how HCM changes were driving improvements in the company's value (CIPD 2015, p20). It may also be the case that investment analysts are right to be sceptical. Integrated reporting may be subject to unconscious biases in managerial thinking. Managers may misunderstand the way that value has been created, paying too much attention to the contribution of their own actions and underplaying the role of factors such as luck and historical legacies. This may result in self-serving accounts which present an inaccurately rosy picture of value-creation prospects. Therefore, despite optimistic accounts that predict a coming wave of integrated reporting (Bassi et al 2015), there may be a classic chicken/egg problem. Investors will only come to understand and value HC reporting within an integrated reporting framework if it becomes relatively common practice, but in the absence of Danish-style regulation, companies have little incentive to do HC reporting if it is not valued by investors. Underpinning this lack of incentive are a set of conceptual problems about how human capital should be reported on the balance sheet. There is an emerging consensus that some form of narrative reporting is the way forward, but less consensus on how this should be done (Scraggs et al 2013). Overall, this suggests to us that the integrated reporting movement is unlikely to result in the development of a standardised approach to HC metrics and reporting without further regulatory intervention.

## Consultancy thought leadership and services

The second source of 'best practice' thinking comes from consultancies and IT service providers. It is apparent from reading the publications of research consultancies such as PwC's Saratoga and Bersin by Deloitte that consultancies are taking the ideas of academics and researcher-consultants such as Fitz-Enz and Boudreau and seeking to turn them into tools and processes that they can sell to their clients. As discussed in the previous section, these consultancies also conduct research into the extent that HC metrics are being used by organisations. This research can then be sold back to clients to provide them with benchmarks against which to evaluate their own use of HC metrics. Similarly, companies and consultancies that have practices which specialise in employee surveys (for example Gallup, Towers Watson, Mercer) also offer to benchmark company results against other companies they conduct surveys for. Software and IT service companies that provide cloud-based computing are also able to analyse the HR data they have in their clouds, so providing benchmarks for key metrics that are built into the software.

As an example of the sort of benchmarking products on offer, the US SHRM offers its members a benchmarking tool. The metrics that are available within this tool's benchmarking report offer a flavour of the HC metrics being used for benchmarking purposes. These include: revenue/FTE, measures of talent pipeline to management positions (percentage of positions at different levels of management for which there is a succession plan in place), measures of the cost-efficiency of the HR department (for example, HR to employee ratio, HR expense to FTE ratio), salary data (average salary increase, salary as a percentage of

operating costs), average employee tenure, turnover rates, cost-per-hire, time-to-fill, and percentage of FTE enrolled in pension schemes (see [www.shrm.org/resourcesandtools/business-solutions/pages/benchmarking-service.aspx](http://www.shrm.org/resourcesandtools/business-solutions/pages/benchmarking-service.aspx)).

However, as the surveys conducted by the consultancies themselves make clear (PwC 2014, Deloitte 2015), with the exception of increasingly ubiquitous employee attitude or engagement surveys, consultancy thought leadership on HC metrics does not yet seem to have resulted in widespread adoption of a standardised approach to metrics. Further, it is not clear that there is much value in the adoption of standard metrics for benchmarking purposes. Fitz-Enz was an early exponent of benchmarking, but in his most recent work he has become more sceptical, arguing that the increasingly complex and differentiated environments that organisations face mean that there is less value in benchmarking unless it is to address tightly defined problems (Fitz-Enz 2009). Similarly, Boudreau and his collaborators advocate developing metrics that contribute to strategic analytics programmes instead of adopting a standard set of metrics. (Boudreau and Jesusthasan 2011, Boudreau and Ramstad 2007). Drawing on the UK experience, Baron (2011) makes similar arguments. Overall, then, there appears to be limited evidence of best practice thinking promoting the growth of standard HC metrics (with the possible exception of engagement metrics); indeed, best practice thinking may be moving away from the idea of a standard set of metrics towards notions of best practice based around bespoke metrics following from HC analytics programmes.

## Culture

It is clear that professional bodies on both sides of the Atlantic are keen to see the use of metrics and analytics become embedded within the culture of the HR profession, with both the CIPD and SHRM producing publications and activities to promote the use of HC metrics (SHRM/Economist Intelligent Unit 2016, CIPD 2013). However, these professional bodies recognise that they have a long way to go on this, because the culture of the HR profession has historically been one of reticence towards the use of metrics that might be construed to dehumanise or commodify the workforce without sufficient regard to contextual information. This culture might be said to be founded upon HR/personnel traditions of staff welfare and a long-established concern for upholding corporate governance with regard to fair and reasonable conditions of employment for employees as organisational stakeholders. They are also still thinking through issues of what sort of approaches to metrics and analytics should be promoted, and how this should be done. (Of course, this review is a contribution to this process.) This means that in the near term at least, professional culture is not likely to result in significant moves towards standardisation.

## Summary

There are only limited pressures driving or encouraging organisations to adopt a standard approach to HC metrics and reporting. Consequently, current trends in HC reporting are unlikely to lead to the emergence of common metrics and standards, because regulation and normative best practice both focus on promoting HC reporting through integrated narrative accounts, which explain how intangible assets contribute to the value of the business. Yet, based on current evidence, it is not clear if this style of reporting will result in evidence that is consistent enough for investors and other stakeholders to use it to make comparisons between companies, or within companies over time. Neither is there much evidence that investors place much value on this sort of reporting.

However, if changing professional norms and best practice ideas lead to the spread of HR analytics programmes, this may in time contribute to the emergence of more widespread reporting of HC metrics in a more standardised way. This is because analytics gives organisations the tools to identify the key metrics that are important to their business in a way that can be explained in the narrative style of integrative reporting. Companies can then report the metrics that matter to their business in a way that investors and stakeholders can track over time. If the underlying analysis is accurate, changes in metrics should be predictive of changes in business performance with the result that investors come to value the reporting of metrics, causing more companies to identify and report their key HC metrics. Of course, over time, the key strategic objectives of a company will change and as such the key (that is, relevant) HC metrics will also need to change. The key point is that if companies are to be able to report on the contribution that their human capital makes to the value of the company, they will need to become more adept at using rigorous methods to identify what that value is.

# Conclusions

This literature review began by explaining definitions and conceptualisations of human and social capital. It noted that definitions of these terms in economics and a lesser extent sociology are rooted in methodological individualism. A key problem with this approach from the perspective of managerial action is that it treats organisations as ‘black boxes’, when from a managerial perspective, what is interesting is understanding what happens within the black box. Consequently, within the field of management research, the focus is on how human capital can be a source of value, and breaking human capital down into constituent components, for example knowledge, skills, attitudes and other characteristics. A key point here is that how workers will respond to investments in their human capital is not always clear (the so-called indeterminacy of labour problem). This is a key reason why organisations do not make greater use of ROI analysis and cost–benefit analysis when making decisions over human capital investments; it is difficult to reach consensus on the assumptions that underpin such modelling. As a result, there has to date been little demand from investors for firms to adopt a standardised approach to human capital reporting, despite efforts to promote best practice in human capital reporting. Instead of following a standardised approach to HC metrics and reporting, much of the literature argues that organisations should develop analytics programmes and associated HC metrics that help them to create value by addressing the questions that are of critical importance in their own specific context. However, the evidence we have collected suggests that most organisations have made only limited progress towards implementing this theory. Underpinning this lack of progress are a lack of skills and, more fundamentally, understanding about data and analytics on the part of the HR profession alongside technical problems related to data organisation and governance, which in many organisations have proved costly and time-consuming to solve.

Our analysis of existing evidence on the implementation of HC metrics points to a number of areas where future research would be useful to further understand how and why HC metrics are being adopted (or not being adopted) by organisations. Despite the maturity of theory and ideas around how HC metrics should be used, there is a lack of high-quality evidence on what HC metrics are being used and for what purpose. High-quality survey evidence is needed to fill this gap in understanding:

- There is also a lack of evidence on the praxis of HC metrics and analytics. Why are firms adopting particular models or approaches to using HC metrics? Why hasn't more progress been made in the development of strategic and predictive HR analytics? Institutionally (history, intellectual and human capital), what sets apart those organisations that have made path-breaking progress in the use of HC metrics and analytics? Carefully designed case study research could shed light on these questions of causality.
- Higher-quality survey evidence, based on national probability samples rather than samples of convenience, could also shed light on what metrics are being used, for what purpose, using what tools and systems.
- Comparative case study research (comparing HC metrics and analytics practices in similar organisations located in different countries, for example Denmark and the UK) could also shed light on the role of regulatory differences in promoting different practices and outcomes. It is perhaps not a coincidence that one of the most widely

cited examples of successful HR analytics, Maersk Drilling (Rasmussen and Ulrich 2015), is headquartered in Denmark, where statutory requirements for HC reporting are most developed.

- There is a worrying lack of research into the ethical consequences of the more widespread use of HC metrics and analytics, given Ton's (2009) evidence of the way in which the adoption of HC metrics and analytics can promote the increased commodification of labour with resulting increases in casualisation and insecurity – this is surely an area where more thought and debate is needed.

Overall, the more widespread metrification of human capital could have a range of possible consequences. These might include: an end to discretion; increasing inequality and insecurity as algorithms find ways to pare labour to the bone while exerting ever greater control over worker behaviour (Haque 2015); or, from a more positive perspective, more efficient and profitable businesses enjoying success through more engaged and effective people (Bock 2015). It is in all of our interests to better understand how to promote the positive vision.

## Limitations

The methodology applied in this report, as detailed in appendix 3 was selected because it offered a broad scope that enables the reader to consider insights and conclusions from a variety of sources. The resources available to conduct this review resulted in a number of limitations:

- A time span of 2005 – 2016 was chosen because this period saw a considerable growth in the number of publications within the analytics domain; however, emerging concepts may have been missed if they were published before 2005.
- Most of the case studies reviewed lacked transparency on the data and methods underpinning them and were weak methodologically. There are limits to the inferences that can be drawn through a review of a literature which suffers from these limitations.

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# Appendix 1: Examples of HC metrics

**Table A1: Human resource management processes requiring measurement**

HR process	Sample process measures	References
Recruitment and selection	<p><b>Measures of activity</b>            Number of vacancies recruited for            Fulfilment of vacancies internally            Quantity recruited            Permanent/temporary jobs recruited for            Full-time/part-time jobs recruited for            Positions with ready candidate            Number of people interviewed            External hire rate (executive, management, other) (number as percentage of headcount)</p> <p><b>Measures of efficiency and effectiveness</b>            Time to recruit (compared with market benchmark) (executive, management, other)            Time to start            Adherence to ethical code (for example diversity, fairness of process)            Offer acceptance rate            Effectiveness of rehiring experienced workers (rehire rate)            Cost per hire breakdown (advertising, agency, referral bonus, travel, relocation, internal)            Cost of recruitment            Sufficiency of appropriate candidates for selection            Direct cost of unfilled post            Indirect cost of unfilled post            Direct cost to replace key (senior) individual            Indirect cost to replace key (senior) individual            Proportion of first option candidates accepting positions            Offer acceptance rate            Extent of recruitment ease/difficulty (by role/professional area or hierarchical-level group)            90-day turnover rate (voluntary/involuntary)            First-year resignation rate            External cost per hire</p>	<p>Aldrich (2008), Bassi (2011), Bassi and McMurrer (2005), Boudreau and Jesuthasan (2011), Center for Talent Reporting (2016), CIPD (2011), Deutsche Bank (2013), Fitz-Enz (2002), Huus (2015), Lawler et al (2004), Meredith et al (2005), Mouritsen et al (2004), O'Donnell et al (2009), Royal and O'Donnell (2008), Stiles and Kulvisaechana (2003)</p>

	<p><b>Measures related to organisational performance</b>  Quality of recruits/effectiveness of new hires (percentage of high-performers)  Quality of recruits by educational level  First-year turnover  New-hire failure rate  New-hire performance satisfaction  Effectiveness of recruitment for key strategic objectives</p> <p><b>Miscellaneous</b>  Comparison of T&amp;Cs with competitors  Effectiveness of induction process  Employment brand strength  Recruitment source breakdown  Strength of internal labour market  Diversity hire rate (see diversity)</p>	
Retention and separation	<p><b>Measures of activity</b>  Staff turnover (compared with market benchmark)  Turnover of high-performers  Length of service/tenure breakdown  Average length of service (by region/division)  Average years of experience  Retention rate  Employee retention index  Number of dishonesty terminations  Resignations by length of service  Turnover of employees in key positions  Proportion of team leavers that are female  Proportion of team leavers that are BAME  First-year (involuntary) turnover rate  Voluntary turnover rate (executive, management, other)  Involuntary turnover rate (executive, management, other)  Resignation rate (by length of tenure and age)  Retirement rate  Average retirement age  Quarterly, half-yearly and yearly staff turnover  Quarterly, half-yearly and yearly expert turnover  Workforce stability  Overall percentage of leavers by business area/departments (enabling trends)</p> <p><b>Measures of efficiency and effectiveness</b>  Effectiveness of processes to retain high-performers</p>	Bassi and McMurrer (2005), Center for Talent Reporting (2016), CIPD (2011), Creelman (2007), Deutsche Bank (2013), Douthit and Mondore (2014), Edwards and Edwards (2016), Fitz-Enz (2002), Holbeche (2014), HRMA (2014), Huus (2015), Lawler et al (2004), Likierman (2005, 2007), Lim et al (2010), Meredith et al (2005), Rasmussen and Ulrich (2015), Stiles and Kulvisaechana (2003)

	<p>Effectiveness of initiatives to retain key skills/knowledge  Cost of voluntary turnover</p> <p><b>Measures of organisational performance</b>  Performance measures broken down by tenure</p> <p><b>Miscellaneous</b>  Composition of termination reasons  Comparison between reward packages  Thematic reasons for leaving  Percentage of leavers by diversity criteria</p>	
<p>Learning and development (L&amp;D)</p>	<p><b>Measures of activity</b>  Annual training hours per employee  Spend per employee on L&amp;D  Percentage of employees with a development plan  Training initiatives for priority skills gap  Per capita annual cost of training, communication and support programmes  Spend on training as a proportion of profit  Spend on training as a proportion of payroll  Investment in training as a percentage of sales  Percentage of employees receiving training  Number of employees with competency development plans  L&amp;D costs as percentage of labour costs  L&amp;D costs as percentage of revenue  L&amp;D hours per FTE  L&amp;D investment per FTE  Number of FTE for each FTE working in L&amp;D  Overall cost of training and development activities</p> <p><b>Measures of efficiency and effectiveness</b>  Effectiveness of learning management system  Adequate provision of training for job  Quality of training measures  Instances of misconduct/litigation resulting from inadequate training  Effectiveness of e-learning programmes  Participant satisfaction levels with training activities  Supervisor evaluation of employee performance post-training</p>	<p>Algorta and Zeballos (2011), Bassi and McMurrer (2005), Holbeche (2014), HRMA (2014), Boudreau and Jesuthasan (2011), Center for Talent Reporting (2016), CIPD (2011), Hoffman et al (2012), Lengnick-Hall and Lengnick-Hall (2003), Mouritsen et al (2004), Ulrich and Smallwood (2004)</p>

	<p>Impact evaluation measures of training post-event</p> <p><b>Measure of organisational performance</b>  Effectiveness of training (for example return on investment tracked over time)  Effectiveness of quality improvement initiatives (for example TQM)  Generation of impactful ideas</p> <p><b>Miscellaneous</b>  Leadership support for L&amp;D</p>	
Remuneration	<p><b>Descriptive measures</b>  Remuneration costs  Labour costs  Labour costs per FTE  Labour cost as percentage of revenue  Labour cost as percentage of operating costs  Benefits as percentage of total compensation  Segmented breakdown of individual total rewards  Average compensation/annual salary per employee  Pay differentials  Average annual salary per FTE  Number provided with a particular benefit  Direct compensation cost operating expense rate</p> <p><b>Measures of efficiency and effectiveness</b>  Effectiveness of remuneration process (for example consistent with effort and expectations for recruitment, retention, motivation, and so on)  Pay competitiveness (for example against industry benchmarks)  Individual-revenue generation: compensation ratio  Bonus payments compared with individual performance  Bonus payments compared with team performance  Compensation satisfaction index</p>	<p>Aldrich (2008), Bassi (2011), Boudreau and Jesuthasan (2011), Center for Talent Reporting (2016), CIPD (2011), Deutsche Bank (2013), Fitz-Enz (2002), HRMA (2014), Huus (2015), Lawler et al (2004), Meredith et al (2005), Widener (2006)</p>
Talent management and development (TD)	<p><b>Measures of activity</b>  Turnover of high-performers  Revenue per high-performing employee  Number selected for internal transfers/promotions  Condition of talent (relevant competencies)</p>	<p>Aldrich (2008), Bassi and McMurrer (2005), Boudreau and Jesuthasan (2011), Edwards and Edwards (2016), Huus</p>

	<p>Promotion speed ratio Retention rate Number of employees who believe they can develop internally Proportion of employees promoted that are female Proportion of employees promoted that are BAME Quarterly, half-yearly and yearly expert turnover Overall cost of talent development</p> <p><b>Measures of efficiency and effectiveness</b> Effectiveness of TD process Time to develop to lead role/high performance level Quality of 'talent' in the managerial pipeline</p> <p><b>Measures of organisational performance</b> Value of talent (for example chargeable rate) Asset values of key employees</p> <p><b>Miscellaneous</b> Recommendation index by 'top talent'</p>	<p>(2015), Lawler (2009), Lim et al (2010), Meredith et al (2005), Mouritsen et al (2004), Rasmussen and Ulrich (2015)</p>
Performance/capability management	<p><b>Descriptive measures</b> Performance distribution Average time to promotion Total promotions/total transfers Competency levels (including speed) Skills inventory New-hire performance satisfaction Percentage of staff working at acceptable performance level Extent to which workforce have competencies to deliver business strategy Measures of good customer relations with targeted customers Performance measures broken down by background experience (for example internally trained vs externally trained) Number of employees with competency development plans Career path ratio (employees moving upwards : all employee moves) Average years of experience Average educational level of workforce at each level Workforce competence profile</p>	<p>Bassi and McMurrer (2005), Center for Talent Reporting (2016), Fitz-Enz (2002), Hoffman et al (2012), Holbeche (2014), HRMA (2014), Huus (2015), Lawler (2009), Lawler et al (2004), Lim et al (2010), Meredith et al (2005), Mondore et al (2011), Mouritsen et al (2004), O'Donnell et al (2009), Rasmussen and Ulrich (2015), Ulrich and Smallwood (2004)</p>

	<p><b>Measures of efficiency and effectiveness</b>  Effectiveness of PM process (including fairness and appropriate standards)  Effectiveness of feedback  Proportion of performance management and appraisal systems aligned to strategy  Percentage of performance appraisals held on time (by functional area)  Percentage of personal development plans complying with business plan  Percentage of personal development plans achieved (by functional area)</p> <p><b>Measures of organisational performance</b>  Productivity measures – revenue/operating cost per employee</p> <p><b>Miscellaneous</b>  Employees’ assessment of colleagues’ interpersonal skills</p>	
<p>Workforce planning and optimisation</p>	<p><b>Descriptive measures</b>  Number of roles with job designs/definitions (accountability, responsibility)  Job heat map (to identify ‘key’ jobs)  Predictability of work requirements  Adequacy of working conditions  Overtime control measures  Skills inventory compared with skills requirements  Innovation skills levels  Proportion of key ‘strategic heart’ staff to operational support and reserve staff  Overtime hours per headcount  Maximisation and utilisation of staff capacity  Number or percentage of FT, contract or temporary staff  Workforce stability</p> <p><b>Measures of efficiency and effectiveness</b>  Workforce planning process continual process improvement  Extent and quality of internal labour market modelling  Effectiveness of matching supply and demand  Timely publication of schedules  Effectiveness of talent utilisation</p>	<p>Aldrich (2008), Bassi and McMurrer (2005), Center for Talent Reporting (2016), Fitz-Enz (2002), Hoffman et al (2012), HRMA (2014), Huus (2015), Lawler (2009), Lim et al (2010), O’Donnell et al (2009)</p>

Engagement/culture	<p><b>Descriptive measures</b>  Staff engagement levels (compared with market benchmark)  Measures of time pressures and work quality  Employee engagement index  Attendance/absence rate  Causes of absences  Cost of absenteeism  Supportiveness of workers to each other  Organisational commitment levels  Measures of sharing of strategic mission  Positivity of staff  Engagement scores by gender within teams  Engagement scores by BAME within teams  Staff satisfaction index  Motivational index  Commitment to management initiatives (for example TQM, KM, liP, EFQM)</p> <p><b>Measures of efficiency and effectiveness</b>  Effectiveness of processes to engage staff  Impact of intrinsic reward elements on engagement</p> <p><b>Miscellaneous</b>  Employee-produced photos  Employee free-text comments  Psychometric data  Proportion of key employees engaged in community development projects</p>	Bassi (2011), Bassi and McMurrer (2005), Boudreau and Jesuthasan (2011), CIPD (2011), Edwards and Edwards (2016), Hoffman et al (2012), Holbeche (2014), Huus (2015), Lawler et al (2004), Lim et al (2010), Lopes (2010), Meredith et al (2005), O'Donnell et al (2009), Russell and Bennett (2015), Sparrow et al (2010), Stiles and Kulvisaechana (2003), Ulrich and Smallwood (2004)
Diversity management	<p><b>Descriptive measures</b>  Workforce demographics/diversity distribution (age, gender, tenure, disability, sexual orientation, and so on)  Pay differentials by diversity criteria  Promotion rate by diversity criteria  Participation in L&amp;D by diversity criteria  Participation in KM activities by diversity criteria  Relationship between values by diversity groups and organisational values  Full-time/part-time jobs recruited for  Age staffing breakdown  Average age of management and operational staff  Gender staffing breakdown  Staffing rate +50 years of age  Staffing breakdown at employment level  Staffing rate – part-time</p>	Deutsche Bank (2013), Douthit and Mondore (2014), Holbeche (2014), HRMA (2014), Huus (2015), Lengnick-Hall and Lengnick-Hall (2003), Lim et al (2010), Meredith et al (2005), O'Donnell et al (2009), Russell and Bennett (2015), Sparrow et al (2010), Stiles and Kulvisaechana (2003)

	<p>Staffing rate – temporary  Staffing rate – less than one year  Staffing breakdown – organisational tenure  Team dynamics – personality type breakdown  Percentage of managers of different nationality from company registry  Diversity of employees in pipeline  Percentage of team members that are female  Percentage of team members that are BAME  Proportion of employees promoted that are female  Proportion of employees promoted that are BAME  Proportion of team-leavers that are female  Proportion of team-leavers that are BAME  Engagement scores by gender within teams  Engagement scores by BAME within teams  Percentage diversity (at executive level, management level, other levels)  Ratio of men to women in management  Percentage of leavers by diversity criteria  Number of grievances raised relating to diversity issues</p> <p><b>Measures of efficiency and effectiveness</b>  Effectiveness of diversity policy across HR processes (for example recruitment, L&amp;D)  Participation in diversity and ethics training</p> <p><b>Measures of organisational performance</b>  Impact of older workers on performance</p>	
<p>People leadership/leadership development</p>	<p><b>Measures of activity</b>  Leader communication skills levels  Supervisory skills/manager effectiveness levels (including internal ratings by staff)  Cost of management communications  Span of control: number of employees per manager  Ratio of HR staff to all employees  Overall cost of leadership development</p> <p><b>Measures of efficiency and effectiveness</b>  Effectiveness of leadership development</p>	<p>Bassi and McMurrer (2005), Center for Talent Reporting (2016), Fitz-Enz (2002), Hoffman et al (2012), Holbeche (2014), HRMA (2014), Huus (2015), Lawler et al (2004), Meredith et al (2005), Mouritsen et al (2004), Ulrich</p>

	<p>Effectiveness in motivating workers  Effectiveness at giving feedback  Effectiveness at communicating expectations  Effectiveness at communicating strategic objectives  Reduction of people/process/project costs broken down by manager  Leadership competence  Prevalence of leadership development plan  Number of employees who see their immediate superiors as being capable of motivating them satisfactorily  Capability of top leadership</p>	and Smallwood (2004)
Employment relations	<p><b>Measures of activity</b>  Days lost to industrial action  Effectiveness of employment relations activities  Number of grievances raised  Number of grievances resolved  Number of contracts negotiated  Union membership as percentage of employees  Number of employment tribunals</p>	Creelman (2007), Fitz-Enz (2002), Holbeche (2014), HRMA (2014)
Knowledge management (KM)	<p><b>Measures of activity</b>  Evidence of collaboration  Evidence of sharing of impactful ideas  Extent of interpersonal knowledge-sharing  New patents per employee  Quantity of innovative ideas  Number of employees on job rotation</p> <p><b>Measures of efficiency and effectiveness</b>  Effectiveness of inter-organisational knowledge-sharing  Effectiveness of KM systems/tools  Effectiveness of incentives to use KM systems</p> <p><b>Miscellaneous</b>  Quality of innovative ideas  Qualitative data on knowledge-sharing culture</p>	Bassi and McMurrer (2005), Fitz-Enz (2002), Hoffman et al (2012), Mouritsen et al (2004), O'Donnell et al (2009), Ulrich and Smallwood (2004)
Health and safety (H&S) and absenteeism	<p><b>Measures of activity</b>  Number of accidents reported  Causes of accidents  Attendance/absence rate  Unscheduled absence rate  Causes of absences</p>	Creelman (2007), CIPD (2011), Holbeche (2014), Lopes (2010), Meredith et al (2005), Mondore et

	<p>Impact of wellness element of remuneration on retention levels  Percentage of staff trained in H&amp;S  Measures of work–life balance  Perception of safety at work  Proportion of key employees using work–life programmes  Participation in safety and security programmes  Percentage of days lost as a result of stress-related absence  Average number of days lost per employee  Measures related to provision of occupational health facilities</p> <p><b>Measures of efficiency and effectiveness</b>  Cost of accidents  Cost of absenteeism  Compensation value of unscheduled absences  Cost of stress-related absenteeism  Absence management process effectiveness measures</p>	<p>al (2011), O'Donnell et al (2009)</p>
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# Appendix 2: Summary of case studies

## Part 1: Case studies related to HRM decision-making

Organisation/team	Case study highlights	Reference
ArcelorMittal	Reports on succession planning being addressed through thoughtful design of appropriate performance measures and analysis of the resultant data to identify talent (that is, potential successors).	Hesketh (2014a)
BNY Mellon	In this article the chief HR officer of BNY Mellon explains how people analytics are used to understand the relationship between the effectiveness of employee engagement and learning/development programmes and the 'success' and satisfaction of employees. Central to the effective employment of data analytics is the posing of a question or questions of most importance to the business strategy of the organisation at that specific moment in time.	Herena (2016)
Cadence Health	To decide whether to develop talent internally or recruit it from outside, data were collected and analysed. This enabled comparison between the cost-effectiveness of alternative initiatives.	HCMI (2016d)
Cisco	This case study that draws on Bersin's HR Analytics Maturity Model and reports on how the company's requirement to recruit between 12,000 and 15,000 people each year in a cost-effective way is supported by talent analytics. The case study reveals that both internal data and external data are used within the analytical process. This external data included both freely available data from the Internet and data provided by specific Internet providers of big data, including LinkedIn and Google. The team used this data to create talent maps showing where people with specific skills were located so that campaigns could be targeted at those areas. The experience of the team also revealed that information relating to their own employees was often more reliable if taken from external rather than internal sources, as <i>'people are more likely to keep their LinkedIn entry up to date'</i> . The key learning from this case study is that HR teams looking to use data to support their HR decision-making should consider what data is available from external sources as well as from internal sources.	Milne (2015a)
Croydon Council (local government)	Reports on how HR analytics were used to support HRM decision-making in relation to cost-saving strategic objectives. HC data (for example number of part-time staff, shift patterns) were analysed to support workspace requirements for staff at the	Chynoweth (2015)

	time of a building move and to identify staff for redundancy.	
Dow Corning	HC data was used to address issues of organisational culture in support of change management initiatives. Specifically, data on employee retention within different parts of the business were analysed, leading to strategic action to address cultural misalignment.	Holbeche (2014)
Frito-Lay (PepsiCo)	Illustrates how analysis of individual HC data, specifically past experience in other companies, combined with corresponding performance data enabled improvement in the effectiveness of the recruitment (into sales-related roles) process.	Levenson (2011)
Google	Supports a research-oriented approach to addressing HRM issues, that is, asking research questions and collecting rigorous data for thoughtful analysis, giving consideration to alternative interpretations. Specific examples included analysis of recruitment and performance data revealing that the optimum number of interviews before recruitment into Google was four; that assessment of education received and learning capability were more important than educational grades.	Knowledge@Wharton (2016)
JetBlue (airline)	Analysis of customer satisfaction data revealed that being helpful was more important to customers than being nice. As a result, the recruitment process was reengineered (to recruit workers who were better aligned with the requirements of the business) and measurable benefits included higher staff retention and engagement.	Knowledge@Wharton (2015)
Johnson & Johnson	In this interview, the chief HR officer of Johnson & Johnson gives examples of how HR analytics were used to support HR decision-making. 1) A question addressed was whether to focus on recruiting young talent straight from colleges or experienced people. The analytics showed that during the first year, experienced people were more productive but that after two years the lines crossed and college recruits were more productive and retention rates and promotability were higher. As a result, J&J shifted their recruitment policy to reflect the need for longer-term advantage. Thus the analysis revealed that for short-term needs, experienced people should be recruited, but that longer-term needs were better met by recruiting from colleges. 2) Another question addressed was whether there was a relationship between differentiated reward and retention. The analytics showed that payment of 'special off-cycle equity grants or off-cycle retention grants' to high-flyers resulted in higher retention rates. Thus the analysis revealed that	Weisul (2016)

	retention of talent can result from flexibility in remuneration.	
Liverpool Victoria Insurance (LV=)	Data previously collected was analysed to identify how far workers at different levels were prepared to travel to work. By overlaying commute data onto a map, areas were identified to target future recruitment campaigns for different types of worker. This resulted in more cost-effective recruitment advertising.	Churchard (2013)
Luxottica Retail	Analysis of workforce turnover data within the Sunglass Hut part of the business showed that 70% of turnover was in the first three months after recruitment. This led to changes in the recruitment processes which had been designed for other parts of the business but which had fundamental differences in the competency requirements. New competencies were introduced to the Sunglass Hut recruitment process and reductions in staff turnover ensued.	Hoffman et al (2012)
Maersk Drilling	Reports on how qualitative and quantitative data was collected relating to a number of business questions that had an HC element to them (for example what explains variance in performance between oil rigs?). The collected data was analysed and issues identified for addressing (for example relating to leadership quality, crew competence, environmental performance and operational performance). The case study also reports on data being collected to better understand a specific HR issue of being unable to fill specialist job vacancies. This data was analysed to show that workers emerging from the company graduate programme for specialists were 'better' than 'their peer group'. These findings supported strategic decision-making to internally build talent rather than recruit it from outside.	Rasmussen and Ulrich (2015)
Microsoft	Reports on a four-step process followed by Microsoft's HR Business Insights Team to ' <i>collect, define, analyse and derive actionable insights from data</i> '. These actionable insights, as reported here, relate to the core HR concerns of recruitment and retention. As such it provides a structured model to follow to improve the performance of the HR function using data.	Hesketh (2014b)
Nestlé	Analytics was used to better understand the high staffing attrition rates. The analysis enabled the construction of a profile of the people who were choosing to leave the company. It was discovered that there were particularly high attrition rates in one particular division which had a different business model from the main business. They also discovered that women were leaving at a higher rate than men, even when maternity reasons were excluded from the data. As a result, changes in HR	Milne (2015c)

	policy and practice were implemented. Study illustrates how analysis of people data can be used to understand reasons for staff leaving by noticing data correlations, and confirming (or ruling out) possible reasons.	
Nielsen	Reports on how data collected from one area of HR practice (that is, internal transfers) was used to address a live issue (as indicated by other data) within another area of HR practice (that is, retention). Through analysis it was discovered that there was a 48% higher likelihood that a manager taking on a new role would remain in the company than a manager who had been in the same role for three years. As a result the company placed a spotlight on lateral moves and incorporated discussion on lateral moves into all talent reviews. As a result the number of lateral moves significantly increased and this is considered as the reason for a halving of the voluntary attrition rate within one year (2015–16).	Green (2016)
Opower	This case study account outlines the application of specific analytical techniques (Bersin) to recruitment of 'talent'. It reports on the integration of recruitment and broader HR data to support the recruitment strategy and broader and more cohesive 'people' strategy. Stresses the importance of defining success and setting goals, then measuring accordingly, and involving a data analyst in HR strategy meetings	Opower (2016)
Sprint	Individualised quantitative performance metrics of customer service workers were analysed alongside qualitative observational data to identify areas for performance improvement. Subsequently, group-level development plans were produced and implemented.	Hoffman et al (2012)
SSE	Web article reports on how SSE worked with PwC to measure the value of people assets and the 'value drivers' for people development (that is, training programmes, in-house labour-sourcing interventions). Demonstrates how the use of accountancy techniques to place a value on 'people assets' might support justification of investment in people initiatives.	Jacobs (2016)
Travelex	This case study reports on the early benefits from an initiative to use 'big data' collected and analysed using a cloud-based HR system to address HR issues. An example given is loss of staff, and how this was being addressed by predicting the next moves of employees and intervening to militate against exits of key talent.	Lewis (2016)
Unilever	Reports on how people measures are being used to fine-tune Unilever's recruitment activities and to understand how successful their employer branding is. The podcast reports on 78 core HR metrics that	Hesketh (2014c), Valuing your Talent (2016e)

	are collected and analysed along with people survey data and talent management information. Of particular significance is the suggestion that by collecting data over time to build up patterns and trends, the usefulness of that data for decision-making will increase.	
Unnamed software company – executive team	Managers in strategic positions were subjected to a skills inventory measurement process. This identified weaknesses in strategic management skills, specifically innovation and collaboration as a management group. This precipitated learning and development and outplacement actions that addressed these identified weaknesses. Subsequently, the company’s competitive performance improved.	Russell and Bennett (2015)
Unnamed US retailer	Analysis of HR data revealed that increasing staffing levels in this retail store chain resulted in improved service quality, and increased sales and profitability. The suggestion is made that labour should not be treated as a cost to be minimised because productivity depends on quality as well as cost: by spending more on labour, service quality might be raised and profits increased, that is, via data analytics the workforce size might be optimised.	Ton (2009)
Unstated charity	Article reports on how HC measures were used to reveal the key underlying issue behind a specific HR issue (Monday absenteeism). Survey data were analysed, revealing to management that an ongoing change management programme was inducing stress. As a result a training initiative for managers leading the change was implemented.	Churchard (2013)
Virgin Media	Analytics was used at this telecommunications company to address a significant issue with absenteeism within call centres. Data showed that, even though engagement levels were high and there was low attrition of staff, absence rates were high. Data analysis uncovered that there was a lack of knowledge about absence policy and staff were taking advantage of slack implementation of the policy. As a result of subsequent changes made, staff absence rates fell from 9% to 4%. This study illustrates that multiple factors need to be considered to address HR issues. By asking the right questions, a range of possible reasons can be considered and rejected or confirmed.	Milne (2015b)

## Part 2: Academic published case studies related to analysis and analytical frameworks

Organisation/team	Case study highlights	Reference
American Standard Companies Inc.	This case study reports on management appreciation of the value of an HC scorecard system having been implemented. This scorecard was specifically used to compare performance across sales offices. The process of using this model encouraged investment in HC practices because of the <i>'compelling evidence on the bottom line that results from improved development and management'</i> .	Bassi and McMurrer (2005)
Australian Department of Defence	This case study aimed to demonstrate how subjective self-ratings of employees as to their individual 'HC' (ostensibly knowledge/capability) might be converted from 'assessments' to objective 'measurements' by considering 'other ratings' as a way of validating the 'self-ratings'. In this case study (which was designed to build theory), it was found that self-ratings of HC value might be enhanced by 10%.	Massingham et al (2011)
Harley-Davidson Motor Company	Descriptive case study account that outlines the use of Accenture's Human Capital Development Framework to review current approach to HR and develop a 'comprehensive' human capital strategy.	Scott et al (2006)
Khazanah Nasional Berhad (strategic investment arm of Malaysian government)	Reports on the use of measurements to support the organisation's objective of developing a leadership talent pool <i>'equipped to deal with a myriad of business models, challenges, and cultures'</i> . Analytics were used to demonstrate an emerging gap in leadership talent and the relationship between that and the measured effectiveness of leadership development programmes.	Boudreau and Jesuthasan (2011)
Qantas	Reports on HR analytics as a driver of and a measuring tool to support organisational change. This is an account of a nine-year organisational transformation project centred on the collection of HC data to produce a consistent metric across business units: unit labour cost per available seat kilometre. This metric was calculated via a scorecard approach that analysed data on: labour costs (headcount and pay rates); cost drivers (eliminating unnecessary work); and productivity (process redesign, automation, human capability improvement). The authors claim <i>'analytics successfully guided this transition'</i> .	Hoffman et al (2012)
SAP America	Documents how a systematic framework approach might be used in practice. Specifically, it reports on implementation of Accenture's four-tier Human Capital Development Framework, outlining the benefits of using this particular framework, with reference to its use at other organisations (for example Harley-Davidson).	Cantrell et al (2006)

Standard Chartered Bank	Reports on use of a human capital scorecard to report to senior management on human capital measurements. It is argued that this scorecard <i>'provides detailed insights into how well the bank is managing people capability and provides early warning signals of areas that need to be improved before they become major challenges'</i> . Emphasises the importance of: (i) measuring what adds value rather than what is easy to measure; (ii) ensuring all data is valid so as not to undermine scorecard validity; and (iii) integrated analysis of measures.	Whitaker and Wilson (2007)
Skandia	This Swedish investment services company has used a set of HC measures for at least 20 years. The case study highlights the benefit of building up data over time for comparison.	Lengnick-Hall and Lengnick-Hall (2003)
Unspecified retailer	Reports on how HR analytics were used to a specific business issue: the loss of saleable products due to damage or theft by employees and non-employees (that is, 'product shrink'). Cause-effect relationships were established between HR processes and product shrink using structural equations modelling (SEM). The analysis revealed key drivers included: manager competency performance ratings, number and location of terminations on grounds of dishonesty, and participation in courses on ethics. Subsequently key drivers of product shrink were added to the HR scorecard and improvement goals set. Cases for investments in these drivers were made, with ROI calculations, and as a result product shrink was reduced substantially.	Douthit and Mondore (2014)

### Part 3: Case studies related to human capital reporting

Organisation/team	Case study highlights	Reference
CapGemini	Reports on how effective reporting of HR data increases enthusiasm for having such data available. The study concerns the reporting of human capital data to senior management via a bespoke tool that enforces consistency of data capture. Key data built into the system includes staff attrition, and data related to talent management and learning and development. Since implementation, the appetite for data has increased and new initiatives by the HR team have been provoked.	Valuing your Talent (2016b)
Coca-Cola	Reports on how people data analytics was given greater emphasis. Although an out-of-the-box system was implemented with standard metrics (replacing a bespoke system), the case study emphasises that the time and expense associated with collecting useful data for reporting should not	Valuing your Talent (2016c)

	be underestimated. The article suggests that out-of-the-box reporting systems using standard metrics might be more beneficial than bespoke systems, even in large organisations.	
Gap	Reports on an analytics initiative at a clothing retailer. A workforce analytics team worked with and trained the company's HR professionals in workforce data collection and reporting. Central to the purpose of the training was to ensure consistency of data collection across the different parts (that is, brands) of the business. Specifically emphasis was placed on collecting metrics related to recruitment, departures, demographics, learning and development, and internal mobility. As a result consistent reporting to senior management via reporting dashboards produced by software that was inscribed with analytical capabilities. We might learn from this that to implement workforce analytics so that it is useful to managers making decisions, it is essential to invest in the design and implementation of appropriate training over a sustained period of time.	Re:Work (2016)
Halfords	This case study demonstrates: (i) how a focus on HC can help to improve performance, and (ii) how the investment community is apparently reluctant to consider HC as central to their investment decision-making. Halfords, a specialist retailer of leisure (for example bicycles) and car products had a high turnover of staff and yet it was recognised that this business relied upon expert advice and service from the employed sales staff. An HC-centric strategy was devised to transform the company's performance, focusing on recruitment, training and development, and engagement. When this strategy was announced to the investor community, the company's share price went down considerably and very few of the investors appeared to see the value in the HCM strategy narrative, instead asking questions unconnected to the strategy. Sales subsequently improved as did the share price, as the company reported that staff turnover had fallen from 21% to 10% and engagement had risen from 64% to 80% in the first year of the HCM strategy.	CIPD (2015), Valuing your Talent (2016a)
Maxon Telecom	In this case study, multiple HC or HC-related measurements are reported upon within the company's intellectual capital statement that is published as an addendum to the financial statement. Each measure relates to a different prevailing management challenge relating to strategy: product development; improvement of personal skills; ensuring products are on time; creating knowledge of and competencies within current and future technologies. The following conclusions are made:	Mouritsen et al (2004)

	<ul style="list-style-type: none"> <li>• The intellectual capital statement (containing HC indicators) functions as: (i) a communication tool to inform (potential) investors, employees, partners, and customers on how the company develops its knowledge resources to generate value, and (ii) an internal management mechanism by which knowledge management activities can be systematised and developed.</li> <li>• Measurements help the company to develop information/knowledge about its strategic progress, aiding decision-making 'towards a better future'.</li> <li>• The discipline of reporting on human capital for the investment community ensures the capture of HC data, which might then be used by management in decision-making.</li> </ul>	
Royal Bank of Scotland (RBS)	<p>This study reports on the strategic value of conducting an employee survey and analysing the data using specialist HR analytics expertise. Focuses on the use of RBS's global employment survey. The results from the survey were summarised for management with key contextualised indices: employee engagement; leadership effectiveness; talent effectiveness; and risk effectiveness. Through analysis done by a specialist HR analytics team with analytical skills, it was possible to identify a category of key workers who were <i>'striving but inclined to leave'</i>. Analysis of other data illustrated to management that in some places 65% of all 'hires' left the bank after 7 to 12 months and that simply pointing this out was enough to drive changes that got this figure down to 15%. Survey results are compared against industry benchmarks and results communicated widely, including the investor community, within annual reports and corporate social responsibility reports and at investor meetings. The study points to the importance of: (i) collecting and analysing qualitative data to give substance to quantitative analysis, and (ii) presenting collected data <i>'in a meaningful way'</i>.</p>	Boudreau and Jesuthasan (2011), Holbeche (2014)
Walmart	<p>Reports on how quantitative and qualitative data, including HR data, from across the organisation is analysed and reported as 'capability metrics', tailored to the needs of different business unit leaders. Specifically, staff turnover, absenteeism and transfers have been given particular attention with links made between this, and other, HR data to wider business metrics, specifically those related to customer experience and sales figures. The study suggests that reporting should include analysis of qualitative data as well as quantitative data.</p>	Haube (2015)

## Part 4: Case studies related to financial performance outcomes

Organisation/team	Case study highlights	Reference
Imperial Services Corp	Reports on how multiple HC factors (for example experience, manager quality, and training undertaken) were analysed to show their influence on productivity at different sales career stages. This analysis revealed how different talent and organisational factors were correlated with sales generation figures.	HCMI [Human Capital Management Institute] (2016a)
Lowe's (retailer)	Reports on how HC data was analysed alongside non-HC data to create a statistically proven model to support decision-making on leadership, structure and training for positive impact on sales. The analysis proved a relationship over time between store sales and: engagement; compensation; and managerial effectiveness.	Smith (2013)
Stantec (engineering and design company)	Article reports on an HC analytics initiative at Stantec that involves comparison of HR factors (such as employee engagement) with business measures (such as revenue and profitability) between locations. Helps to identify problem areas (for example local change in financial performance) so that problems might then be addressed. HC measures used in the diagnosis of business problems.	Chynoweth (2015)
Unspecified sales team	An inventory of the strengths and abilities (that is, human capital) of a sales team was taken using assessment tools and this showed particular weaknesses in areas that were important for this particular sales work (for example information processing speed for complex solutions sales; innovative thinking for adaptive solutions sales). Analysis of this data supported decision-making that dismissed investment in training initiatives and alternatively pursued personnel changes within the team, redeploying existing staff to positions they were better suited for and recruiting new team members using psychometric assessments.	Russell and Bennett (2015)
Unspecified technology company	Reports on how organisational analytics, including data drawn from an HR information system, might address worker performance in terms of what efforts are expended upon ' <i>the biggest value drivers of the business</i> '. Naturally produced organisational data (primarily email data) was combined with data from HR and customer relationship management systems to better understand the cost of ' <i>managing their partner ecosystem</i> ' (that is, the company's collaborators in business, notably resellers and manufacturers). Data analysis revealed that, although from an individual management perspective employees were performing well, when looked at from an	Fuller (2016)

	organisational perspective there was a clear productivity issue. The analysis sought to shed light on what work drove value for the company, and what work might be labelled 'overhead' or 'bureaucracy'.	
Xerox	Reports on collaborative working between the HR and finance functions to support strategic objectives. Underpinning this initiative was recognition that people are central to the intangibles that add value to an organisation and therefore need to be understood in terms that recognise the components of that value (for example length of tenure). The key learning from this case study is that the HR and finance functions need to operate together to achieve shared corporate understanding and thus be able to avoid contentious thinking that will undermine HR analytics initiatives.	Hesketh (2014d)

### Part 5: Case studies related to other key strategic outcomes

Organisation/team	Case study highlights	Reference
Ameriprise Financial	Outlines an initiative to directly relate the HR function to the provision of shareholder value. Describes how measures related to key strategic objectives can be identified and given particular attention. Specific measures identified as being directly related to shareholder value were grouped according to five 'major focus areas': developing and promoting talent; successful new hires; ensuring leaders' effectiveness; managing performance; optimising costs.	Boudreau and Jesuthasan (2011)
Asda	Reports on how people data was used within a broad-based initiative to encourage the embracing of change in the way that Asda operates as a supermarket chain. Two key measures were identified as being important for organisational success: customer satisfaction and employee engagement. As part of the analytical techniques the idea of segmentation, most typically applied to customers, is applied to the workforce in order to apply focus on different segments' capabilities to deliver high-quality service for competitive advantage. This study illustrates how change management and customer service initiatives are strategic issues with a significant HR element and thus it is appropriate to collect and analyse HC.	Valuing your Talent (2016d)
Baptist Health Care	Study illustrating how health and safety data has potential for supporting achievement of strategic objectives. Data collected from employees in an employee survey were analysed alongside data collected from patients in a patient survey and it	Mondore et al (2011)

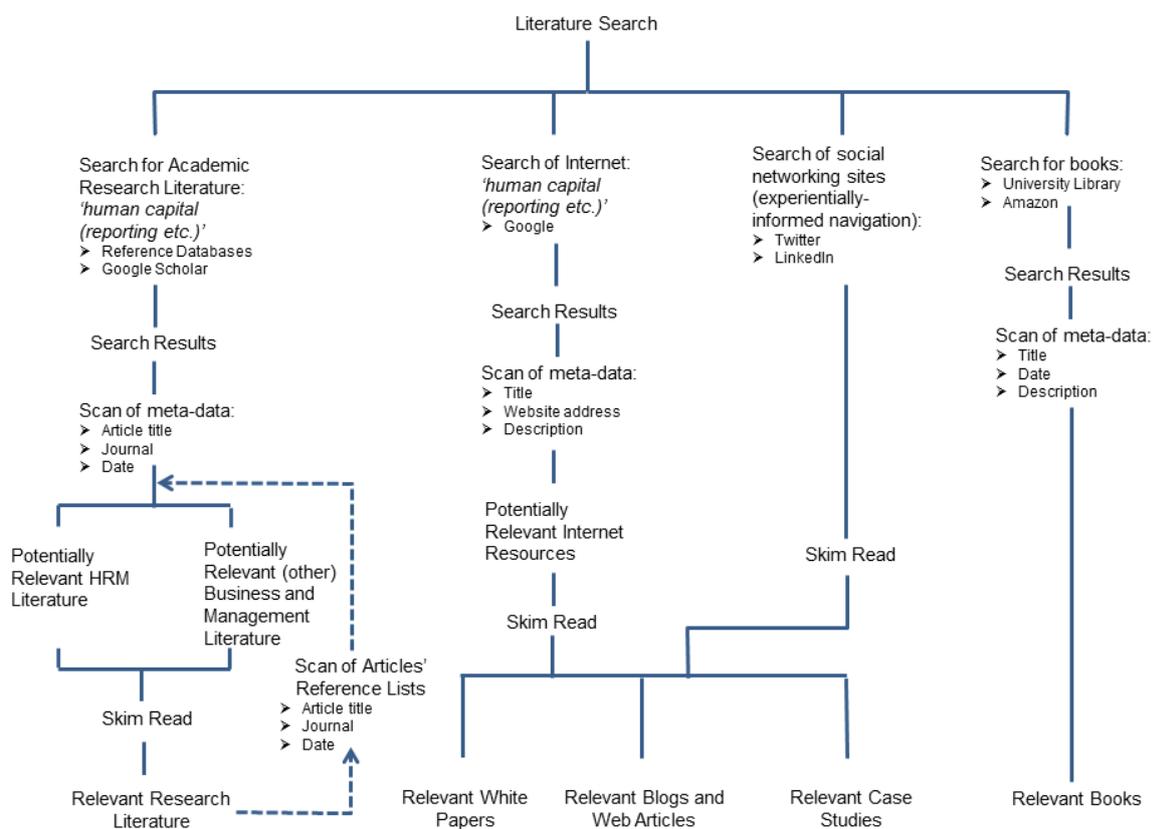
	was discovered that when workers felt safer at work they treated patients more effectively. As a result of this analysis the organisation raised <i>'the sense of urgency around safety even higher'</i> . Thus the data was used to support the improvement of a critical business outcome.	
Global Package Providers	Case study detailing the identification of a relationship between leadership quality and organisational performance/workforce productivity, and areas for improvement.	HCMI (2016c)
IBM	Reports on potential for diversity data supporting achievement of strategic objectives. This case study points to how IBM recognised the strategic significance of diversity for pursuing contracts in the SME marketplace, specifically how it needed to be alert to issues of diversity in order to be successful with SMEs from diverse cultures.	Creelman (2007)
ISS	Reports on how data analysis demonstrated that employee engagement correlated strongly with customer experience. The analysis identified that the primary drivers behind customer experience were the motivation and engagement of service staff, the amount of training, the quality of service staff, and the service staff knowledge of customer expectations. The suggestion is that in analysing collected HC data, it is important to identify correlations between it and other internally collected data to support strategic decision-making.	Andersen et al (2015)
JetBlue	Case study that links employee engagement measures to customer relationships and profitability. Analysis showed how company compared with competition and guided decision-making relating to achievement of outcomes on customer satisfaction.	HCMI (2016b)
McDonald's Restaurants (UK)	Reports on the impact of 100 different measures of the performance of 635 McDonald's restaurants in the UK. These measures were analysed alongside employee demographic data and engagement data. Significant findings from this analysis included: (i) employing older people has performance benefits (for example customer satisfaction was 20% higher in restaurants that employed staff over 60); (ii) a 'positive' workforce (as shown in engagement survey data) brings in customers and drives sales. As a result of these findings, the corporate performance dashboard was redesigned to give greater emphasis to HR data in decision-making.	Sparrow et al (2010)
Richer Sounds (retailer)	Reports on how HC data was used to encourage and monitor innovative thinking. Measures employed included: number of suggestions for improvement made by staff, number of suggestions implemented and number of brainstorming sessions held.	Holbeche (2014)

<p>Royal Bank of Canada (RBC)</p>	<p>First reports on how diversity data might be used in strategic decision-making. Describes how RBC used HR diversity data to help fulfil a strategic objective of winning the banking business of migrants into Canada. Through exploitation of this data they were able to serve customers using over 150 languages, thus aligning their HR strategy and marketing strategy. By measuring diversity patterns within the workforce and using that diversity data, the company's perceptions about diversity shifted <i>'from having diversity to doing something with diversity'</i>.</p> <p>Second, reports on how data from employee surveys might be analysed in multiple ways to support management decision-making. Describes usefulness of analysing engagement measures collected via an employee opinion survey (EOS). The survey was linked to the HR information system so that analysis could be done on different groups of employees (for example by 'classical segments' such as gender, or by more considered segmentation). The objective of such segmented analysis was <i>'to find meaningful differences and point these out to leaders'</i>.</p>	<p>Boudreau and Jesuthasan (2011)</p>
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# Appendix 3: Methods for conducting the literature review

To facilitate this summary, we first undertook a structured systematic review of the literature (Tranfield et al 2003), with concern for three factors: relevance, quality and recentness. This review method is illustrated in Figure A1.

**Figure A1: Methodology for structured systematic review**



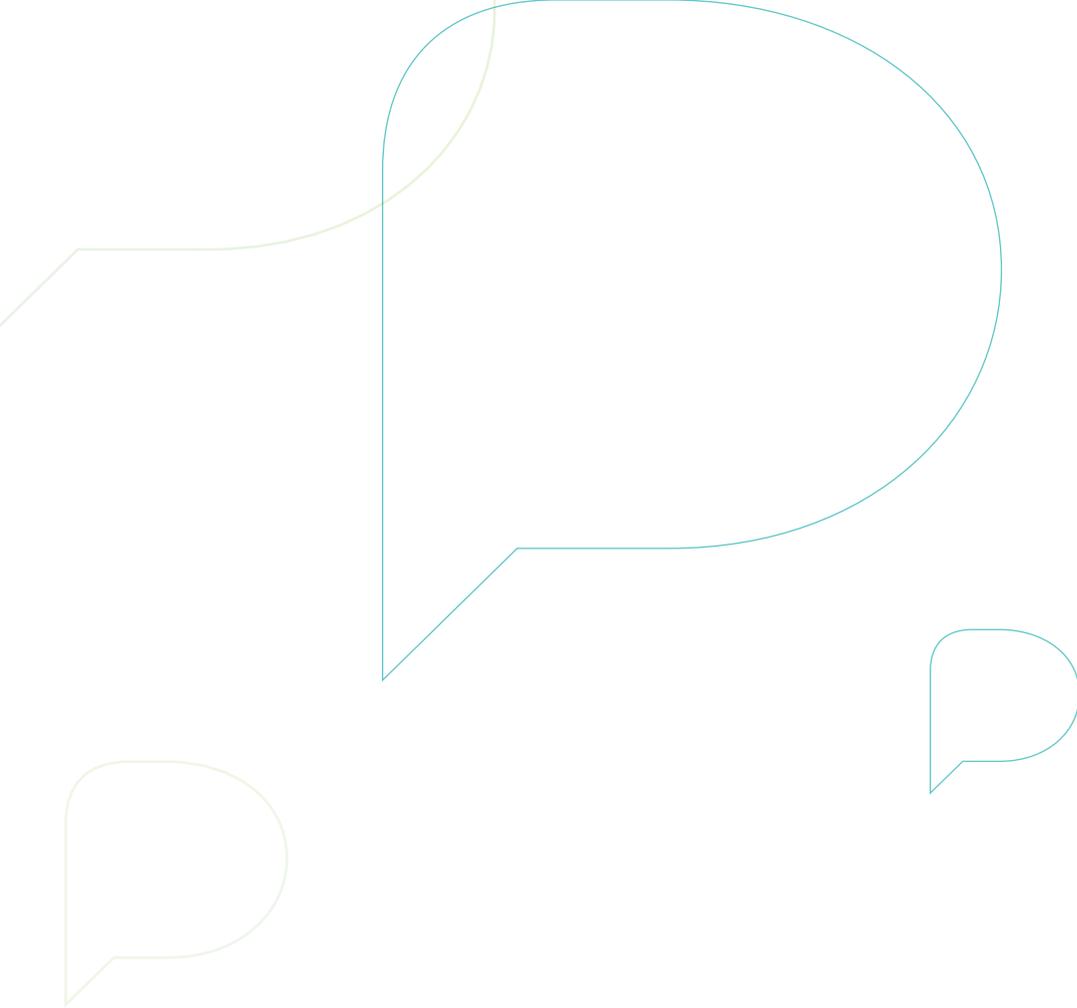
First, a number of online academic referencing databases were searched, with greatest attention focused on EBSCO, Web of Science and Google Scholar. We searched using the terms ‘human capital’, ‘human capital measure’, ‘human capital metric’ and ‘human capital reporting’. Given constraints of time and resources, the search, which was completed between May and August 2016, focused on the period 2005–16. Even with this constraint, these search terms returned a very high number of resources. For example, ‘human capital’ returned 111,852 items, ‘human capital measure’ 5,048 items. We filtered by selecting relevant ‘topics’, specifically those related to human resource management. This removed most articles that interpreted human capital from a social rather than business perspective. We then scan-read the titles provided for those resources and selected those resources that offered the most promise in relation to our terms of reference. Where the number of resources returned was not too high (for example a search on ‘human capital metrics’ returned 418 items), we manually scanned the titles of these resources and downloaded those that were relevant to our terms of reference. Although many articles were returned by

the search engines, when we scanned the high-level information concerning these articles (that is, title, journal, publication date, abstract), with concern for the three factors of relevance, quality and recentness, it was found that the majority did not warrant further consideration. We also made use of the citation measurement functionality that Google Scholar offers to help us in making judgements on the significance of articles.

Second, to track down relevant contemporary grey literature reflecting impactful human capital measurement practice (that is, highly rated in terms of relevance), we used the main Google search engine using relevant terms. Similarly, we also used the social networking platforms of Twitter and LinkedIn to identify recent grey literature material from recognised thought leaders in the field, for example by searching through the Twitter feeds of @hrcurator (run by Dave Milner of IBM) and @david\_green\_uk (also IBM), who are some of the more active disseminators of thought leadership material on HC metrics and analytics.

Finally, to confirm our familiarity with the popular business and academic literature on the subject published in book form, we searched the university's library database and Amazon for books on the theme of human capital measures, metrics or reporting. Additional credible literature identified in this way was borrowed, purchased or ordered via the Interlibrary Loan Service.

Note that the quantity of the 'grey' literature published on the web via social networking sites, company websites and personal blogsites has continued to expand since this review was completed. It has not been possible to consider articles, and so on, published since August 2016.



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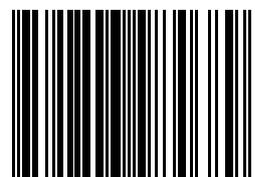
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