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***ELECTRONIC PERFORMANCE MEASUREMENT
SYSTEMS***

Feasibility of electronic Performance Measurement systems: a case
study

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ABSTRACT

This thesis explores the possibility of using digital technologies to improve and redefine the performance management process of employees within organisations. A review of the literature indicates that performance processes are not working; a key finding in the literature is the difficulty in collecting the right evidence in order to have the relevant conversation between manager and employee: that is, having access to enough data in order to run the performance measurement.

A case study is used to explore two different perspectives: a technical one, looking for accuracy in the performance appraisal, and a social one, for acceptance of the results among the different stakeholders.

The main findings of the research are as follows:

- Technically, it is possible to gather data about how employees perform at work and develop an algorithm that predicts individual performance, that is: know-how compared with the job profile; behaviours compared with the company values; and output compared with the budget or business plan.
- The use of technology to support performance measurement – which is very limited currently – is likely to increase dramatically. With predictive models, performance can be measured, and data be collected at any time.
- Like any other new technology, the success of an electronic performance appraisal system depends on the determinants of adoption. These, being complex depend largely upon the different stakeholders, CEO (or eventually the Board), line managers and employees. Each has different interests, perceptions, wills and fears.
- In the case study analysed, all stakeholders accepted the concept idea intellectually, an electronic system capable of capturing information and predicting performance at an individual level. However a common fear among line managers is that they will lose control over even basic decisions (i.e. promotion, salary review or bonuses for the consultants). This implies a significant loss of managerial power.
- The performance process in most organisations has four different stages: planning, assessment, recognition and career planning. These are usually framed into the budget cycle.
- The introduction of technology opens up a new perspective. The measurement phase can be run by the system, in its entirely virtually, and be run at any time. Managers could run performance appraisals and interviews at any time over the year, probably interviewing staff focused on specific issues more; likewise employees may receive feedback more often; the process is disconnected from the recognition phase. The discussion between line manager and employee looks forward rather than backward and focuses on action plans.

The research gives practitioners the opportunity to rethink the performance management process, and shows that it is possible to reframe it thanks to technology. As a case study, however, there are still many limitations when generalizing the process.

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1 Introduction

As a Human Resources (HR) practitioner the contributions people make to organisations through their work is something that has always been of interest to me. I have undertaken many projects aimed at helping a wide range of organisations measure and improve individual and collective performance. I have also run an organisation of 150 people where I have tried to both measure and improve peoples' performance. However – whether as consultant or manager – the results of these Performance Management and Performance Appraisal projects have proved to be very disappointing.

It is the disappointing results of performance appraisals that have motivated the current Doctor of Business Administration (DBA) research. The objective of this research is to understand why it is so difficult to measure and improve performance in organisations, and to try to find out whether the latest digital technologies might be able to help improve these processes.

The ultimate goal of the current research is to explore the feasibility of a new performance process and to look at whether the latest digital technologies can possibly help HR practitioners and line managers better measure and manage performance within their organisations.

1.1 Why performance?

Performance appraisal is probably the most challenging and difficult process when managing people and an area that has received considerable attention over the last seven decades (De Nisi & Smith, 2014). It is a widely extended practice among medium and large, local or multinational companies, with over 90 per cent of these having implemented formal performance management systems (Bernthal et al., 2003). But the level of satisfaction of these companies with their appraisal practices is very poor. According to a recent study, only 16 per cent of employees believed their employer was able to recognise the difference between star employees and poor performers (Mishra & Farooqi, 2013).

The link between individual performance and organisational performance remains a paradox. It has not been proven that improving every employee's performance improves organisational performance (De Nisi & Smith, 2014), but there is not a single organisation that would state that individual performance does not matter.

However, on the contrary, in recent years, there has been significant corporate movement towards different performance management processes. Probably the most famous among these cases is that of Microsoft, which in 2013 changed dramatically their performance appraisal process, getting rid of the ratings and the forced-distribution (Sarkar, 2016). There are other examples of large companies making changes in their performance appraisal systems. But there is not a common pattern beyond the idea that current performance appraisal systems do not work, and that something else should be done.

In my experience, working as a consultant together with several dozen of the top HR professionals in the big firms over the last twenty years, performance management is probably the most controversial and frustrating topic within HR management. According to these conversations, the performance process, planning, appraisal, recognition and career development often struggles in the appraisal phase, where many managers tend to avoid conflict and do not make the right judgements. As a consequence, recognition and career planning are influenced negatively and the whole process is discredited. Even worse, sometimes, employees do not have a clear understanding of what good performance or company success looks like, and the whole process becomes bureaucratic, useless and disconnected from the business itself.

These concerns formed the basis for the decision to carry out research about performance management processes – more specifically they underlie the decision to investigate performance appraisal. There is a common dissatisfaction, which this research seeks to frame, yet there is no new common approach with which to move forward.

1.2 Why digital technology?

Digital technology is invading every single aspect of management within organisations. Thus, performance management might be affected as well. How? And to what level? This is what the current research is looking into.

Looking at the performance process today, managers capture most of the data and make all the judgments regarding performance appraisal (Pulakos, 2009). According to Pulakos, help in this mechanical part of data supply is very limited and data and evidences are very much dependent on the manager who is doing the appraisal. As a consequence, the process is a very long and cumbersome one, which still requires a great deal of refining and review before it is completed. And on top of this, as appraisals are only carried out once a year; the possibility that the data will be analysed in order to understand what is going on is very limited.

Thus, often, instead of having rich and relevant conversations with employees about what should or could be done and how, conversations struggle around discussions about the mechanics of data and information, something which should be left unquestioned at least in that context (Pulakos & O’Leary, 2011).

So, why is it that there is not a single digital system tasked with collecting and analysing all the data and information? New and upcoming digital technologies could present a new opportunity to rethink the whole performance process. A digital system might collect information and algorithms might propose a measurement that managers would only then need to interpret, validate and use for decision-making purposes. This online data collection might be a continuous source of performance measurement connected by algorithms, based on real work in real time. Maybe in this way it would be possible to avoid the part of the discussion about the mechanics of data and information, leaving both manager and employee free to focus on having rich and relevant conversations.

Of particular interest for this research is validating the current performance appraisal difficulties and looking at the concerns of appraisals, and then answering to what extent digital technology could represent a solution to these difficulties and concerns, and not least, provide a solution to the companies considering using it. Finally, the research hopes to validate to what extent managers and employees will accept implementation of digital solutions to human resources management.

The ultimate goal of this research, and what hopefully will set it apart from other studies, is the idea of measuring and appraising performance “at work”, but not through specific electronic tools as previous models have done. In the current research, the objective is to capture and gather relevant information about what happens “at work” and then to process that information in order to propose a performance appraisal system.

There is not much in the literature about the concept “electronic performance appraisal systems”. Cohen and Hall (2005) were probably the first to use the term “electronic performance appraisal system”, when considering a software tool that collects and registers all the information related to individual performance. In the main, the focus of their proposal was to save process costs. Other authors, like Ow and Chen (2007) or Szabla (2007) also mention the concept linked to software tools.

For this reason, the first part of the current thesis will define a comprehensive review of performance appraisal and performance management of employees found in the current literature review, combined with the possibilities that technology brings to the concept (i.e. algorithms, data analysis, etc.).

Following this, the research will seek to understand why current performance appraisal processes do not work. As mentioned above, the researcher’s experience of appraisal processes, as a consultant, as an employee and as a manager has been very disappointing. But in order to propose something new, taking advantage of new technology, it is important to understand the fundamental reasons behind why these processes fail. For this reason, the research commenced with a series of interviews informed by a preliminary literature review, as presented in full in Document 3. As these interviews – conducted with a sample of both line managers and HR professionals in large companies – were important in framing the subsequent research, brief details are outlined here. From the interviews, the following key findings emerged:

- Large companies have a long tradition of performance appraisal and many years of experience. Nevertheless, despite this accumulated experience, there is a clear consensus of feeling that performance appraisal does not work as it should.
- Most of these large companies are continuously making small changes in the way performance is appraised. These changes are always made to the same kind of topics, such as scales, the combination of objectives, and even the naming of the process. From this perspective, large organisations are continuously revisiting their performance appraisal system, but only in order to fine-tune some of its basic elements.

- The idea of “deep change” in the performance appraisal system only appears to happen either when there is a significant collapse in the current system, or if a significant change in the business strategy is deserving of new values or new ways of working. There is also a sense of frustration that after so many years, and so many changes, major problems still exist.

These major problems may be summarised as:

- The performance appraisal system is not a business management tool; in the best case it is a people management tool. For this reason, business managers feel separated from it and therefore it only matters in the HR environment.
- The objective-setting process is kept completely separate from the budgeting process. Despite the development of tools such as the Balanced Score Card, budgeting remains mainly a financial issue while the deployment of objectives remains mainly an HR issue.
- Managers are uncomfortable with the performance interviews in many cases; they even tend to avoid the difficult discussions that should take place as part of the appraisal of them.
- In some companies, the consequences of good or bad performance are not very clear. Salary increases, bonuses, developments and promotions are the most common HR processes affected by performance, and yet the relationship between performance and these processes is overshadowed by other kinds of considerations.
- Performance appraisal systems are not boosting overall company performance.
- The use of technology to support performance appraisal is very limited. All the IT systems supporting current performance systems are “data repositories” without any intelligence or analysis.

Not one of the interviewees in the sample considered the idea of introducing digital-data gathering to improve performance appraisal. On the other hand, the majority of interviewees recognise that one of the key bottlenecks of performance appraisal is its lack of evidence-based findings.

Given both these findings and the lack of knowledge about the new possibilities of digital technology, a different approach to the research was necessary. As explained in the literature review, much of the academic work on performance appraisal has been carried out in a “laboratory” setting rather than in natural surroundings. This suggested the need for an exploratory case study that had two phases: proof of concept and a response to the analytical findings. The justification for an exploratory case study and the issues involved in the selection of the organisation chosen are explored in Chapter 3. The case study represents the core of this thesis. The findings from the proof of concept, which were reported on in Document 4, are rehearsed in

some detail, as they are important in framing the reactions of the different stakeholders.

Finally, once the researcher is able to pinpoint with some certainty the fundamental reasons behind failure of the process, and when it is clear where a gap to introduce a new technology that might help lies, a new process to assess and manage individual performance will be proposed.

The current research will be of interest to HR practitioners, especially those who are dedicated to defining and following up talented individuals and management processes. Managers and employees might be curious as well, in order to prepare themselves for new processes that may appear in the near future. Finally, top managers and business leaders, who should be continuously alert to new opportunities to make their organisations more efficient, will also benefit from the findings.

The framing question this thesis aims to answer is “Are electronic Performance Appraisal systems in large organisations feasible in the near future?”

However, in order to answer this broad question, some intermediate questions need to be addressed first. It is important to understand the real issues and challenges companies face when managing performance. To this end, as discussed above, a set of interviews was run with a sample of companies, which sought to answer a pair of preliminary questions: “To what extent are large organisations revisiting Performance Appraisal systems and processes? What are the issues that trigger these revisions?”

The core of the research as presented in this document then seeks to answer two other related questions:

- To what extent is it possible to predict individual performance using data generated automatically?
- In the case where these digital solutions are implemented, what would be the level of acceptance by relevant stakeholders (managers, middle managers and employees)? What might their perception of the fairness of such systems be?

2 Literature Review

The literature review is divided into four main sections in order to cover the topics related to the research question:

- The first section is about performance; its history, goals, what it has achieved and what the main concerns and challenges of the current systems are.
- The second section explores technology; HR systems and the new possibilities that technology may provide in order to draw out new sources of evidence. Briefly, what is feasible by using more data and algorithms?
- The third section relates to data quality. Electronic performance appraisals should be based upon a greater amount of available data: and the quality of that data is crucial to providing reliable outcomes.
- The final section explores the determinants of the adoption of new technologies within organisations. This includes how members of the organisational respond to new systems.

2.1 About performance in organisations

The purpose of this first section is to understand how organisations deal with performance.

2.1.1 Performance management does not work

Performance management is not working in today's organisations. There has been a long history of studying methods in order to improve performance at work, both concerned with both organisational performance and individual performance (De Nisi & Smith, 2014).

It is generally accepted in the literature that the performance process in a firm is composed of four phases: planning, assessment, recognition and finally career development (Antonioni, 1994), (Bititci et al., 1997), (Forslund & Jonsson, 2007) and (Stiles et al., 2007). Typically, the whole performance management process takes one year, according to the annual budget, and then it restarts the following year.

- Planning is about establishing company and unit strategic goals, aligning goals to employees' work and determining the performance-level criteria.
- Assessment is about the annual appraisal of performance. This provides ongoing feedback about how the employee is performing, and entails a final discussion between the employer (generally the immediate superior) and the employee.

- Recognition is about correlating incentive programmes with performance, as well as providing information about future base salary increases and possible awards.
- Career development is about developing an Individual Development Plan considering strengths and weaknesses, whereby the employer and employee discuss about particular talents, and how best to utilise training facilities in order to improve performance in the next cycle. This may also provide the organisation information about future promotions.

Performance management today is used extensively among medium and large, local or multinational, companies. There have been many studies analysing the extension of performance management. In all of them, performance systems are extended in over 90 per cent of the companies researched (Nankervis & Compton, 2006), and (Thursfield & Grayley, 2016).

But then again, according to a survey among employees, less than 20 per cent of employees reported that performance management systems and performance reviews helped them to improve their performance. The majority of respondents were dissatisfied with the level of feedback from and the frequency of performance reviews by managers. In the United States the research findings are very similar. According to the consulting firm Watson Wyatt (2004), only 30 per cent of US employees felt that performance management systems helped them to improve performance.

There are genuine reasons why both, managers and employees have difficulty with performance management. Managers avoid performance management activities (especially performance appraisal) because they do not want to risk damaging relationships with the individuals on whom they count to get the work done (Pulakos & O'Leary, 2011). And employees avoid performance management activities (especially performance appraisal and appraisal of their development needs) because they do not want to jeopardise either their pay or promotion.

2.1.2 Performance measurement, performance appraisal and performance management

It is important to differentiate between three different concepts: Performance Measurement, Performance Appraisal and Performance Management. There are many definitions of these concepts, all of which have been widely researched over the last few years.

Performance measurement begins by the measure of distinct indicators and data at individual level and ends measuring the organization as a whole system (Neely, 2002). Folan and Brown (2005) describe the evolution of performance measurement in four sections, recommendations, frameworks, systems and inter-organizational performance measurement. De Nisi and Smith (2014) define performance appraisal as the process by which the individual performance of an employee is evaluated over a specific period of time. Formal appraisals are infrequent events; some type of score is assigned and there may or may not be

formal developmental feedback. Aguinis et al. (2012) define performance appraisal as the depiction of the strengths and weaknesses of employees in a non-continuous manner, typically once a year. Both authors coincide that performance appraisal is a separate but central subset of overall performance management. It is simply the process of formally evaluating work performance, rectifying non-standard performance and providing feedback to individual employees.

Although not all the authors agree on these definitions, performance measurement relates to the tool set needed to understand what has happened; performance appraisal relates to the judgement done by the supervisor and performance management relates to the communication to the employee in order to manage the process.

Armstrong (2009, p. 618) defines performance management as a systematic process for improving organisational performance by developing the performance of individuals and teams and getting better results by understanding and managing performance within an agreed framework of planned goals, standards and competency requirements. Aguinis et al. (2012) define performance management as the continuous process of identifying, measuring and developing the performance of individuals and aligning that performance with the strategic goals of the organisation. In a similar way, performance management encompasses all the activities a firm undertakes to improve employees' performance (De Nisi & Smith, 2014), beginning with evaluation of performance and subsequent feedback to the employee and continuing with decisions concerning individuals in order to improve performance in the future. Among these decisions are found reward and recognition, training and development, promotion and career planning or demotion and dismissals.

The definitions are quite similar, and there is an emphasis on the idea that performance appraisal is employee focused (rather than business focused) and also that it is something infrequent, normally carried out once a year, while performance management is much broader and has a strategic business impact (Aguinis & Pierce, 2008). These authors also state that managers often see performance appraisal as an HR requirement more than a strategic management tool. The concept of performance appraisal is a snapshot concept, whereas the concept of performance management is a rolling concept.

According to De Nisi and González (2000) and De Nisi and Pritchard (2006), the ultimate goal of the individual performance appraisal process is improvement of the individual performance, whereas in the case of the performance management process, according to Pulakos (2009) and Aguinis (2013) the ultimate goal of the performance management process is to improve the level of performance of the entire organisation.

These definitions, which are focused and clarify the goal of both processes, seem particularly relevant to bridge the gap between performance appraisals and performance improvement at the individual level, but now a link needs to be made between improvement at the individual performance level and in the overall organisational performance.

As a summary, Table 1 shows the main differences between performance measurement, performance management and performance appraisal.

	<i>Performance Management</i>	<i>Performance Appraisal</i>	<i>Performance Measurement</i>
<i>Definition</i>	Continuous rolling process of developing individual performance	Snapshot process by which individual performance is evaluated over a period of time	Snapshot process by which performance can be identified by indicators
<i>Main driver</i>	Feedback and consequences	Interpretation of data and judgment	Data and measurement tools
<i>Goal</i>	Improve organisational performance	Understand individual performance	Measure individual and collective performance
<i>Main perception</i>	Seen as a strategic tool to outperform competitors	Seen as an HR tool, "once-a-year" event, bureaucratic	Seen as an HR tool, "once a year" event, bureaucratic

*Table 1
Differences between Performance Management, Performance Appraisal and Performance Measurement*

But why does performance appraisal so often fail? Why are performance measurement, performance appraisal and performance management not appropriately linked?

Scholarship has moved from a concern about performance appraisal to a greater concern with performance management (De Nisi & Smith, 2014). But this is not because the failures of performance appraisal have been fixed. Both, scholars and practitioners agree that the ultimate goal of these performance management systems and tools is both to help employees meet their goals as well as help the organisation to work more effectively (De Nisi & Smith, 2014). This idea coincides with the goals of performance appraisal and performance management mentioned above.

2.1.3 Performance measurement criticism

The way performance is measured is not neutral. Meyer, Kay and French (1965) analysed the effect that measurement and performance interviews had in motivating employees within General Electric. The main conclusion is that the way performance is measured may raise defensive reactions. Similar conclusions were raised by Folger and Cropanzano (1998). According to these authors, simplistic rating systems do not provide fairness and are not helpful when appraising performance and are even more harmful in the performance interviews.

Heap (1993) defines the principles of effective rating measurement as a combination of many different aspects: training the practitioners, standardization

of the different rating scales, validating the rating procedures, hold regular and frequent rating clinics and implementing a system for auditing the rating scales.

According to the author, it is difficult that all these principles are applied, and the comparison of different rating scales is a problem global companies are facing more and more when measuring performance.

There is a long history of research on performance rating and performance appraisal (for reviews, see Bernardin & Beatty, 1984; DeCotiis & Petit, 1978; DeNisi, 2006; DeNisi, Cafferty, & Meglino, 1984; Ilgen & Feldman, 1983; Landy & Farr, 1983; Milkovich & Wigdor, 1991; Murphy & Cleveland, 1991, 1995; Wherry & Bartlett, 1982), and although different reviews highlight different strengths and weakness of the rating scales that are used in organizations, none of these reviews leads to the conclusion that performance rating is particularly successful either as a tool for accurately measuring employee performance or as a component of a broader program of performance management. Austin and Villanova (1992) suggests that there is a longstanding history of problems with performance rating and little reason to believe that these problems will be solved in the foreseeable future.

The conclusion that performance rating is not working is not solely an academic one; there is evidence of widespread dissatisfaction with performance rating and related techniques in organizational settings; many large organizations (e.g., Accenture, Deloitte, Microsoft, Gap, Inc., Eli Lilly) have abandoned or substantially curtailed their use of performance appraisal (Culbert & Rout, 2010; Cunningham, 2014).

The vast majority (89%) of companies link compensation decisions to performance ratings (Mercer, 2013). Performance ratings are the basis for pay for performance systems in most organizations; so, most organizations “pay for performance ratings.” These ratings can have long and lasting effects on employees’ lives and careers in organizations, affecting staffing, promotion, and termination decisions as well as affecting access to other development opportunities. This is serious business, and ratings don’t measure up (Adler et al., 2016).

The task of accurately evaluating someone’s performance is difficult if not impossible. It requires a supervisor to observe the performance of another employee over the course of a year and to collect reports of others’ observations of the same employee. The supervisor, usually with little or no formal training, then sifts, sorts, analyses, weighs, and aggregates this information to make a judgment about the employee’s performance. Supervisors must also exclude from consideration other irrelevant information about this individual and any other judgments that may have been made about the individual in the past, and they must suspend any biases or tendencies they possess while making this judgment. The point of this is what we are asking managers to do is virtually impossible to do well, especially with the frailties of human beings as measurement instruments (Adler et al., 2016).

The criticism of rating scales is mainly focused on the amount of information required and the difficulty for a human supervisor to be fair when considering all this information in front of a rating scale. What if we help the manager in the

measurement task? What if we ask the manager to appraise performance out of a “neutral measurement” done with all the available information? The answer to these questions is at the core of this research.

2.1.4 Individual performance appraisal

The performance process today is mainly focused on the individual (De Nisi & Smith, 2014) and, as mentioned above, there have been more than seven decades of research and development of performance management. De Nisi and Smith review the most significant milestones of performance appraisal; the first of which was management by objectives, followed some decades later by people behaviours and finally by multisource evaluations.

It helps elucidate if people’s work in organisations is considered as a process, where their input is the skills and know-how they offer, the throughput itself are their behaviours and attitudes and the outputs are the results; performance appraisal uncovers a combination of all these elements of the process. As a summary, Table 2 shows what is being evaluated when appraising individual performance:

	<i>Inputs</i>	<i>Throughputs</i>	<i>Outputs</i>
What is being evaluated?	Employee skills and know-how	Employee attitude and behaviours	Employee results
Compared with?	Skills required for the job	Required by company culture	Results planned in the budget

*Table 2
Elements evaluated when appraising individual performance*

According to this conceptual framework, while performance appraisal is about measuring each element of the process, performance management is about helping employees to update and utilise their skills, engaging them in positive attitudes and behaviours effectively, in order to encourage them to achieve the expected results. This is coherent with the previous definitions and comments concerning the difference between performance appraisal and performance management.

Empirical experience suggests that, regardless of the available tools, the process is uncomfortable for both parties (managers and employees) and that the process can be time-consuming. In short, managers do not like to implement performance appraisals and no new tool is going to change that (Pulakos, 2009).

The point of view of Pulakos (2009) is particularly interesting. Business organisations are in a position whereby appraising performance is more and more difficult due to many reasons outside the performance process. These include delayering, meaning that one manager may have more employees reporting (to him / her) than in the past; intellectual work, where the output is not easily made concrete; or project-based work combined with process-based work, whereby there may be many managers at the same time, increasing exponentially the number of interactions with very different stakeholders, inside or outside the organisation.

The problem is no longer about improving the accuracy in the rating. Now the problem is more about planning strategically the skills needed and generating the right attitudes and behaviours in order to achieve the desired results. This is exactly the definition of performance management suggested by Aguinis et al. (2012).

Looking critically at the history of performance appraisal, there has always been a concern about the accuracy in the rating (De Nisi & Smith, 2014). This suggests that all the research has considered performance appraisal in the “laboratory”, rather than in the field, looking at appraisal as something that is quite isolated from the environment and the culture of the organisation. It has to be acknowledged that any of these appraisal methods are neutral to the behaviours they are encouraging. The Microsoft case is a good example of a company adopting tools to improve accuracy while at the same time the system encourages behaviours completely destructive to the business (lack of collaboration among units, innovation seen as a risk; better not to take risks therefore, and so on).

Thus, like many other phenomena in the natural and social sciences, the appraisal of the performance itself is affecting the management of it. As a consequence of this, performance management today in most large firms is still trapped in the performance appraisal issue.

This assertion needs to be confirmed by the research, as it is key to explaining why performance management fails most of the time in most cases. Of the answers found in the literature to the questions already suggested in the Introduction, however, they appear to confirm that performance appraisal is far from fixed.

2.1.5 Performance effectiveness

When do we know that performance appraisals are effective for organisations? A significant number of researchers have established the key conditions for the success of performance appraisal. Among them, Bernardin and Beatty (1984) analyse the impact of human behaviours and especially its impact for managers; Cederblom (1982) analyses the performance interview; Dipboye and Pointbraind (1981) analyse employee reactions to performance appraisals; Jamieson (1973) analyses bad behaviours that could be inducted by using incorrect performance appraisal systems; McIntyre et al. (1984) analyse the importance of training; Pulakos (2009) analyses the importance of having IT tools to support the process; and Rogers and Wright (1998) analysed the impact of having the support of top management in the process.

Research on performance appraisal systems has been shifting from the psychological dynamics of appraisal processes to a more social perspective, focusing both on managers’ and employees’ reactions to the appraisal process, format and feedback. Positive reactions include perceptions of fairness, usefulness and accuracy (Levy & Williams, 2004). De Nisi and Smith (2014) consider that all the models researched emphasise the importance of employee reactions in the performance process.

Among all of these authors, perceived fairness has been identified as one of the most important criteria when answering the question as to whether performance appraisals are effective for organisations (Erdogan, 2003). A survey among Fortune 100 companies provides evidence of the importance of perceived fairness (Thomas & Bretz, 1994).

This sense of fairness, perceived as just or not, is a combination of three different kinds of justice (Erdogan, 2003):

- Procedural justice. This includes what is measured as well as making visible to employees the organisation's values through actions (Folger & Cropanzano, 2001).
- Interactional justice. This includes the application of the procedures by the manager or immediate supervisor (Masterson et al., 2000).
- Distributive justice. Comparison of input/output ratios among different employees according to the equity theory (Adams, 1965).

Pulakos (2009) considers one of the main reasons why companies struggle in performance appraisal, and are unable to manage performance, is because that there is a perception of unfairness among employees. According to this diagnostic, the source of the problems with performance appraisal might be classified into three categories:

- Validity (lack of procedural justice): performance is not connected with the business and managers do not value employees' contributions.
- Communication and feedback (lack of interactional justice): managers are not having the right sort of conversations with employees related to performance planning, performance appraisal and performance improvement.
- Consequences (lack of distributive justice): reward and promotion are not influenced by performance; on the contrary, performance is influenced by what managers want to achieve in terms of promotion and reward for their employees.

Validity issue: is performance connected with the business and do managers measure at an individual level what really contributes to improving organisational performance?

- The validity of performance systems is a key problem pointed out by De Nisi and Smith (2014); there is a disconnection between individual performance and organisational performance. According to Kaplan and Norton (1996), a traditional deficiency in management systems is their inability to link long-term strategy with short-term actions and objectives.

Communication and feedback issue: are managers holding the right conversations with employees related to performance planning, performance appraisal and performance improvement?

- In contrast to a mechanistic view of performance appraisal as a “management tool”, which it is assumed works, so long as one follows the instruction manual, the view that it is down to users’ reactions to appraisal that impacts on the overall effectiveness of appraisal systems, seems to dominate the research community today (Cawley et al., 1998; Jawahar, 2007; Kavanagh et al., 2007; Keeping & Levy, 2000; Kleingeld et al., 2004; Kuvaas, 2006, 2007; Levy & Williams, 2004; Youngcourt et al., 2007).
- Klein and Snell (1994) argued that there is “no best way” to conduct an appraisal interview. According to Meyer (1991), managers tend to see performance feedback interviews as distasteful. Unless there is some kind of administrative pressure, like an employee signature requirement, managers are likely to ignore this responsibility. Whitener et al. (1998) considers the performance interview as a cornerstone to create trust between the employee and his or her employer, represented by the manager. According to these authors one of the reasons why these interviews struggle is the difficulty to access reliable information about what is going on within the organisation, especially when appraising know-how and behaviours. More recent research (Falcone & Sachs, 2007) state that “managers tend to cringe when conducting performance reviews”, as they believe the relationship will turn sour and awkward for both parties. The communication and feedback phase is a failure. This failure spoils the next stage: the consequences of the system, which are not consistent with employees’ expectations.

Consequences issue: are reward and promotion influenced by performance, or is performance influenced by what managers want to achieve for their employees?

- Performance appraisal is a “contract-maker”, as employees are aware that their work will be evaluated and the outcome rewarded (Davila & Elvira, 2007). This promise could be broken for many reasons, e.g. reviews may fail to acknowledge employee contributions clearly; and supervisors, who may favour the harmonious organisational climate, could deliberately avoid confronting employees with critical feedback (Rousseau & Greller, 1994).

Pulakos and O’Leary (2011) assert that there are many concerns among both managers and employees that prevent formal performance management systems from working well. On the contrary, the systems have turned into largely administrative drills adding very little value. Among these concerns, for example, managers regularly provide informal feedback to employees about specific tasks, but the same managers are often reluctant to document formally less-than-stellar performance for fear of damaging relationships with the very individuals on whom they count in order to get the work done. Similarly, many employees want guidance from their managers about how to accomplish work, yet they do not want documented examples of their need for guidance for fear that these will undermine their pay or advancement.

According to Pulakos and O’Leary (2011), frequently in both cases (from the perspective of managers and employees), formal performance is being influenced by reward and career development.

Proponents of digital technology suggest that it directly addresses the two key issues about fairness: data may be gathered as frequently as the organisation wants; and the treatment process of these data with algorithms will be unique for the whole organisation irrespective of the acting evaluation manager. Research conducted in a large industrial organisation has proved that the perceived fairness of a performance appraisal system correlates positively to variables such as the frequency of the evaluation (Landy et al., 1978). A follow-up confirmed this idea two years later (Landy & Farr, 1980).

2.2 About technology: what potential is there for IT to draw out new sources of evidence from performance appraisal systems?

The purpose of this section is to understand through the literature if digital technology opens up an alternative to current performance appraisal systems. The review also includes the current IT systems that are applied in HR processes of performance, and the possibilities that the latest developments in digital technology might bring to this purpose.

2.2.1 Automate vs “Informatate”

The impact of information and communication technologies (ICT) on managers has been extensively researched since the early 1980s (Mutch, 2008). Mutch analyses the work of the Harvard academic Shoshana Zuboff (1988) drawing on extensive ethnographic studies of workers in paper mills and offices, suggesting that the difference between ICT and other forms of technology is that ICT has the capacity to supply information about the way the operations had been carried out. Zuboff (1988) suggests that the capacity to use information made available by ICT has profound consequences for managers. According to Mutch (2008) those who work with data produced by an ICT-enabled system need always to apply their own reasoning to the data rather than relying on managers for the answers. This challenges managerial legitimacy (Zuboff, 1988).

Taking the issue of the impact of ICT on people management further, Zuboff makes a distinction between “automate” and “informatate”, dependent on whether the machine fulfils the functions of an automatic lathe or if in addition it also records details of the process in which it was engaged. But if we distinguish between data and information, we can see that ICT does indeed possess the power to produce masses of data that will tell us about the processes in which the subject was engaged (Mutch, 2008). Zuboff coined the term “informatate” in order to indicate the potential of IT not only to automate existing practices and so increase efficiency, but also to supply information about how those practices were carried out. The recognition of this potential – to use data generated through the completion of everyday tasks to encourage learning and improvement – was dependent, Zuboff argued, on having the right organisational culture in place. This distinction is crucial and informs the

discussion that follows. The review also includes the current IT systems that are applied in HR processes to monitor and measure performance, and the possibilities that the latest developments in digital technology might bring to this purpose.

2.2.2 e-HRM

As the role of HR has been transformed in the last few decades from an administrative function to a strategic business-partner role, hence HR has become a critical element of a company's competitive success (Shilpa & Gopal, 2011). The application of e-HRM reinforces this transformation even further (Grant & Newell, 2013; Gupta & Saxena, 2012; Heikkälä & Smale, 2011; Stone & Gueutal, 2005). From a research point of view, an extensive number of studies were published between 1999 and 2011 (Marler & Fisher, 2013). In general, these research projects have found there is a growing trust in the use of e-HRM, especially following expansion of the Internet in the twenty-first century. However, the main purpose remains administrative (Bondarouk & Ruël, 2013; Strohmeier et al., 2012), with many firms failing to integrate comprehensively e-HRM applications into their existing HR systems (Mishra & Akman, 2010).

The literature does not reach consensus regarding a definition of e-HRM. Before the term e-HRM became popular, it had been described as re-engineering HR using IT (Hempel, 2004). At this point, it is important to differentiate between e-HRM and HRIS: the term e-HRM is not a synonym of Human Resources Information Systems (HRIS); HRIS is a database to track HR activities (Shilpa & Gopal, 2011). And also, while HRIS is specifically directed towards the HR department itself and aims to improve HR processes, e-HRM integrates not only the HR department but also other people in order to improve the business (Ruël et al., 2004).

There is also a difference between the systems that store information and support processes very efficiently (administrative processes such as payroll), and the systems that are able to capture criteria and analyse all different kinds of data in order to provide the process with various types of intelligence (management support).

Bondarouk and Ruël (2013) consider e-HRM as an "umbrella" term that includes all types of connections between IT and HR. Tansley, et al. (2013) consider e-HRM as the merging together of HR and IT functions. Jackson et al. (2009, p. 28) define e-HRM as the "practice of managing human resource through the use of various forms of hardware and software technology including databases, mainframes, laptops, use of materials online, DVDs and CDs, accessibility, confidentiality, privacy ownership, and the Internet as applied to all HR activities."

Such an open definition requires a more concrete approach in order for it to be useful. Such a definition may come from the various classifications of e-HRM that the literature provides, as well as specific HR functions and processes that can be related to the concept e-HRM.

2.2.3 Types of e-HRM

According to Ruël et al. (2004) three key types of e-HRM may be identified: operational, relational, and transformational. Operational e-HRM refers to basic administrative HR activities, such as payroll or personnel data management. Relational e-HRM is concerned with the more sophisticated activities such as recruitment, selection, and training, as well as performance and reward management. Transformational e-HRM refers to activities linked to the strategy of the firm, such as organisational change processes, strategic reorientation, and competence management (ibid.). Foster (2010) uses a similar classification referring to the HR function (operational), business operations (relational), and organisational capability (transformational). Other research (Marler et al., 2009) takes a different approach in order to consider the level of development of e-HRM. According to these authors, the most advanced e-HRM is the Employee Self-Service (ESS) technologies, where the interaction of HR professionals is minimised and responsibilities of employees maximised.

Shrivastava and Shaw (2003) identify two types of approaches to e-HRM: a process driven and a technology driven approach. A process-driven approach focuses on customising IT systems in order to support existing HR practices. A technology-driven approach aims to re-engineer HR processes. The technology-driven approach has a higher potential for development (ibid.). For the purposes of the current research, the idea of the technology-driven approach is of most interest, as the performance process might be completely re-engineered towards development of an electronic performance appraisal system. In light of the definitions given above, the electronic performance appraisal system is among the most complex e-HRM types, as a system of this sort is likely to need to serve the active participation of both employees and managers via the web and directly relate to organisational capability (transformational).

Brynjolfsson and McAfee (2014) identify another critical element in this area that is likely to see a rapid increase in use. They look at the development over the last five or ten years of technologies that allow machines to carry out cognitive tasks, identifying substantial growth of these analytic tools in the near future, even though to date only a few companies have exploited the opportunities they offer. This is exactly the kind of software development that is of particular relevance for the current research.

2.2.4 Challenges of e-HRM systems

According to the literature review, there are many reasons why companies adopt e-HRM. The initial hypothesis is that although an e-HRM system will not reduce costs, it might fix many unresolved issues relating to performance appraisal and might raise the bar of HR as a recognised business partner. Three main challenges to the implementation of e-HRM appear in the literature (Foster, 2010; Ruël et al., 2004) and these are discussed below.

Infrastructure challenge

In general, the introduction of technology has been identified as one of the key challenges for the HR profession (Hempel, 2004; Gómez-Mejia et al., 2001). Selecting the right system is a complex undertaking: among software tools alone there are more than 140 HRIS providers in the USA and Canada (Shrivastava & Shaw, 2003).

A specific challenge is the security and protection of data (Yang, 2011; Jackson et al., 2009; Khalil et al., 2001). Illegal access to data and data-entry errors are the two main drawbacks (Ruël et al., 2004).

Skills challenge

Companies need not only to have the necessary IT infrastructure, but also the comprehensive skills to enable them to implement an e-HRM system successfully (Esen & Özbağ, 2014; Grant & Newell, 2013; Powell & Dent-Micallef, 1997).

Employees generally and HR professionals in particular have to be trained to work with IT (Bondarouk & Ruël, 2013; Parry & Tyson, 2011). Certain technical expertise is essential, and HR professionals often do not have the necessary technical education and skills (Hempel, 2004). Bell et al. (2006) argue that a broader understanding of the business is required from HR professionals.

Marler (2009) states that the development of a strategic e-HRM plan is absolutely necessary. Knowledge of the business, functional HR delivery, and expertise in technology are the main competences that become most important. Although results show that e-HRM might be a driver of transformation, HR professionals fail to mention an increase of the importance of change management as a competence (Bell et al., 2006).

However, it is not only down to HR: line managers also need to develop their competences; a greater involvement in HRM processes requires the analytic skills of line managers as well (Bondarouk & Ruël, 2013).

Acceptance challenge

The acceptance of new IT systems by HR, managers and employees in general is crucial for the successful implementation of an e-HRM system (Burbach & Royle, 2014; Parry, 2014).

Brynjolfsson and McAfee (2014) argue that institutions need to rethink strategies and engage more people to participate. It is important to note that most stakeholders will react and that not all stakeholders will react well either psychologically or emotionally to new IT systems (Fisher & Howell, 2004), and the impact of these reactions, especially among the general workforce, should not be underestimated (Parry & Tyson, 2011; Karahanna et al., 2006; Fisher & Howell, 2004).

The introduction of e-HRM systems often results in line managers taking greater responsibility and becoming more involved, in particular when applying Employee Self Service (ESS) technologies (Marler et al., 2009). In many cases, managers are unwilling to take on more responsibility, seeing themselves as separate from the HR department (Bondarouk & Ruël, 2013; Davis et al., 1989). It is HR professionals who are most likely to carry out the process of role changes, employees and line managers usually do not get involved with this (Bondarouk & Ruël, 2013). In order to overcome the scepticism that seems to persist over e-HRM systems in companies, it is suggested that firms should communicate the value of them and introduce the system more effectively (Bissola & Imperatori, 2010; Marler et al., 2009).

In addition to these considerations for managers, as suggested above, sufficient training is essential; likewise so is enhanced co-operation with the IT department (Parry, 2014; Parry & Tyson, 2011; Gainey & Klaas, 2008; Haines & Petit, 1997). A high degree of involvement is necessary from the very beginning; following a proactive, rather than a reactive approach from managers (Leonard-Barton & Shina, 1993).

Potential employees, current employees and line managers criticise these technological systems not only because of difficulties experienced by users, but also because of loss of personal contact through headcount reduction and automation (Jackson et al., 2009). The traditional social functions of HR have been reduced through implementation of e-HRM, and on top of that, Brynjolfsson and McAfee (2014) state that technology has destroyed jobs in the past and always will reduce jobs in the future. The same authors also argue that the prediction of technology advancement is relatively easy, whereas forecasting the reactions of organisations and individuals is not.

Considering these challenges, electronic performance appraisal systems are a very challenging and sensitive tool to implement. The main risks concern acceptance, and it is this area that the current research tackles.

2.2.5 Digital technology

ICT (Information and communication technology) may be defined as “technologies for the processing, storage and transmission of digital material, consisting of ensembles of hardware and software with distinctive feature sets allowing for the physical storage and logical representation of different forms of data” (Mutch, 2008, p. 257). Although this definition might apply to any computer technology, in this chapter it is helpful to have an overview of developments in technology of the last five to ten years, and to look at how this might have affected life-work in organisations and, as a consequence, performance systems.

More specifically, this section relates to three different areas:

- Mobility and cloud computing
- AI applications
- Big data, analytics and algorithms

Mobility and cloud computing

Cloud computing can be defined as the sum of delivery / licensing software as a service (SaaS) and utility computing (Armbrust et al., 2010). This is changing the rules of the IT industry. Apart from the elasticity of resources, which is unprecedented, there are three aspects that are new in cloud computing:

- The appearance of infinite computing resources available on-demand (including mobile devices such as smartphones);
- The elimination of up-front commitments; which allow companies to start small and increase resources as needed;
- The ability to pay to use and roll out as needed

Cloud computing is inevitably linked to mobility and wireless Internet. Data may be continuously updated thanks to smartphones, tablets, “phablets”, or any other kinds of mobile devices. The concept of “fresh data” is particularly applicable to electronic performance-appraisal data gathering.

For the purposes of the current research, the appearance of infinite computing resources is of particular interest. Employees with a smartphone may collect information about what they do continuously and this information may then be recorded to the cloud to be used in performance appraisals when needed.

AI applications

An application is a software program that is designed to perform a specific function for the user, or in some cases, for another application program (Smith & Eckroth, 2017). According to Shrobe (1996), “the emergence of scientific achievements had triggered opportunities to tackle new problems”.

According to Smith and Eckroth (2017), several factors are contributing to AI applications:

- The Moore’s law: Since the first AI conference (1989), hardware is 2,500 times faster and storage is 25,000 times bigger. This explosive growth can be attributed to Moore’s law, the number of transistors in integrated circuits doubles every two years.
- The Internet: The web enables easy acquisition of massive amounts of data, from billions of web pages provided by billions of users (Halevy et al., 2009). According to these authors, sophisticated knowledge representation may be unnecessary when a massive corpus such as the web is available.
- Open source software: The idea of Open source software started in 1983, spread out, and the end result is the abundance of high-quality open source software as seen today (Smith & Eckroth, 2017). As of November 2015, 99 per cent of the 500 most powerful computers in the world run the open source Linux operating system.

- Machine learning: Because available hardware did not allow large-scale numeric computation, early AI systems relied on heuristics encoded symbolically. But the power available to process vast amounts of data has enabled practical deployment of machine learning techniques (Smith & Eckroth, 2017)

Is electronic performance appraisal an AI application? There are good reasons to say that it is, as the definition fits with the basic idea and most of the factors apply. However, it is important to determine how the system evolves and learns, which will be treated in a separate section below.

Big data, analytics and algorithms

Big data analytics is the process of examining large amounts of different data types, or big data, in an effort to uncover hidden patterns, unknown correlations, and other useful information. Companies using analytics in fields such as airline reservations (American Airlines) or predictive maintenance (Otis Elevator Company) have boosted both their revenues and reputation (Davenport, 2006).

An algorithm is a step-by-step procedure designed to perform an operation, which (like a map or flowchart) will lead to the result sought if followed correctly. Algorithms are used for calculation, data processing and automated reasoning.

If big data is combined with analytics and algorithms properly, complex information dynamics can be created that “may propel organisations in unexpected directions” (Scott & Orlikowski, 2012, pp. 22–40).

Davenport et al. (2010) compared analytics on customers to analytics on talent, concluding that relevant information about employees might be another means of outperforming competitors. Among the different possibilities in talent analytics, the same author suggests six topic types: talent value chain, talent value model, workforce forecast, human capital investment analysis, analytical HR, and human capital facts. Performance is behind several of these topics.

Collecting performance information from multiple sources can be carried out either formally or informally (Pulakos & O’Leary, 2011). If carried out informally, managers simply ask for feedback from various people who have different relationships with the employee and then they incorporate these findings into the ratings. If carried out formally, a more complex process is required (Pulakos & O’Leary, 2011).

2.3 About data quality

Data quality is one of the key aspects of this research, as performance is appraised considering many different data. No matter if it is the manager in the traditional way or a machine using an algorithm, data must be reliable. An information audit should be carried out in order to ensure that everything that is considered for performance appraisal is valid.

One example of an information audit concerns the information flows at Nottingham City Homes (Jones et al., 2013). According to these authors, it is important to determine both the responsibility for the information as well as acknowledge the importance of the context, in order to provide meaning.

Performance appraisal is a combination of many different pieces of information that are assessed by the appraiser. The process to consolidate information should start with the business goals and an audit of the resources needed to achieve the stated objectives (Orna, 1990). There is a relationship between the perceptions of managers about information practices and the perceptions of the same managers about business performance. Do information practices cause business performance? Or is a business successful (from the perspective of managers) due to successful information practices (from the perspective of the managers)?

Buchanan and Gibbs (1998, 2007, 2008a, 2008b) outline in a series of articles the facets of an “information audit”. In the example of Nottingham City Homes (Jones et al., 2013), the authors start by setting out the strategic context from a broad social-economic perspective. Then, they review the key company documentation, and finally examine the processes in detail.

For performance appraisal purposes, information without a business framework and lacking context may easily create a data flood. This creates a situation whereby there are so many pieces of information that it is difficult to separate the causes from the effects; the danger thereby being that systems consider useless information in order to appraise performance. How an organisation manages the data in systems that feed performance appraisal is thus an important topic for exploration.

2.4 About the adoption of technology

The purpose of this section is to understand through the literature how technology is adopted within organisations. Electronic performance appraisal might be technically viable, but it needs to be properly adopted within an organisation in order to be useful. This section of the literature review includes the determinants of adoption of new technologies, the development of collective intelligence and the needs of a definition, and lastly the ethical limits when using personal information.

Implementation is a very broad and unbounded topic. For this reason, instead of looking in-depth into every aspect, the current research takes into account the most important issues likely to affect implementation of technology within HR. Confirmation of the concerns and challenges relating to performance appraisal systems and definitions of the latest new electronic performance appraisal systems will determine an implementation plan, which will need a further literature review before proceeding.

2.4.1 Determinants of the adoption of new technologies

New technologies are not always adopted within organisations in the way they were designed to be used. Technology and organisations have undergone dramatic

changes in both form and function during the last decades. During the 1990s numerous models were developed to provide a variety of insights into the influence of technology within organisations. In all of these models, human action is a central aspect, especially when embedding structures within a technology or when appropriating those structures during use of technology (Orlikowski, 2000).

According to Orlikowski (ibid.), people may redefine and modify the meanings and applications of technology; thus, the idea that technology will become embedded within an organisation is not valid.

What people do with technology is an appropriation of the “structures” inscribed in the technologies. Such appropriation occurs when “people actively select how technology structures are used” (De Sanctis & Poole, 1994, p. 129). The same authors distinguish between “faithful” and “unfaithful” appropriations of the technology structures (ibid., p. 130). They also highlight two types of appropriations; those corresponding to technology-embedded structures, and those related to the expected outcomes. Their analysis identifies “different types of appropriation moves which preserve, substitute for, combine, enlarge, contrast, constrain, affirm, or negate the structures provided by the technology” (ibid., p. 135).

Another interesting approach to these determinants of the adoption of technology is the Theory of planned behaviour (TBP), proposed by Azjen (1991). According to this theory, a person’s action, at first, is determined by behavioural intentions, which are influenced by their attitude toward behaviour(s) and subjective norms (ibid., 1991). On top of this attitude toward behaviour(s) and subjective norms, according to this theory, perceived behavioural control can influence intention as well (ibid., 1991).

In more recent research, Ramayah (2012) analysed the TBP in relation to use of e-HRM systems, using a sample of more than fifty HR professionals. According to his research, attitude was the only motivation found to influence intention to use e-HRMs. On the contrary, subjective norms and perceived behavioural control did not have a significant effect. This may mean that information is important when designing implementation methodologies and that change management strategies should to be designed especially to meet the company’s requirement of e-HRM implementation.

All of this shows that implementing electronic performance appraisal systems needs a very careful implementation programme, with a high degree of transparency, and a focus of building trust among both managers and employees. Moreover, no one should be made to feel threatened by the introduction of this kind of system, otherwise there is a risk that it might easily be disqualified or cheated by individual and collective behaviours.

2.4.2 Technology and the development of collective intelligence

It is thanks to information technologies that so much more information is available today about clients, employees and stakeholders. With that information, a more

accurate understanding of the environment can be gained. Exploring data, it is possible to discover opportunities, evaluate them, and proceed accordingly (Bonabeau, 2009). But a framework for data is necessary in order to understand what type of collective intelligence is possible or not, desirable or not and affordable or not. Research into collective intelligence is generally carried out from the perspective of client intimacy, and rarely undertaken from the perspective of getting to know employees and learning about what they do.

For the purposes of the current research, collective intelligence frameworks might be useful for multisource information, but not for decision-making purposes. The benefits of collective decision-making systems are not applicable in performance appraisal where there are very few stakeholders involved. However, it is necessary to define the rules of performance, and it is crucial to determine who defines those rules.

One good example of collective intelligence is the effect TripAdvisor has had on the travel industry. Participants' reviews on social media are being used to rank the popularity of travel services. This makes for a substantial redistribution of accountability (Scott & Orlikowski, 2012).

Before TripAdvisor, accreditation schemes for travel services were developed hand in hand with the rise of automobile clubs, such as the Automobile Association (AA) or the Royal Automobile Club (RAC) in the UK, or the Michelin Guide in France. Furthermore, National Tourism Boards or niche guides such as those in the Lonely Planet series were involved. The process of ranking and rating was once the preserve of these organisations, and formal rating focused on operational issues and the assessment of certain types of facilities and services. A trained team visited the hotel or restaurant and conducted inspections, aligning the verdict within an international standard system. Reviews were updated and published every twelve to eighteen months.

These days, TripAdvisor reviews appear within twenty-four hours of the visit, producing a permanent update of opinions based upon guest experience. The meanings of the opinions are undefined and reviewers interpret it in their own way.

The structure of accountability is completely different: whereas in an analogue review service set-up, accountability is collated within "central" organisations, in the case of TripAdvisor, and generally among social media websites, accountability is distributed among all participants (Scott & Orlikowski, 2012).

But the question of who is responsible for deciding the rules of the game is crucial. Coming back to performance appraisals today, accountability in data gathering and interpretation is reliant on the manager. With electronic systems for data gathering and with algorithms for data interpretation, accountability for that part of the process will rely on the integrity of the organisation. Managers will be obliged, then, to take decisions about performance appraisals in a much more transparent and scrutinised environment. They will need very strong and compelling reasons to change whatever the system is suggesting. The question, here, then, is: Who determines the rule of the algorithm that predicts performance?

Again, a very significant part of this research ought to include both the rule setting and the distribution of accountability that needs to be in place in the new system. In today's systems, the HR department very broadly defines rule setting and the manager is almost the only person accountable for the performance evaluation. But in the electronic performance appraisal system, these accountabilities might change completely. Who determines the rules to include what within the algorithms, and where do the accountabilities lie? These are two significant questions yet to be answered.

2.4.3 Ethical limits

Researchers usually face the dilemma that the observations or surveys they produce could have consequences for the individuals surveyed or observed of which the subjects may not have been aware (Borgatti & Molina, 2003). Social network data have one troublesome and distinctive attribute: the names of either individuals or social units are not incidental to the research. Furthermore, the network analyst in collecting information about who relates to whom, is not confined to the names of respondents or informants within the study, for they may give the names of other subjects who have no idea that they are being named (Borgatti & Molina, 2003).

The same authors consider that there are only two ways of protecting research subjects: anonymity or consent forms (Borgatti & Molina, 2005). However, in the case of performance appraisal, anonymity is not an option. On the contrary, a consent form might be considered.

According to Kadushin (2005), the key issue when using personal information is who benefits and what the benefits looks like. For example, in medical research, the benefit is for humanity, in organisational research on behalf of clients, the organisation benefits. The ethical issue might be considered when benefits accrue only to management, or even worse, to particular managers.

From this perspective, there is a general concern about the ethical limits of electronic performance appraisal, which should be addressed during implementation. But it seems clear that, in order to keep the system within the ethical limits, everybody should benefit from the new system:

- Employees through a fair system;
- Managers through an online system that they can check and validate;
- Organisation through a better process for performance appraisal.

During the implementation phase, consideration of ethical practise is critical. Either through a consent form or through transparency and mutual benefits, ethical limits should never be transgressed.

As a conclusion of this section, the literature review about the implementation of an electronic performance appraisal system has identified many issues that should be taken into account in order for the research to be successful. With this review, it is possible to create a framework in order to take into account all of these issues.

The key concepts to be considered are:

- Adoption of e-HRM technology: the main difficulties might come from the adoption of this technology by the incumbents (managers and employees), and a very careful implementation plan should be designed, according to the problems that incumbents may envisage.
- Transfer of accountability: the new system creates a completely different structure of accountabilities when appraising performance. These accountabilities should be clearly defined: who determines what good performance looks like? Who validates the algorithms? Who supports the system?
- Ethical limits: lastly, but by no means least, it is crucial to keep the system within the ethical limits, that is, the system is transparent, people are aware they are participating, and nobody disproportionately benefits.

3 Empirical research

As explained in the introduction, following an initial literature review and the qualitative research presented in Document 3, the research question “To what extent is an electronic performance appraisal system feasible?” was formulated. Having explored aspects of this in an updated literature review, the empirical research took the form of an exploratory case study with two different phases:

- Phase I: The first part of the case study attempted to validate the possibility of electronic systems to predict performance appraisals. The question behind this research is: To what extent it is possible to predict individual performance through electronic performance appraisal systems that draw on data and calculate through algorithms?
- Phase II: The second part of the case study attempted to identify the determinants of the technology adoption of such a technological system. The question behind this third research area is: In the case where these digital solutions are implemented, what would be the level of acceptance by the relevant stakeholders (managers, middle managers and employees)?

In order to answer these questions, a combination of research methods has been used. As Scandura and Williams argue (2000, p. 1250), “increased triangulation should improve the ability of researchers to draw conclusions from their studies”. As these authors state, using a variety of methods might result in a more robust set of findings. The research question cannot be answered with a unique research method and one simple research approach, rather each of the intermediate questions requires a different approach. The next section explores the use of an exploratory case study.

4 Research Methodology and Methods

Performance has been widely researched and there are many quantitative studies using a positivist approach to go about it. Some of them are about the utilisation of performance tools and processes (Bernthal et al., 2003). Some are about employee satisfaction with these systems and processes (Moullakis, 2005). Others link individual performance with organisational performance (Pulakos, 2009). De Nisi and Smith (2014) review the most significant milestones of performance appraisal research, starting with management by objectives in the 1930s; then including behaviours and know-how in the 1960s and multisource rating in the 1990s. A common feature of all this research is that all of them are conducted through a laboratory-type setting, often using students as subjects. The problem with this is that findings from such research, as Di Nisi and Smith (2014) argue, do not translate well into natural settings. In addition, the traditional methods that positivists use to address such settings, such as survey instruments, tend to produce superficial data, which cannot probe the richness of the appraisal process. As we have seen, performance appraisal is a troublesome and contested practice, which suggests the need for a research methodology that will enable the capture of the complexity of the subject. Accordingly, the methodological considerations behind the selection of an exploratory case study need to be considered from the outset.

According to Van de Ven (2007), methodology is a composition of the ontology – what phenomenon is to be examined, – and the epistemology – the methods for understanding it.

Regarding ontology, there are two opposing ways to address reality, “what there is to know” (Ormston et al., 2014), constructivism and objectivism:

- The first, constructivism, is a view from which reality is socially constructed “through the use of language in conversation”. “According to this methodology reality is continuously shaped by social activity and human intervention, leading to a convincing interpretation of the subjective reality of the phenomenon being researched.”
- Opposed to constructivism is objectivism, where reality “cannot be significantly influenced by social activity, actors or any form of human intervention”. According to objectivism, objects around us have an independent existence.

Regarding epistemology there are two basic ways of knowing and learning about the world: interpretivism and positivism.

According to Bryman and Bell (2007), the term interpretivism “subsumes the views of the writers who have been critical of the application of the scientific model to the study of the social world. They share a view that the subject matter of the social sciences (people and their institutions), is fundamentally different from that of the

natural sciences [...], [with emphasis on] understanding human behaviour [rather than on its explanation].”

The same authors state that interpretivism uses observations and findings to build theory (an inductive course of action in which the researcher is part of the analysed reality), while positivism uses observations and findings to prove theory (a deductive course of action in which the researcher is outside the analysed reality).

In practice, it could be argued that these contrasts are rather exaggerated and that research needs to recognise both the objective nature of social phenomena once performed, especially when this takes the form of data produced by technology, and the subjective nature of the interpretations that actors make of such data. Accordingly, for this research, the ontology is one of weak social constructionism, one which recognises that the social world is activity dependent and strongly influenced by interpretations. However, the products of this activity can, to an extent, be measured. Accordingly, phases I and II are the two sides of the same coin in this particular research, one in the field of the Natural Sciences (prediction of performance through the use of data and algorithms, similar to what a Performance Appraisal looks like) and another in the field of the Social Sciences (social acceptance of the tool among the relevant stakeholders). Given this broad orientation to research, the next section explores why a case study was considered appropriate.

4.1 Methodology

4.1.1 Discussion of the methodology used for Phase I

4.1.1.1 *Quantitative vs. qualitative research*

According to Van de Ven (2007), qualitative research is the examination, analysis and interpretation of observations for the purpose of discovering underlying meanings and patterns of relationships within phenomena, in a manner that does not involve mathematical models. The preliminary research, in attempting to understand the current situation of performance systems in organisations, required an in depth understanding of the underlying patterns related to the phenomenon. This is why a constructivist approach was taken for the ontology and an interpretivist approach was taken for the epistemology.

However, the first part of the research, which proposed “To what extent is it possible to predict individual performance using data generated automatically?” required a completely different approach. The question “Is it possible?” suggested a proof of concept, taking a quantitative research approach. Qualitative research produces information only about the particular cases studied, but quantitative methods can be used to verify which of such hypotheses are true.

4.1.1.2 Quantitative research

In the natural sciences and social sciences, quantitative research is the systematic empirical investigation of observable phenomena via statistical, mathematical or computational techniques (Given, 2008). According to the same author, the process of measurement is central in order to connect the empirical observation with the mathematical expression of quantitative relationships.

The modern idea of quantitative processes have their roots in August Comte's positivist framework (Kasim et al., 2010). According to these authors, positivism emphasises the use of the scientific method through observation in order to empirically test hypotheses explaining and predicting what, where, why, how, and when phenomena occurred.

But there are a number of limitations to trying to answer the research question in this case. According to the preliminary research about performance appraisal systems used in today's large organisations, one of the key elements is the importance of the context in which the system is operating. Also, the culture of the organisation may affect decisively the performance system and, finally, all the data gathered by the organisation are very much related to the nature, composition, technology and habits of the organisation itself. Performance is not a universal measure.

For all of these reasons, after careful consideration, it was decided to carry out quantitative research based on a case study for Phase I, and not to base it on a universal sample.

On top of that, performance appraisal systems are highly influenced by the job, the organisation and the context, as the preliminary research showed. This makes it almost impossible to analyse this phenomenon by taking a broad perspective. Rather, it is necessary to identify a job that can be analysed in depth, to identify an organisational culture where this is disposable, and to find a business context that favours this idea. This is suggestive of a business case.

4.1.1.3 Quantitative research based on case studies

According to Thomas (2011) case studies are analyses of persons, events, decisions, periods, projects, policies, institutions, or other systems that are studied holistically by one or more method. With this basic idea in mind, always according to Thomas (2011), the case that is the subject of the inquiry will be an instance of a class of phenomena that provides an analytic frame – an object – within which the study is conducted and which the case illuminates and explicates.

According to Yin (1994), case studies may be applied to quantitative research when the nature of the question is “how” or “why”. They may also be adopted when the researcher has almost no control on the events and when the phenomenon studied is a contemporary phenomenon in a real-life context.

These three conditions fit perfectly with the research question “To what extent is it possible to predict individual performance using data generated automatically?”

- The question is a “how?” one; in the sense that the underlying meaning is to make sure that with alternative data it is possible to reproduce performance.
- There is no control whatever over events; on the contrary, the events – in particular the acceptance of the performance appraisal results by both the employee and the manager – are a long way from the idea of “reproducing” performance through data.
- The phenomenon is contemporary and within a real-life context. On top of that, the phenomenon is very much influenced by the context, the culture and the tools used by the organisation.

Yin (1994) states that a case study is a good alternative as an empirical inquiry in which the focus is on contemporary phenomenon within a real life context, and boundaries between the phenomenon and its context are not evident.

This is exactly the case that applies for this research. Performance appraisal is a phenomenon very much related to the context of the organisation. According to the literature and as confirmed by the qualitative research, sometimes performance appraisal is adapted to the context; sometimes performance appraisal is used to change the context. The boundaries between performance appraisal and its context are not evident.

The procedural characteristics of the situation include many variables of interest, many sources of evidence and complex theoretical propositions, to guide the collection and analysis of data.

Again, this is exactly the case with this research. At this point of the research the source of the variables and the variables themselves are not clear. There is an underlying theory about performance appraisal, but the theoretical propositions to guide data collection and analysis have yet to be developed. There are no procedural designs.

Finally, considering the nature of the question to be answered in this second research area, the company has been purposefully selected. Scandura and Williams (2000) suggest that a purposeful sample is valid when carrying out a triangulation of research methods, especially when the researcher’s intention is to validate a theory. This is exactly the case with this research, where the question “is it possible?” does not suggest a representative sample, but a purposeful one. The main characteristics of this purposeful case are:

- The company (CEO and management team) is willing to participate in the exercise.
- The company operates in the IT industry, which implies a certain open mindedness to the conceptual idea of the current research.
- The company carries out a core job with a large number of incumbents.
- The company has enough primary data available.

The clearest limitation to this purposeful approach is that it is impossible to determine whether this theory represents a global population or not.

The types of case studies include: exploratory, explanatory or descriptive. In the current research, the case study is exploratory. Framed as a proof of concept, it is far from an explanation, but on the other hand, nor is the study only descriptive.

The design of the research could be either single or multiple case studies; however, in order to prove the concept of the current research it was decided that it was better to focus in-depth on one case study, even within one specific population, rather than attempt to confirm using several case studies the validity of the research (Yin, 1994). In the specific case of the current research, therefore, depth was felt to be more important than breadth.

4.1.1.4 Criticism of case study quantitative research

According to Yin (1994), the typical criticism about case study quantitative research is about:

- The lack of systematic handling of data
- The lack of a basis for a scientific generalisation
- The time frame: time limits depend very much on the researcher's choice

Regarding the lack of systematic handling of data, one of the most critical aspects of the current research is to gather enough information (primary data) to allow the replication of performance appraisals carried out by managers with employees. It would have been impossible to try to find consistent data from across all different organisations and among all the various jobs. For this reason, the only way to handle information that is of value is to focus in on a case study, even more, focus in on a population within an organisation. In this case, the criticism becomes one of the strengths of the approach.

With regard to the lack of scientific generalisation, it is clear that the outcome of this research will not be the test of a new theory applicable to all organisations. The research may validate an approach that will certainly need a lot of adaptation and validation when transferred to other populations and other organisations in different industries. More than a new theory, it is a possible new way of addressing performance appraisal that is validated in this research.

On top of these criticisms drawn from Yin (1994), the company and the sample analysed as a case study, will have their own limitations to be extrapolated:

- A company always operates within a very specific business.
- The population will be quite homogenous.
- The context is a real-life one, but the people taking part will not be advised of the research (explained in the research design). This means that the research is not influencing behaviours at all.

4.1.2 Discussion of the Methodology used for Phase II

For the discussion of the research methodology in Phase II of the research there is a clear limitation; this is the fact that the only place where this acceptance can be researched is in the same company where the Phase I of the research was run. In order to have a broad perspective, different stakeholders should be involved: CEO, managers and employees.

Phase II concerns the social acceptance among relevant stakeholders of digital tools to measure performance. As the research methodology of Phase I is a case study, thus Phase II of the research is limited to the same case study.

4.1.2.1 Action research

When trying to move further and answer the second question (“In the case that these digital solutions are implemented, what would be the level of acceptance by the relevant stakeholders?”), we are entering completely into the field of the social sciences. But again, the level of acceptance will not be universal; it will depend on the context and the culture of the company.

The concept of *action research* (Berg et al., 2004) applies in order to examine a variety of as yet undetermined situational and conditionally based issues. The origins of action research, according to these authors are not clear. According to Holter and Schwartz-Barcott (1993), however, it was developed in the 1940s for psychology research. Action research takes into account company culture, the activities developed and other population characteristics (Berg et al., 2004).

Both characteristics apply perfectly to the research question and the population considered. On the one hand, the ontology is extremely undetermined; the basic question to ask interviewees is “What do you think about this?” On the other hand, the population has experience with performance issues, they already have a culture built around it. Although this research is not pure “action research”, the spirit of action research, engaging the population analysed, has been very useful in order to reach the final conclusions.

Action research has been widely used when researching changes to technology in professional populations. Two examples are educational change and its impact on teaching practices (Anderson, Herr & Nihlen, 1994; Kemmis & McTaggart, 1988), or nursing studies (Holter & Schwartz-Barcott, 1993; Seymour-Rolls & Hughes, 1998).

The common threads that draw these disciplines together when conducting action research are (Berg et al., 2004):

- A highly rigorous approach to empirical research;
- The active engagement of individuals, traditionally known as subjects, as participants and contributors in the research enterprise;
- The integration of some practical outcomes related to the actual lives of participants in the research project.

Stated differently, action research may be understood as a mean or model for enacting action-oriented approaches of investigation and applying small-scale theorising to specific problems in particular situations (Reason, 1994; Stringer, 1999). In another way, action research is a method of research in which creating positive social change is the predominant force that drives the investigator and the research. Again, this applies perfectly to the situation and the research question.

The basic action research process involves four stages:

- Identifying the research question
- Gathering the information in order to answer the question
- Analysing and interpreting the information
- Sharing the results with the participants

For this particular stage, sharing the results with the participants, Stringer (1999, p. 81) suggests a number of activities that the investigator may use, especially when there are different stakeholders. Among them, the most interesting in terms of this research are the Focus groups; “in which people with similar interests discuss particular issues.”

4.2 Methods

4.2.1 Methods: discussion of the quantitative research used in Phase I

Research methods are tools used in order to collect data, both quantitative (number of data) and qualitative (richness of data). According to Collis and Hussey (2009), methodologies and methods are different concepts, as methodologies are approaches to the process of research that encompasses a body of methods. There are two different units of analysis: first, to analyse the relevance of the data and second to construct a model.

The relevance of the data involves analysis of the relationship of the different available data (dependent variables) with the performance appraised by the company (independent variable, or variable to be explained). From this perspective, and considering the estimated number of possible variables to consider (no more than 15), regression analysis is considered to be the best method to apply.

Regression analysis is a statistical process for estimating the relationships among variables. It includes many techniques, when the focus is on the relationship between the dependent variable and one or more independent variables. In this research, the dependent variable will always be the performance evaluation being predicted.

Despite the capacity of regression to establish relationships among variables, there is no magic. Sometimes regression may lead to illusions or to false relationships, as correlation does not imply causation (Armstrong, 2012).

The underlying assumptions of the regression model are:

- The sample is representative of the population for the inference prediction.
- The error is a random variable with a mean of zero conditional on the explanatory variables.
- The independent variables are measured without error. (Note: If this is not so, modelling may be done instead using errors-in-variables model techniques).
- The independent variables (predictors) are linearly independent, i.e. it is not possible to express any predictor as a linear combination of the others.
- The errors are uncorrelated, that is, the variance–covariance matrix of the errors is diagonal and each non-zero element is the variance of the error.
- The variance of the error is constant across observations (homoscedasticity). If not, weighted least squares or other methods might be used instead.

Regression models predict a value of the dependent variable given known values of the independent variables. Prediction within the range of values in the dataset used for model fitting is known informally as interpolation. Prediction outside this range of the data is known as extrapolation. Performing extrapolation relies strongly on the regression assumptions. The further the extrapolation moves outside the data, the more room there is for the model to fail due to differences between the assumptions and the sample data or the true values (Chiang, 2003).

4.2.2 Research design for Phase I

The central components of the case study design (Yin, 1994) are the following:

4.2.2.1 Proposition of the study

The basic proposition is that performance appraisal may be replicated through analysis of different data. At this point, the core of the research relates to where these data are to be found and how they are to be used. Thus, the very first criteria to select the case study is to have enough data available that might be considered eventually as a potential predictor of performance. The more homogenous the population analysed, the more accurate the research will be. This is why it is important not only to consider a company, but a homogenous population within the company.

4.2.2.2 The study's units of analysis

There are two different parts when defining the units of analysis: the relevance of the data and the construction of a model. The research is looking into the possibility of replicating performance appraisal through the use of different data. Thus, the first thing needed in order to carry out the case study is a performance appraisal system already tested in the organisation and known to be reliable. Then, following this, the first unit of analysis is to identify which data bear some relationship to performance

appraisal. Once those data have been filtered, the second unit of analysis is to build the model that may replicate performance appraisal.

4.2.2.3 Neutral employee's stance

One of the most critical aspects of performance appraisal is that it may affect employee behaviours. Having said that, it would be very difficult to ask employees directly about the way they are appraised. The bias might be influencing the results of the study.

For this reason, the analysis was run only with primary data (performance data and other kinds of data recorded in the company's systems). As a consequence, employees were not advised about the study, in order to preserve the integrity of the data. This use of already available data was covered by existing arrangements within the company pertaining to data protection.

The preliminary theory and blueprint of the study was to validate the possibility of defining a new process when appraising performance within an organisation. That is, looking into the possibility of anticipating the results of performance appraisal even before the manager makes a judgment about the employee's performance. The design of the case study, therefore, was exploratory. Following this, the response of employees being managed in this way was analysed through qualitative methods, as was the way the organisation as a whole might adopt this new technology.

4.2.2.4 Collecting and analysing the evidence: data collection

As Yin (1994) states, analysis of evidence is one of the least developed and most difficult aspects of carrying out case studies. According to this author, the most important thing is to always have a general analytical strategy as this helps the researcher make choices from among the different techniques.

From the two possible analytical strategies – theoretical propositions or developing a case description – the final choice for this research is oriented more towards developing a case description.

The reason for this choice is that although there may be a theoretical orientation guiding the study, there are no theoretical propositions forming the design of it. Still at this stage, it is not possible to focus on certain data and ignore other data, as it is not yet known which data will be relevant.

The development of a case description will help in exploration of the relationships among the different variables and the performance appraisal as an independent variable.

4.2.2.5 *The case*

The previous sections, dedicated to methodology and methods, have explained the choice of a case study as the most appropriate in order to answer the research question (“To what extent is it possible to predict individual performance?”).

The next step in the research was to find a company with a proven performance appraisal system (that is, one that had been running for at least the past two years), and with information enough to gather relevant data relating to performance.

The final choice was a consulting company with two characteristics: first of all, the management wanted to co-operate with the research and secondly the company had already been using a corporate social network since mid-2013; that is, the company already had a relevant amount of data available. On top of that, the profile of the employees, young people, technically oriented, and curious about new things, made for the ideal atmosphere where a corporate social network was already in use, that is, one where relevant and abundant data was available for collection.

The company

The company chosen is Company XYZ, from now on “the company”. A confidentiality contract has been signed with the company, with the ban to disclose its name and the ban to disclose the name of any employee. Employees will be called according to a number code (Employee 001, Employee 002, and so on). A copy of the confidentiality contract is shown also in Exhibit 3.

The company operates in the ICT business sector and was founded in 1995. Its head office is in Madrid and the company has technical offices in Oviedo (Spain), Mexico City (Mexico) and Miami (USA). The team consists of more than 350 people specialised in different fields of information technology, in many cases creating numerous spin-offs and start-ups specialised in Internet business models.

The biggest office is located in Madrid (including the Oviedo team), with over 190 consultants serving in four different job roles:

- Junior consultant: working on projects under the supervision of consultants and project leaders. Their basic contribution are data collection, data analysis and basic programming.
- Consultant: provides experienced know-how for projects. He / she may supervise junior consultants within the framework of a project. Their basic contribution is about client deliverables supervision, testing and on-the-job training.
- Project manager: manages a project in terms of balancing quality, timeframe and cost. He / she is accountable for the team assigned to the project, and also for the client relationship within the framework of the project. Their basic contribution is about client satisfaction and project profitability.
- Principal: expert in a critical know-how domain for the company. Their basic contribution is developing a particular know-how within the company.

The employees

The employees chosen for this research are the 104 consultants working in the Madrid office in different job roles:

- Junior consultants: 39
- Consultants: 104
- Project managers and Principals: 53

There is a management structure running the Madrid office. This structure consists of an Office Director (Madrid Office Director) and five different Area Managers. The Madrid Office Director is accountable for the whole Profit and Loss account of the office as a Business Unit. The Area Managers are accountable for sales and client relationships. Each consultant reports to an Area Manager, working in teams of around 40 people. From this perspective, Area Managers are also accountable for the development of consultants and people management.

There is not a strong connection between the different offices. Mexico City and Miami are far enough so as they can be considered as completely different business units. Thus, from the perspective of this research, the Madrid Office works as an isolated business unit, and the Office Director and the Area Managers are the real management team of the sample.

The corporate HR unit, reporting to the CEO, provides HR processes and tools, consolidates information and runs all the administrative processes. People management is completely delegated to the offices. In practical terms, Area Managers are the real people managers managing the consultants.

The rationale to choose this specific sample is that the job role is the most representative of the business, that the size of the sample is the largest possible and that the age and background of the consultants make them avid users of the digital tools the company offers their employees.

The data

From this perspective the company and the sample analysed has its own limitations to be extrapolated:

- The Company operates a very specific business, professional services.
- The population is homogenous, young, and very open to the utilisation of technologies in the workplace.
- The context is real life, but people were not advised that the research was being carried out. That means that the research is not influencing behaviours at all.

The data collected for this research belongs to 2014, but it can be refreshed, and the experiment may be reproduced within almost any other time frame, not necessarily according to a one-year budget. Creswell (2009) states that data collection in a case study occurs over a sustained period of time.

Once the data are collected, the research stance chosen is the positivist one. There is always one hypothesis behind the research question, performance evaluations may be predicted by data stored in the corporate social network of the company. The effort throughout the document is to validate the hypothesis through the evidence of data.

The current performance system

Three years ago the company put in place a performance appraisal system. The system applies to all professional job roles (that is junior consultants, consultants, project managers and principals). All these professionals are evaluated with the same tool. The main characteristics of the system are:

- It is yearly based.
- There are several elements judged by the manager. Those elements are grouped into clusters.
- Each one of the elements is evaluated from 0 to 5, – 5 being the maximum. There is no definition of the meaning of the ranking.
- The manager can make comments about each one of the elements. All the evaluations and the comments are recorded in a database.
- There is a global evaluation, mathematically calculated from the different elements evaluated.

The clusters and elements that are evaluated are the following:

1. Commitment to clients and projects

- Response to workload peaks
- Responsibility concerning assigned tasks
- Proactivity to anticipate and solve problems
- Efficiency (quality and validity of the solutions provided)
- Productivity (speed of the solutions provided)
- Technical quality of work

2. Personal relationships

- Autonomy
- Reliability in estimating his/her work
- Solidarity and companionship
- Potential value from other colleagues
- Potential value from customers

3. Company engagement

- Care in the working environment
- Interest in corporate information, policies and values
- Collaboration in horizontal responsibilities
- Participation in tasks for disseminating know-how
- Support to colleagues

4. Personal development

- Investment in training and self-training
- Ability of technical learning
- Interest in the development of personal skills complementary to his / her work
- Certifications

The appraisal form includes the key strengths of the consultant, his / her areas for improvement, his / her professional interests and finally a general comment.

4.2.3 Methods: discussion of the qualitative research used in Phase II

With regard to the qualitative research methods employed, there are several options: interviews, focus groups, critical incidents, case studies, documentation analysis, life stories, etc. (Cassell & Symon, 2012). For the purposes of Phase II of the research, the interview and the focus group methods were selected. The use of focus groups is consistent with the spirit of “action research”. The environment will also help the researcher to identify the use of rhetorical techniques and metaphors (Tietze et al., 2003), limiting the pollution and noise that could drown out salient points of the conversations.

Regarding other types of qualitative methods proposed by Cassell and Symon (2012), they have been discarded for several reasons. Critical incidents apply for very specific activities, whereas in these interviews, the goal is to open up the issue about a particular way of measuring performance and how it would work. Use of ethnography, documentation analysis and life story does not make sense for the purposes of this study.

4.2.4 Research design for Phase II

4.2.4.1 *The interviews*

The semi-structured approach was chosen for the design of the interviews. That is, maintaining the assistance of tuition, and with a conceived framework in mind, instead of just an informal conversation, which might be said to characterise an unstructured interview (Fisher, 2010).

In this context, the first part of the interview explained what needed to be done and stated the main results from the proof of concept. Then, depending on the initial reaction of the interviewee, a set of probes was used, in order to amplify, explain, explore, clarify, value, or challenge the respondents’ answers.

The explanations and questions were clear, avoiding prefaces or double questions or questions too abstract or theorised; and privileging language and terminology commonly used by people.

For the focus groups, a set of conclusions from the interviews was presented as discussion content. Each of the conclusions was raised and through the interaction of the group, the main drivers beyond each of the conclusions were drawn out.

4.2.4.2 The question

Already defined, “In the case where these digital solutions are implemented, what would be the level of acceptance by relevant stakeholders (managers, middle managers and employees)?” The question is suggesting a hypothetical situation (“in the case that ...”) so again, in this third research phase it is not possible to define how close the research will come to an answer.

4.2.4.3 The sample

The sample selected for Phase II of the research was composed of a set of people, each representing one of the stakeholders within the company, used as a case study in the analytical phase of this research.

These people are:

- CEO (1 person)
- Managers (5 managers interviewed)
- Consultants (12 consultants interviewed)

On top of the interviews, 3 focus groups were run:

- Managers’ focus group: 4 managers attended, among the 5 previously interviewed individually.
- 2 Consultants’ focus groups: 4 and 5 consultants attended (9 out of the 12).

The selection of the sample was decided with the CEO taking into the following criteria:

For managers:

- Managers with more than one-year experience as managers in the company, so they had experimented a complete performance cycle.
- Managers that previously had worked as consultants in the same company, so they can understand both sides of the table.

For consultants:

- Consultants with more than one-year experience in the company, so they had experienced a complete performance cycle.
- Consultants with good reputation among the whole group, kind of opinion leaders.
- Finally, consultants available in terms of client location (no trips needed).

The final selection, both for managers and consultants, was proposed by the CEO. Although this represents a limitation on this research, in that the CEO may have chosen those who he thought were amenable to his own perspectives, it was a condition of access. In practice, respondents appeared to respond to questions openly. Research access often involves a balance between the desired conditions, in this case the free selection of respondents by the researcher, and the practicalities of the situation. While the potential limitations are recognised, on balance the evidence gleaned outweighed these limitations.

4.2.4.4 Interview analysis

Analysis of the interviews was undertaken starting with a very open question, more or less “What do you think about this?” without any kind of “pre-figuring” the field for the interviewee. “Pre-figuring” the field runs the risk of researchers only finding out what they want to find out, by only looking for a specific phenomenon, or by being blind to other issues that might arise (Sandelowski, 1986).

The information about what was done was presented, including his / her performance appraisal calculated by the algorithm, according to the data recorded. In the case of the managers, their direct reports on performance appraisals were shown.

The reaction of the interviewee is very important. In some cases, they took some time to digest the information; in others the reaction was more spontaneous.

Iteration – moving back and forth– was also seen as important. This moving back and forth allows for a kind of triangulation of the analysis, as it is very rare for qualitative data to be collected all in one go, then processed and analysed. It is a term “borrowed” from geography – and in qualitative analysis it means more than one perspective of a situation, in this case, consultants and managers.

Fluency and colloquialisms are also important. This is why all the interviews were carried out in Spanish, the first / mother-tongue language of all interviewees as well as the researcher. Then, the way in which the qualitative research is presented to readers is also crucial in order that readers have confidence in the rigour of the work. An effective way to show that theories come from the understanding of the research participants is to allow their voices to be heard. This means including representative quotations from peoples’ discussion to illustrate points.

All the main conclusions from the interviews were presented to the focus groups, in a way reminiscent of “action research”. As the conclusions were already set, the discussion in the focus groups was more directed. The groups could discuss a topic and propose an action plan, so that everything would be recorded.

Interview preparation and discussion

A short presentation about the research was prepared in order to introduce the individual interviews. The presentation included critiques to the current performance system and a broad overview of the process followed: data considered, and algorithms developed in order to predict performance measurement. A final discussion about the differences among performance measurement, appraisal and management was run.

After introducing and framing the conversation, the questions explored were (from an open perspective to a more detailed one):

- Which are your views about the current performance process?
- What is your view about the possibility to predict performance in this organization?
- Which are, in your view, the potential benefits of this approach?
- Which might be, in your view, the potential drawbacks?
- If this system is implemented, which would be your personal position about it?

For the focus groups, the questions were related to the main findings of the individual interviews.

Managers' focus group

- Confirmation of the current performance process conclusions
- May we figure out a new process using this tool?
- Would you accept to participate in such a process as a manager?
- Which are the potential threads of such a process?

Consultants' focus group

- Confirmation of the current performance process conclusions
- May we figure out a new process using this tool?
- Would you accept to participate in such a process as a consultant?
- Which are the potential threads of such a process?

To summarise, an exploratory case study was conducted, which examined the potential of digital performance appraisal in one company. The research consisted of two phases: Phase I was the collection and analysis of data produced by IT systems with a view to measuring performance. These measurements were then compared to existing performance measures. This phase of the research could be characterised as broadly positivist in character, in that it sought to derive evidence from objective quantitative measures. Phase II, however, was more interpretive in character, as it used qualitative methods to probe responses to the findings of Phase I. The overall research can therefore be characterised as employing mixed methods. The following chapter sets out the key findings of Phase I of the research.

5 Findings

5.1 Phase I

As presented in previous sections, performance is a combination of different elements (know-how, behaviours and results), which can be seen from different perspectives (the CEO perspective, company perspective, individual perspective, etc.). This demonstrates the need to set up the ontology (what is really being examined?) before selecting the epistemology (how should one approach it?).

Considering the ontology, “what is being examined”, a broad perspective of performance is proposed, considering the current performance system and the results as well as the predicted performance.

This broad perspective analyses three different types of correlations:

- Current performance system against business results (comparing know-how and behaviours against results)
- Predicted performance against the current performance system (comparing know-how and behaviours)
- Predicted performance against business results (comparing know-how, behaviours and results against the overall results)

5.1.1 Technical information about the Phase I research

Survey sample:

104 consultants with performance records of the researched company.

Measures:

Comparison of the current performance measurement with the predicted performance measurement according to a set of available variables.

Current performance measurement includes the following outcomes:

- Global performance
- Commitment
- Relationships
- Engagement
- Personal development

The set of variables identified to build up a predicted performance measure are:

- Hours billed (recorded in the accounting system)
- Number of relevant skills identified by the Corporate Social Network Tibbr
- Number of referrals to those relevant skills carried out by colleagues

- Percentage of profile completed by the consultant.
- Number of entries on the personal blog
- Number of visits to the personal blog
- Number of subjects created
- Number of participations in different subjects / forums
- Number of “likes” to opinions or answers to the subject
- Number of meetings rejected (recorded in the corporate diary)
- Influence score (calculated by the Tibbr software according to visits)

Descriptive statistics for each variable:

The different statistics for each one of these variables are the following:

Current performance measures:

<i>Item</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Average</i>	<i>Standard deviation</i>
Global performance	2,59	4,68	3,72	0,42
Commitment	2,67	5,00	3,94	0,58
Relationships	2,60	5,00	3,93	0,51
Engagement	2,20	4,60	3,54	0,52
Personal development	1,50	4,75	3,47	0,55

Set of variables identified:

<i>Item</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Average</i>	<i>Standard deviation</i>
Hours billed	791	1804	1343,73	238,40
Number of relevant skills	2	6	3,75	1,08
Number of referrals	16	68	44,58	9,07
% of profile completed	33%	100%	69,51%	13,52%
N. of entries on the blog	0	41	16,79	10,78
N. of visits to the blog	0	483	144,59	115,70
N. of subjects created	0	18	7,90	5,09
N. of participations in subjects	363	869	586,97	97,63
N. of “likes” to the subject	698	4.747	2.533,09	882,65
% of meetings rejected	0%	15,24%	6,81%	3,61%
Influence score (%)	22,93%	94,25%	59,41%	14,12%

Linear regression analysis carried out:

Current performance systems compared with business results:

Hours billed predicted by commitment		Hours billed predicted by relationships		Hours billed predicted by engagement	
Independent variable	Hours billed	Independent variable	Hours billed	Independent variable	Hours billed
Dependent variable	Commitment	Dependent variable	Relationships	Dependent variable	Engagement
R-squared variance	0,314	R-squared variance	0,295	R-squared variance	0,232
Slope	231,19	Slope	252,90	Slope	220,66
Intersection	433,76	Intersection	351,07	Intersection	563,35

Hours billed predicted by personal development		Hours billed predicted by global performance	
Independent variable	Hours billed	Independent variable	Hours billed
Dependent variable	Personal development	Dependent variable	Global performance
R-squared variance	0,225	R-squared variance	0,435
Slope	203,77	Slope	371,46
Intersection	636,90	Intersection	-36,82

Predicted performance know-how (personal development) against know-how variables:

Predicted performance know-how by number of referrals	
Independent variable	Predicted Know-How performance
Dependent variable	Number of referrals on relevant skills
R-squared variance	0,560
Slope	0,0458
Intersection	1,427

Predicted performance behaviours against behavioural variables:

Commitment predicted by number of subjects created		Commitment predicted by number of participations in subjects		Commitment predicted by number of "likes" in subjects	
Indep. variable	Commitment	Independent variable	Commitment	Indep. variable	Commitment
Dependent variable	Subjects created	Dependent variable	Part. in subjects	Dependent variable	"Likes" in subjects
R-squared variance	0,003	R-squared variance	0,237	R-squared variance	0,493
Slope	0,0066	Slope	0,0028	Slope	0,00046
Intersection	3,885	Intersection	2,242	Intersection	2,770

Relationships predicted by number of visits to the blog		Relationships predicted by number of "likes" in subjects		Relationships predicted by number of meetings rejected	
Indep. variable	Relationships	Indep. variable	Relationships	Indep. variable	Relationships
Dependent variable	N. visits to blog	Dependent variable	"Likes" in subjects	Dependent variable	Meetings rejected
R-squared variance	0,019	R-squared variance	0,519	R-squared variance	0,490
Slope	0,00061	Slope	0,00041	Slope	-9,952
Intersection	3,836	Intersection	2,865	Intersection	4,602

Engagement predicted by completion of personal profile		Engagement predicted by number of entries in the blog		Engagement predicted by influence index	
Indep. variable	Engagement	Indep. variable	Engagement	Indep. variable	Engagement
Dependent variable	% personal profile	Dependent variable	Number of entries	Dependent variable	Influence index
R-squared variance	0,606	R-squared variance	0,037	R-squared variance	0,133
Slope	2,999	Slope	0,0093	Slope	1,349
Intersection	1,451	Intersection	3,379	Intersection	2,734

Predicted performance behaviours against behavioural variables:

Relationships predicted by 2 variables		Engagement predicted 2 variables	
Independent variable	Relationships	Independent variable	Engagement
Dependent variable 1	% of meetings rejected	Dependent variable 1	Completion personal profile
Dependent variable 2	Thousands of “likes”	Dependent variable 2	Influence index
R-squared variance	0,64	R-Squared variance	0,63
Slope variable 1	-6,12	Slope variable 1	2,82
Slope variable 2	0,277	Slope variable 2	0,663
Intersection	3,63	Intersection	1,179

Predicted business results (hours billed) against significant variables:

Hours billed predicted by number of referrals		Hours billed predicted by “likes” in subjects		Hours billed predicted by meetings rejected	
Indep. variable	Hours billed	Independent variable	Hours billed	Indep. variable	Hours billed
Dependent variable	Number of referrals	Dependent variable	Likes in subjects	Dependent variable	Rejected meetings
R-squared variance	0,201	R-squared variance	0,252	R-squared variance	0,242
Slope	11,795	Slope	0,1357	Slope	-3257,77
Intersection	817,93	Intersection	999,96	Intersection	1565,54

Hours billed predicted by completion of personal profile		Hours billed predicted by influence index	
Indep. variable	Hours billed	Independent variable	Hours billed
Dependent variable	% personal profile	Dependent variable	Influence index
R-squared variance	0,149	R-squared variance	0,113
Slope	681,61	Slope	567,68
Intersection	869,955	Intersection	1006,48

5.1.2 Current performance systems against business results

Considering the consultants' population, the most significant results taken from the accounting system are the number of hours billed during 2014.

Hours billed

It is a very simple concept. It is the number of hours worked by the consultant that have been charged to the client at his / her standard fee. If the consultant has not been on board the full year, and there are a few cases (new hires or maternity leave candidates), the number of hours has been interpolated to the whole year. As the evaluation system is applied to people with more than six months in the job, there is unlikely to be any big mistake made by taking this approach.

The number of hours billed is not the decision of the consultant. Consultants could argue that they work on projects without billable hours. But it is clear that the consultants with the best skills are preferred by managers and are the first to be called upon to staff projects. In a specific project a consultant might be unlucky but in a full year it is clear that billable hours are a very significant indicator of results.

In order to compare the current performance dimensions against results, two kinds of analysis were performed:

- Correlation of each of the performance dimensions against results
- Correlation of global performance against results

As the sample is the whole population of consultants in the company, the analysis will be based just on the correlation and the regression coefficient.

Correlation of each of the performance dimensions against results

The different results obtained for the prediction of hours billed depending upon the current performance dimensions are very weak.

5.1.3 Predicted performance against current performance system

In this second block of comparison, the intention of the research is to analyse data gathered throughout 2014 from the corporate social network, which could eventually predict performance in terms of know-how and behaviours.

Know-how data

- Number of relevant skills identified by the corporate social network Tibbr
- Number of referrals to those relevant skills carried out by colleagues

The relevant skills defined by the company are:

- ✓ Agile software development
- ✓ Business Analysis
- ✓ Cloud computing
- ✓ Scrum
- ✓ SOA (Services oriented architecture)
- ✓ Software development
- ✓ Web 2.0

For each of the consultants, the corporate social network gives the number of referrals for each of these relevant skills. Those data are disclosed in Exhibit 4.

As consultants are polyvalent in terms of the type of project they are assigned to, the first attempt to analyse know-how involved counting how many referrals each consultant had. The number of referrals and the kind of comments against the referrals should be relevant at Principal level, but not yet at consultant level.

Behaviour data

All this data may be related directly to the behaviours shown by the consultants, and are gathered from the corporate social network, Tibbr:

- Profile:
 - ✓ Percentage of profile completed by the consultant.
- Blogs:
 - ✓ Number of entries on the personal blog
 - ✓ Number of visits to the personal blog
 - ✓ Number of “likes” to articles on the blog
- Subjects:
 - ✓ Number of subjects created
 - ✓ Number of participations in different subjects / forums
 - ✓ Number of “likes” to opinions or answers to the subject
- Events:
 - ✓ Number of meetings rejected
- Notifications:
 - ✓ Number of times the consultant reacts to a notification (% of notifications)
- Insights:
 - ✓ Influence score (calculated by the software according to visits)

5.1.3.1 Analysis of the know-how: prediction of the personal development

In order to analyse the prediction potential of Personal Development, a comparison with the number of referrals is proposed. The idea is to check if the number of referrals could predict the current performance element.

Assuming that at consultant level they are all practitioners, there is no need to differentiate the quality of the referral. Also, it is very difficult at this level to differentiate between the relevant skills, that is, it is the amount of know-how that is important and not the depth of know-how in a certain skill. For this reason I consider the total number of referrals in relevant skills no matter which skill it is.

Analysis of the correlation of predicted know-how according to the referrals in the corporate social network and the performance evaluation measured by the current system is very promising.

Considering the Best 10 and the Worst 10 of both systems, the following results were achieved:

- 4 consultants in the Best 10 according to the performance system are also among the Best 10 in the referrals of the corporate social network Tibbr.
- 6 consultants in the Worst 10 according to the performance system are also among the Worst 10 in the referrals of the corporate social network.

The predicted Know-how evaluation, according to the referrals would therefore be:

$$\text{Know-how (Personal development)} = 0,0458 \times \text{Number of Referrals} + 1,427$$

The correlation coefficient is 0,56 (which is quite significant).

Both results (the correlation and the Best and Worst 10) show that, although the relationship is not perfect, it is possible to make a prediction of the Personal Development of each of the consultants, based on the referrals from other colleagues. In order to fine-tune the prediction, some sort of “quality of the referral” might be included in the future, that is, taking into account who the consultant is referring. For instance, it is not the same if a referral comes from a Principal rather than from a Junior Consultant. This has not been taken into account at this stage.

5.1.3.2 Analysis of the behaviours: prediction of commitment, relations and engagement with the company

In order to analyse behaviours, there are three components of behaviours in the current evaluation system and 10 relevant data coming out of the corporate social network. These are:

Components of behaviour in the current evaluation system:

- Commitment to projects and clients
- Relationships
- Engagement with the company

Relevant data coming out the corporate social network:

- Percentage of completion of the personal profile
- Number of entries in the personal blog (provides an idea of the volume)
- Number of visits to the personal blog
- Number of visits per entry to the personal blog (provides an idea of the interest)
- Number of subjects created
- Number of participations in subjects
- Number of “likes” in the subjects
- Percentage of meetings rejected
- Percentage of reaction to chats
- Influence index measured by the corporate social network Tibbr.

Although a comparison may be possible, it makes sense to establish a map of possible relationships:

Commitment to projects and clients	Number of subjects created
	Number of participations in subjects
	Number of “likes” in the subjects
Relationships	Number of visits to the personal blog
	Number of “likes” in the subjects
	Percentage of meetings rejected
	Percentage of reaction to chats
Engagement with the company	Percentage of the profile completed
	Number of entries on the blog
	Influence index measured by Tibbr

Prediction of Commitment to projects and clients

The evaluation of commitment to projects and clients should be related to:

- Number of subjects created
- Number of participation in subjects
- Number of “likes” in the subjects

The reason for this might be that every project has a “subject” in the corporate social network. If the number of subjects created could be a matter for discussion, the participation of subjects should clearly relate to the commitment in projects. In the same way, the number of “likes” against those participations should give an idea of the quality of them, and thus also relate to the level of commitment in projects.

The relationship with the number of subjects created is almost random, whereas compared with the other two variables there is a significant relationship. The number of consultants participating in the subjects should be considered in a multilinear regression along with the number of “likes”, with which it has a significant relationship.

The multilinear regression with two variables (number of participations and number of “likes”) has almost the same capacity of prediction that the number of “likes” has. Although in this case both variables have a limited mean-square error, the high correlation of both does not provide a better capacity of prediction (R2 coefficient increases from 0,49 to 0,51).

For this reason, the predicted Commitment to clients will be calculated using only the variable number of “likes” awarded to participation in the subjects.

$$\boxed{\text{Predicted Commitment to Clients} = 0,46 \times \text{Thousands of "likes"} + 2,77}$$

The limitation of this variable may be that in practical terms it is very easy to award a “like” to a comment. When consultants know that their performance is related to the number of “likes”, this might be inflated.

But for the purpose of a proof of concept, in the context of this document, it still may offer a valid option.

Prediction of Evaluation of Relationships

The evaluation of Relationships should be related to:

- Number of visits to the personal blog
- Number of “likes” in the subjects
- Percentage of meetings rejected
- Percentage of reaction to chats

The reason for this is that evidence of teamwork is being sought. Team players participate in subjects, co-operating with their colleagues, offering ideas or challenging other professionals. Normally good contributions should be rewarded with “likes”. Not rejecting meetings or reacting quickly to chats are the behaviours we would expect from a team player.

The relationship between commitment and the number of visits to the blog looks very poor, and probably they are not related at all. On the contrary, the relationship with the number of “likes” and the number of meetings rejected is quite significant. Finally, if we consider the number of reactions, it is difficult to see a trend, which is probably due to the large amount of chats there are taking place. Most of the conversations carried out through group chats could be derived from individual chats or smaller group chats.

With this analysis, the two variables that better predict the Relationships evaluation are the number of “likes” to the comments in the subjects and the number of meetings rejected.

A multilinear regression with these two variables calculates a good estimation, with a high R2 coefficient (0,64) and a limited mean-squared error for the two variables and the interception constant.

$$\text{Predicted Relationships} = -6,12 \times \% \text{ meetings rejected} + 0,277 \times \text{Thousands of "likes"} + 3,63$$

The negative coefficient for the Percentage of meetings rejected makes sense, as the more meetings a consultant rejects, the less teamwork should be expected.

Prediction of Engagement with the company

The evaluation of Engagement with the company should be related to:

- Percentage of completion of the personal profile
- Number of entries in the personal blog
- Influence index measured by the corporate social network

Again, evidence is being sought for behaviours that might predict Engagement with the company. People that complete and maintain their profile, update it, or who create content in their personal blog are, in principle, people behaving as if they have a high engagement with the company. In the same way, the influence index, measured by the corporate social network should be higher as engagement increases.

There is a strong correlation with the level of personal profile completion on the corporate social network Tibbr. On the contrary, correlation is very weak at the number of personal blog entries. It seems that at this point the fact that a consultant runs a blog is more of a personal thing rather than a company thing. For this reason, although the company encourages all professionals to run blogs and create content, still there is no relationship between both variables. Finally, although one might expect a high correlation of Engagement with the Influence Index, measured by the corporate social network, the numbers show a weak correlation.

With these data, Engagement with the Company should be predicted using the completion of the profile in the corporate social network and the Influence Index calculated by Tibbr.

A multilinear regression with these two variables calculates a good estimation, with a high R2 coefficient (0,63) and a limited mean-squared error for the two variables and the interception constant.

$$\text{Predicted Engagement with the Company} = 2,82 \times \text{Percentage of completion of the Profile} + 0,663 \times \text{Influence Index calculated by Tibbr} + 1,179$$

5.1.3.3 Predicted performance against business results

At this point it is interesting to check to see whether the elements that may predict performance would have a better fit with business results than the current evaluation system.

For this purpose, all the elements with significance considered in the performance prediction model have been compared with the business results. From the perspective of the business results, only the hours billed are taken into account, as project profitability has been proven to be a very volatile indicator at consultant level. The variables considered are:

Business results:

- Hours billed

Elements considered in the performance prediction:

- Number of referrals (Know-how)
- Thousands of “likes” in the subjects’ comments
- Percentage of meetings rejected
- Percentage of completion of the personal profile
- Influence index calculated by the corporate social network Tibbr

None of these variables show a definitive correlation with the hours billed, but what is interesting is that the R2 coefficients of these variables are very close to the R2 coefficients of the elements of the current performance appraisal system.

The way the number of hours billed may be predicted by these elements is very similar to the way hours billed may be predicted by Commitment to projects and clients, by Engagement with the company, by Relationships or by Personal Development.

When the analysis is run through a multilinear regression, the following results are achieved:

- The number of “likes” and Influence Index shows a very weak coefficient with very high mean-squared errors. This is probably because these variables overlap with others.
- When selecting only the number of referrals, the percentage of meetings rejected and the completion of the personal profile, we get a clean prediction model with a R2 coefficient of 0,39.

Again the quality of this prediction of the hours billed is similar to the capacity of prediction of the global performance evaluation (R2 coefficients range from 0,39 to 0,42).

By way of a conclusion, it cannot be stated from the data that the predictive results model is better than the data gathered from the corporate social network. But in the

same way, the current performance evaluation system is no better when predicting the results measured by the number of hours billed by each consultant.

5.1.4 About the predictive model

This section represents the point at which the core of the proof of concept is reached which is the very purpose of this thesis; that is, to answer the question: “To what extent is it possible to predict individual performance using data generated unintentionally?”

All the analysis and insights discovered previously above, provide the opportunity to build up a model in order to predict individual performance. But there are two ways to answer the question:

- Predict performance as performance is defined in the current performance system
- Go beyond this definition and create a new performance measure, answering to the challenges proposed by the CEO

Predicting the current performance system

In the previous analysis, different statistical models were developed in order to predict the evaluation components of the current performance appraisal system.

These models are as follows:

- Prediction of Commitment to the project and clients:

$$\text{Predicted Commitment to Clients} = 0,46 \times \text{Thousands of "likes"} + 2,77$$

- Prediction of Relationships:

$$\text{Predicted Relationships evaluation} = -6,12 \times \text{Percentage of meetings rejected} + 0,277 \times \text{Thousands of "likes"} + 3,63$$

- Prediction of Engagement with the company:

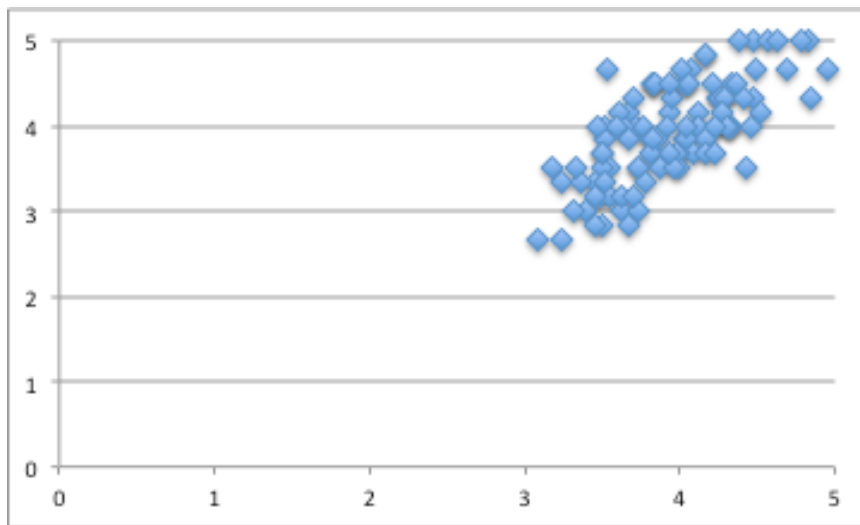
$$\text{Predicted Engagement with the Company} = 2,82 \times \text{Percentage of completion of the Profile} + 0,663 \times \text{Influence Index calculated by Tibbr} + 1,179$$

- Prediction of Personal development:

$$\text{Predicted Personal development} = 0,0458 \times \text{Number of Referrals} + 1,427$$

For the whole sample (104 consultants), the prediction has been calculated according to this prediction model. How predictable and accurate is the model?

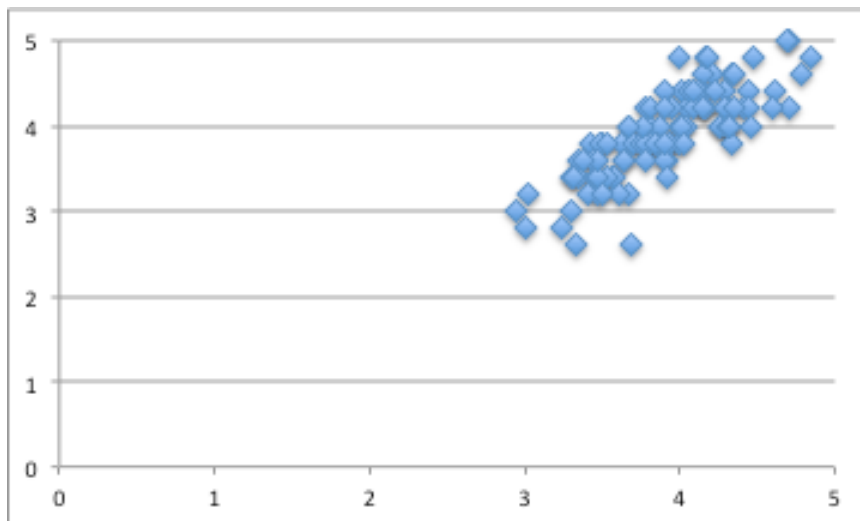
Prediction of Commitment to projects and clients:



Graph 1: *Prediction of commitment to projects and clients*

Graph 1 shows in the Y-axis (dependent variable) the predicted evaluation of Commitment to projects and clients and in the X-axis (independent variable) the current evaluation of the same variable. The R2 coefficient is 0,49 and the mean-squared error is 0,167. The prediction is valid according to these parameters.

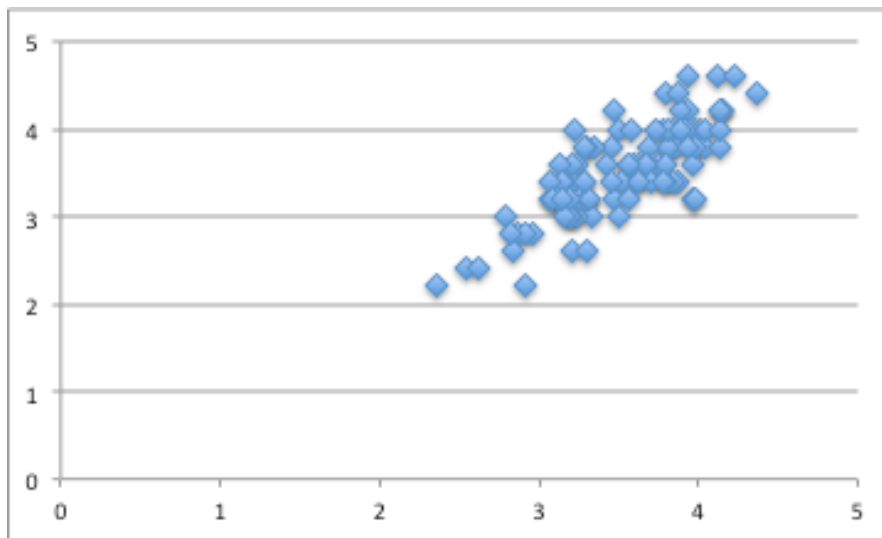
Prediction of Relationships:



Graph 2: *Prediction of relationships*

Graph 2 shows in the Y-axis (dependent variable) the predicted evaluation of Relationships and in the X-axis (independent variable) the current evaluation of the same variable. The R2 coefficient is 0,64 and the mean-squared error is 0,09. The prediction is valid according to these parameters.

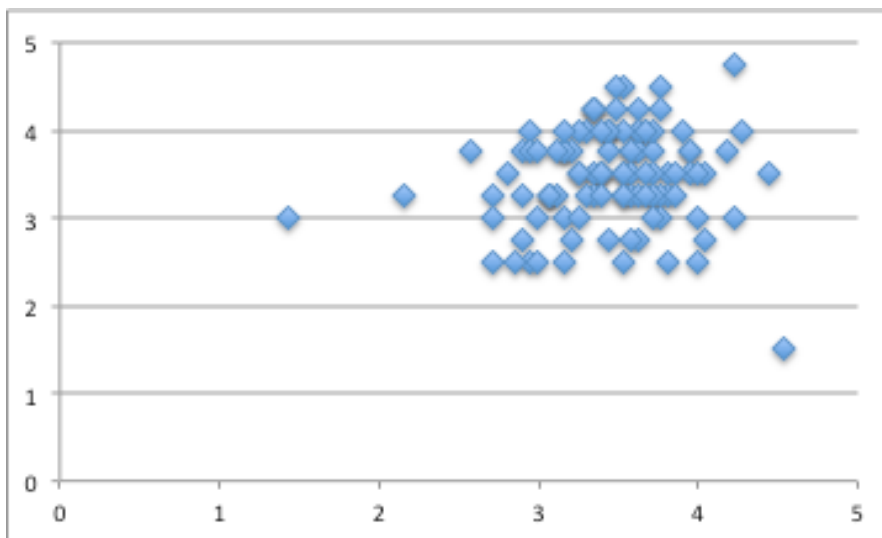
Prediction of Engagement with the company:



Graph 3: Prediction of engagement with the company

Graph 3 shows in the Y-axis (dependent variable) the predicted evaluation of Engagement with the company and in the X-axis (independent variable) the current evaluation of the same variable. The R2 coefficient is 0,63 and the mean-squared error is 0,09. The prediction is valid according to these parameters.

Prediction of Personal Development:



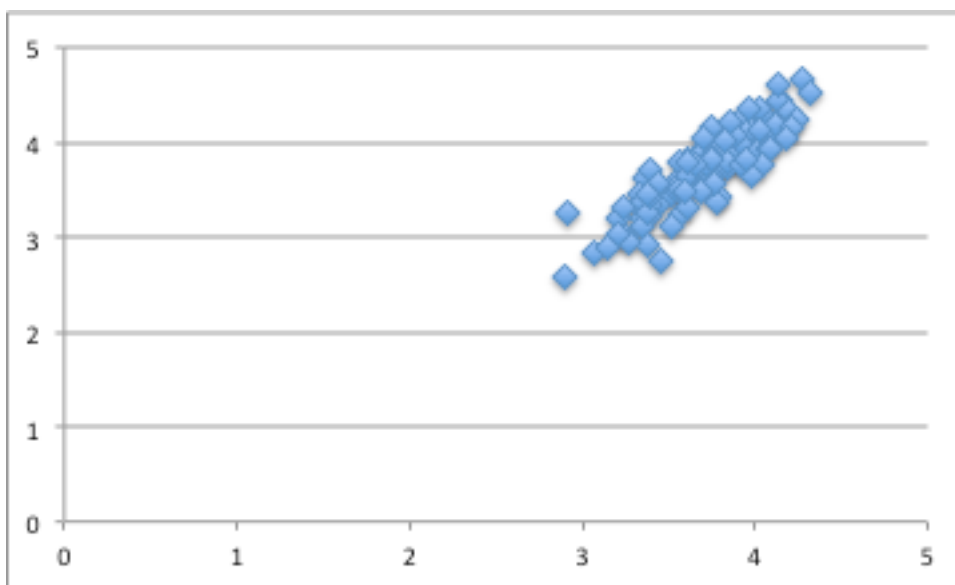
Graph 4: Prediction of personal development

Graph 4 shows in the Y-axis (dependent variable) the predicted evaluation of Personal Development (Know-kow) and in the X-axis (independent variable) the current evaluation of the same variable. The R2 coefficient is 0,01 and the mean-squared error is 0,46. The prediction is not valid according to these parameters

The reason that this element of the model predicts the evaluated performance so badly is probably because the measurement is being carried out on two different things.

The current measurement of personal development is not very clear. Most managers evaluate the personal effort of a consultant as something they do in order to improve their know-how and skills. On the contrary, the element considered in the model, the number of referrals, relates more to the total level of know-how owned by a consultant. This has not been detected in the analysis, and is proof of how important it is to be coherent with the kind of measurement being carried out.

Prediction of Performance Appraisal



Graph 5: *Prediction of performance appraisal*

Graph 5 shows in the Y-axis (dependent variable) the predicted evaluation of Performance and in the X-axis (independent variable) the current evaluation of the same variable according to the current system. The R2 coefficient is 0,76 and the mean-squared error is 0,04. The prediction is valid according to these parameters.

Except for two outliers, this final graph shows that the predicted model works extremely well, and that the standard error is only 0,2, probably much less than the real performance of consultants according to the CEO's perspective of performance.

5.1.5 Creating a new performance measure

Although the predictive model has succeeded in the proof of concept, it might be possible to go one step further and to redefine completely the concept of performance according to the CEO and the model developed in Document 2, out of the literature review.

According to these perspectives, individual performance is the combination of three different elements: the input element (know-how), the throughput element (behaviours and attitude) and the output element (results).

According to the available data, it is possible to map these three elements as follows:

Input	Throughput	Output
Know-how	Behaviours and attitude	Results
<ul style="list-style-type: none"> • Number of referrals 	<ul style="list-style-type: none"> • % Profile completion • Number of entries in the personal blog • Number of visits to the personal blog • Number of subjects created • Number of participations in different subjects • Number of “likes” to those participations • % Meetings rejected • % Reaction to chats • Influence score 	<ul style="list-style-type: none"> • Hours billed

Once this data map has been validated, there are many possibilities to present performance appraisal, different levels, ranking, absolute measures, and so on.

The richness of all of this information and the possibilities technology offers in terms of feeding data to the system in a continuous way, allows completely new ways of treating performance. That is:

- Performance can be measured according to different tools depending upon the consequences of performance (for instance, as a ranking for promotion and at different levels for bonus purposes).
- The idea of measuring performance simultaneously with the budget cycle may be done away with. These models allow performance to be measured in real time, when needed, not just at the end of the year.
- Evidence is available for any element of performance that is thought should be included. This makes for easier and smoother performance conversations, as manager and employee may focus on the consequences of the behaviours and not on the evidence.
- A homogenous judgement on the evidences is achieved. There is no risk that there are hard or soft bosses. Everybody is judged with the same model. This should increase the perception of fairness in the system.
- The performance of anyone who participates in a corporate social network can be evaluated. This opens up the possibility of measuring the know-how and behaviours of external collaborators, and not necessarily just internal employees.

5.1.6 Conclusions for Phase I

Below are the main conclusions from Phase I of the research, which attempted to answer the question: “To what extent is it possible to predict individual performance using data generated unintentionally?”

First of all, it is important to consider some basic ideas that frame this question:

- It is critical to determine what performance looks like. In the context of one company, looking only to one job role, we see that there are different views and perspectives about what performance looks like. The official company system mainly looks at behaviours while a CEO perspective looks both to economic results and appetite for know-how.
- All of the information from the accounting system of the company and the corporate social network was gathered “silently”, that is, without the knowledge of the consultants who “accidentally” generated the data. One of the limitations of this research is that it cannot be known what would happen were consultants to learn that this information was being used for this purpose. The adoption of the technology and the induced behaviours will be analysed in Phase II.
- The answer to the question is confined to the limits of a case study which takes a particular population in a particular company. It is a proof of concept, and extrapolations to other populations or other companies with different criteria about performance are not possible.

Having said that, the conclusions about this proof of concept are:

- There is a clear relationship between the current performance appraisal model and the predictive model created out of the data gathered. The model predicts very accurately performance and is valid.
- The correlation of behaviours with results (measured in billed hours) is very weak, no matter whether it is done through the current performance system or through the predictive model with data from the corporate social network.
- The concept model confirms that it is possible to define performance as the combination of know-how, behaviours and attitudes and results, but it is very difficult to establish a unique measurement of performance or a relationship among these three components. In the case study for this company, these three components are independent.
- The concept model is timeless. Data may be collected at any time and be referred to at any time. This would allow a different time frame for the performance cycle.
- The evidences behind the model are composed of five types of data. But there are more elements and types of information that might eventually reinforce the predicted performance. Evidence is gathered from data in the system, so

there is no space for personal discussion. This might be of help during the conversation about performance between the manager and the employee. One of the conclusions of Document 3 was that a key bottleneck of performance appraisal is the evidence finding.

- The use of technology to support performance appraisal, which right now is very limited, is likely to increase dramatically. It is necessary to have an actively used corporate social network in order to collect the data, otherwise it will be difficult to collect enough information to make predictions.

5.2 Phase II

5.2.1 Insights from the individual interviews

The main findings drawn from the individual interviews are as follows:

5.2.1.1 *The concept idea is accepted*

The initial question to analyse is how the electronic performance appraisal is accepted as a concept. All the interviews (18 out of 18) show two main insights:

- The concept idea has not been thought about before
- The concept idea is considered feasible

Regarding the first insight, no one from among the interviewees had ever thought about the possibility of using an electronic appraisal system.

Below are three examples of managers' statements:

Manager 2 for instance, stated: "*I never thought about this idea, I have always seen performance appraisal as a judgment, and I never considered that something that should be judged could be managed by an algorithm*"

Manager 4 stated: "*I have always thought about recording evidences in order to be more precise and objective when making the appraisals, but honestly I never considered an algorithm to do the job.*"

Manager 5 finally stated: "*It seems weird, probably this is why I never thought about it.*"

Below are three examples of consultants' statements:

Consultant 1 stated: "*I have always seen this process as a kind of exam and I have done many exams at school. I have always envisaged my professor reading the exam and delivering a mark.*"

Consultant 5 stated: "*I am used to discussing performance with my manager, I did not imagine a different kind of conversation.*"

Consultant 8 stated: "*I do not care very much about performance, I consider the way it is implemented in the company is not very realistic. So, I have not thought very much about it. To be honest I only care about my salary review, and eventually my promotion, but that is far away.*"

From these statements, it would appear that performance appraisal is not in the daily thoughts of either managers or consultants. As presented in the literature review, in most organisations, performance appraisal is a once-a-year exercise. And this is the case also in the organisation used here as a case study. It is likely to be the

infrequency of performance appraisals that means people don't think much about how to improve the process.

However, once the concept idea was presented to managers and consultants, it was not rejected; on the contrary, the majority of the interviewees understood and accepted it. Below, two managers provide their thoughts:

Manager 2 stated: *"I can see your point. In fact, there are many daily life issues where algorithms may help. For instance, every day I ask the Google algorithm how long it will take to get to work, depending on the traffic. Every day I get a different forecast, depending on traffic incidents, accidents, etc. and it is very accurate. I really trust it. If someone can predict something as complex as traffic, I can understand that you may be able to predict people's performance in an organisation. Why not?"*

Manager 4 on the contrary stated: *"I do not imagine how you are going to do it. In principle, everything is possible if you have the adequate data, but I do not know how you can draw the data." However later, in the same conversation, the same management stated: *"It could be possible, why not, maybe today you have 20 data, tomorrow you get some more data and one day you discover you have 200 different data to rely on."**

5.2.1.2 Consultants are more favourable towards the idea.

Of the consultants interviewed 11 out of the 12 were very positive about the idea. Three out of five managers raised significant concerns that data isn't used more to predict performance:

Consultant 1 stated: *"I really think this is a great idea. My manager does not collect the real information, except for the hours billed, which you would be able to find in the accounting system too. For instance, when we talk about teamwork, it is all about gossip, you did this, or you did not that... I do not like this approach at all, and I understand that real data are the only solution."*

Consultant 3 is even more explicit: *"I think this is the best solution. In the last two years, I have tried to convince my manager about my engagement and he always argued with stupid things like teamwork or culture fit, without any kind of solid arguments. We are telling clients that data provide the truth, and we do not apply that to ourselves. I understand and support the idea that you may find enough data and good enough algorithms to predict performance better than our managers."*

Consultant 5 stated: *"When we talk about financial markets, sales forecasts, customer behaviours, etc. we all agree that data analysis is probably the best solution. But when we discuss about people in our organisation we do not use any kind of data, and it is all about perceptions. And I do not know why, as it should be the same."*

Similar comments may be extracted from the 17 interviews; no one among the five managers or the 12 consultants was reluctant about the concept idea. Enthusiasm was higher among the consultants, but from an intellectual perspective, gathering

data and predicting individual performance with the help of algorithms was seen as feasible by all the interviewees.

Two issues should be taken into account:

- On the one hand, the managers and consultants interviewed work in the IT industry. This means that acceptance of the concept is probably higher than in other populations.
- On the other hand, it is interesting that no one among the interviewees had even thought about the possibility to appraise performance through a technological system. This is probably due to the fact that performance appraisal is seen as a bureaucratic and time-wasting exercise, and nobody among this group (managers or consultants) had any intention or plans to make improvements to the performance system.

Among the reactions in the focus groups when this conclusion was raised, none of the participants (managers or consultants) challenged the concept idea. On the contrary, all the groups showed a high degree of acceptance, comparing it with other data/algorithm approaches to complex problems, such as traffic control (already mentioned), financial investment decisions, or predicting customer behaviour and preferences. Most of the people in the room considered that performance appraisal was easier to predict than customer preferences.

5.2.1.3 Managers tend to see that there is room for manipulation

Most managers considered that once a system is put in place there is room for consultants to manipulate data. Some of the statements supporting this idea are as follows:

Manager 2 stated: *“If a consultant knows that attending meetings on time is a key factor for assessing performance, he / she may be on time to the meeting, leave the phone in the meeting room and then leave the room and do something else. There is a lot of room for manipulating the data, I am afraid that after a couple of assessments all consultants will have top records in every subject.”*

Going further with this idea, Manager 5 stated: *“I think consultants will learn how to gamble with the system very quickly, as they are not stupid. For me that is a good reason to consider that this might work the first time, but not the second time, nor the third, and so on...”*

The possible evolution of the system may include more and more variables, as far as it is possible to draw more and more on the available data. When asked about this possibility:

Manager 3 stated: *“This is like IT security, the more security systems you put in place, the more sophisticated are the attacks. I think the more data you collect in order to appraise performance, the more room to manipulate data you create.”*

Across all the interviews with managers, there is a sense that the system is vulnerable to manipulation, probably far beyond the actual reality. This is probably due to managers' fear that they will lose control over the performance appraisal process. To some extent, managers may feel that a machine might substitute them. This is probably a very irrational fear. But some degree of manipulation should be expected, and those working for the change to the system should work against this attitude.

It is quite normal that managers should consider this possibility. Job-holders usually manipulate all the systems dealing with variable pay. For example, sales reps tend to create more clients if the number of clients is a variable pay criterion (no matter if it is real or not). Performance is very close to variable pay, and nobody likes to be considered an underperformer. So, it is true, that with a limited number of variables, there is a huge risk of manipulation on year two and beyond.

People may interchange "likes" in the Tibbr system, so inflation on "likes" in order to improve Know-how performance ratings is to be expected. People may also be more worried about being on time at a meeting than preparing for the meeting, in order to improve commitment scores, and so on.

The best plan of action in order to avoid manipulation of the system is the continuous development of more and more data to be included in the system, so the effect of manipulating one of them becomes irrelevant. Also, some consistency checks in the algorithms would be needed, in order to identify outlier values in the data.

At this point of the research, with the number of data available, it is impossible to develop further consistency checks. But there are many examples of algorithms that identify outliers among the data in order to prevent strange deviations or inconsistencies. A very simple consistency check, already analysed in the algorithm, is the correlation of Know-how and Behaviour with Financial results. Deviations may help the manager to better understand the consultant's behaviour, and the manager might consider the possibility of consultant manipulation.

Regarding the focus groups, it is worth mentioning that the reactions of managers were very different the consultants' reactions. Managers insisted that consultants would manipulate the data as far as they knew the relationships between these variables. Both managers and consultants believed that an increased number of variables would help make the algorithms more robust and resistant to manipulation. However, the possibilities of reducing the likelihood of manipulation were clearer among consultants than it was among managers.

5.2.1.4 Both, managers and consultants like the idea of timeless performance appraisal.

One of the hottest issues concerning performance appraisal, already found in the literature review, and of course confirmed in the preliminary research, is that of time pressure. Usually performance appraisal is framed within a process with very

tight time constraints. Typically, performance appraisal is run at the end of the year, very close to three important decisional events: salary review, bonus and promotion.

For this reason, managers are usually overwhelmed during the period when performance appraisals are due. For a manager with ten direct reports the time needed for preparation, interview, and to write up the final report is probably more than a week. This is one reason why performance appraisal struggles in many organisations (Pulakos, 2009). Some insight is gained from the interviews:

Manager 1 stated: *"I hate performance reviews. It is a very stressful period. I have 10 consultants reporting to me. HR is always calling for the due date when appraisals should be completed, but I am busy, consultants are busy, I do not think they understand this in HR. We work for the clients, not for HR..."*

Manager 3 stated: *"We hurry to deliver a performance appraisal and then the information is considered for salary review purposes and sometimes for promotion purposes. I would love to do it without the tight schedules, but HR needs this information, and year after year we are late..."*

Manager 4 stated: *"Interviews to review performance are a bargaining exercise. Every time you state something, the consultant is calculating the impact on the salary review or how this may affect his / her promotion. It is almost impossible to focus on what you are really talking about: performance, behaviours, impact on the business, the impact on others' jobs, etc."*

The example from Manager 4 in particular demonstrates how linked performance appraisal and salary review and promotions are. As the literature says, this mechanic linkage spoils performance appraisal and reduces the scope of the discussion.

Consultants have the same feeling, and their statements are quite similar, although quite overwhelmingly negative about the system.

Consultant 2 stated: *"I think performance reviews are pre-manipulated by the company and the budget constraints. They have a budget and then they decide which people will get the salary increases. Once they know this, they decide the performance. I do not believe at all in performance appraisals. It is already three years that I suffer this, the first year you believe, the second year you have doubts, the third year you think that everything is a show."*

Less devastated, Consultant 4 stated: *"You cannot avoid thinking about your salary review when analysing performance. You enter in the room with expectations at level X, and all the discussion is influenced by the idea of meeting or not meeting those expectations. It is neither an open discussion nor a constructive one. I try to defend my position and my expectations all the time."*

Consultant 5 stated: *"Last year the number of promotions was limited, as the business did not run as expected. At the beginning of the year I had the expectation I'd get*

promoted, but as the months went by, it was clear that my promotion was impossible. But instead of recognising that fact, I received a poor performance appraisal. While I had worked very hard, much harder than the year before, when I received all the awards. It would have been much more honest [from a company perspective] to say, look, your performance is good but there is no room for promotion than to say your performance is bad and you do not deserve a promotion. It is a lie, it is unfair.

The mechanic link between performance appraisal and salary review and promotion creates a lot of noise among consultants. The system is completely discredited among them, much more than among managers, who still try to apply the system, measure and communicate performance.

5.2.1.5 Consultants perceive more fairness in an electronic system

It is interesting to pay attention to the perceptions of fairness among managers and consultants. Whereas managers do not have a particular feeling of the appraisal system as either fair or unfair, consultants do have a perception of a higher level of fairness with the electronic performance appraisal system than with their manager's appraisal. Below are some of the consultants' statements that confirm this insight:

Consultant 1 stated: *"To be honest, I trust data more than my manager's memory. He always reminds me about what happened in the last couple of weeks, and I understand it is normal. Data stored during the whole year are much more objective and reliable. On top of that, data treatment would be the same for everybody and the algorithm would not be influenced by emotions. When my manager is happy, everything is fine, but when there are problems, everything is a problem, even my appraisal. Definitely, I would be much more confident with an electronic system to appraise my performance than my manager."*

To confirm this perception, Consultant 6 stated: *"Data are not biased, or are not biased in the same way. Managers are biased in many ways, and sometimes the bias may be random. Cold data and algorithms should work much better than humans; by definition they are bias free."*

If we consider that perceived fairness is one of the key elements that spoil performance appraisals according to the literature, here we find an opportunity to increase the level of perceived fairness. The limitations of the characteristics of the population are clear (young people, IT industry, very skilled, etc.), but still it is an opportunity to be considered and explored in other populations.

5.2.1.6 Managers want to take decisions

Managers are decision makers, and they are used to being entrusted with making the decisions. They have been managing performance for a long time; they are appraised too, and they definitely consider that performance falls within "their kingdom". For this reason, they still want to be decision makers, even for

performance appraisal. Below are some further insights on this issue from managers:

Manager 1 stated: *“From an intellectual point of view, I acknowledge that maybe a system composed of data and algorithms may propose an appraisal. But I still want to keep my capacity to decide if the system has the same perception I have. Probably in the majority of the cases, I will confirm what the system says, but I would like always the opportunity to correct things that cold data are not able to see.”*

Manager 5 stated: *“I think it is dangerous to let [technological] systems take decisions. Systems are here to help, not to substitute. We are talking about human relations, there is nothing more human dependent than the expectations or the delusions of people within an organisation. In my view it would be foolish to leave that in the hands of a [technological] system”.*

However, later the same Manager (Manager 5) stated: *“I think [technological] systems are there to help the decision makers to do their job, like in any other subject. If you can see the entire data together and if the system helps you to understand how this compares with others, you will take decisions with more confidence.”*

5.2.1.7 Who is accountable for reviewing the system in the future?

A key question raised by the researcher was who was going to be accountable for reviewing the system in the future. The current research has been performed comparing data available against real performance measures. But if one day this system is implemented, there will no longer be “human” performance measures. So, if the system needs to be updated, there are no anchors to compare it to.

Both, managers and consultants were surprised and concerned about this topic and there were no clear positions relating to it. Among consultants, there were some interesting suggestions:

Consultant 3 stated: *“If you want to fine-tune the model and include more variables, there is a need to capture from time to time the real performance through the opinion of different stakeholders, in a kind of 360-degree evaluation. Then, compare the new model against these new performance measures. You do not need to review the performance throughout the whole company, but just do a sample.”*

Consultant 8 stated: *“Who examines the examiner? That is the point. Maybe we need to rely only on the hours billed and compare any future model against that final result variable.”*

Consultant 11 stated: *“We may think in terms of a learning machine, where new data helps the system to perform better.”*

Among these statements none seems to provide a satisfactory solution. While measuring performance by using stakeholder opinions again and again, nothing will change in the current system. But just by comparing stakeholder opinions with the data-algorithmic results will probably drive behaviours in the wrong direction in

the future. Finally, it would be very difficult for the system to learn with new data without a clear comparison or target.

In this matter of accountability managers were more or less on the same page as consultants, although they took a different perspective:

Manager 2 stated: *“Every year we have informal meetings where some managers agree the definition of the criteria to evaluate behaviours. They are not official, just informal conversations about how do we should do it, and not everybody attends those meetings. Maybe, these criteria should be agreed and shared between the CEO and all of us and become part of the model building in the future”.*

Manager 5 stated: *“I do not see HR leading this process. They are bureaucrats and they do not understand the business. Maybe you should come back every year and fine-tune the model.”*

Manager 7 stated: *“This is a critical point. If we agree that consultants might discover the magic of the system and trick it from time to time, there is a continuous need to review, fine-tune, and drive the system towards the company strategy. I think this is a CEO accountability, but I do not see how to implement it.”*

5.2.2 Insights from the focus groups

According to action research methodology, the results of the research should be discussed with the participants in order to gain more insight, confirmation and a wider perspective (Berg et al., 2004). For the purposes of the current research, two separate focus groups, one with managers and the other with consultants, were held. These discussed the main findings as examined above. Above all, there was one important conclusion:

5.2.2.1 *Electronic performance appraisal may offer the opportunity to define a new performance process*

The current performance process in place in the organisation is based upon the four classical performance steps:

- Planning, where targets are established in accordance with strategic company goals
- Appraisal, where performance is reviewed and communicated to employees
- Consequences, where salaries are reviewed, bonuses are established and decisions about promotion take place
- Action plan, where manager and consultant agree how to fix different performance issues and make improvements over the coming year.

The whole performance process actually takes place over a very short period of time, basically December and January. By the end of November, and starting in December, performance interviews are taking place, so as of 20 December of all the performance appraisals should be in the system.

During the same meeting, sometimes at least three out of the four phases of the process take place, as performance is reviewed, action plans are defined and objectives are set for the year to come. Promotions, bonuses and salary reviews need further HR and Management Team approvals, and these are communicated by the end of January, usually by HR.

Both groups, managers and consultants, agreed that a new process could be defined. The guidelines of this new process would be: more active planning and action plans, electronic appraisal instead of manager appraisal, and timelessness, which means that consequences would be set apart from the performance process.

5.2.2.2 Within this new process, updating the system should play a significant role

As discussed in the individual interviews, the validation of the model's future updates is a significant part of the new process. All stakeholders agreed that this proof of concept may represent the starting point of a real electronic performance appraisal system, but that there is a long way to go in terms of model updates, as far as new variables that may be considered for the system. But the way these new variables are included, the way algorithms are designed, and the final approval is something that should be clearly defined in the new process.

There are significant differences of opinion about how a new accountability should be included in the new process. While managers' perception is that they should be included in this accountability, consultants' perception is that only the CEO should be involved. No one among managers or consultants consider HR should be involved in the decision-making for this part of the process.

5.2.3 Managers' group discussion

Below are a selection of relevant statements taken from the managers' focus group discussion:

- About how the current process is run:

"It is a bit crazy what we do. We are always stating that performance is an ongoing process, but then, we do it in a quick and dirty way at the end of the year".

"Yes, but do you have time enough in daily life to talk about performance?"

"What do you think a consultant will think if by mid-June you ask him / her to meet for a performance review? They would think they are doing something wrong, and probably they will be scared. It is not usual to do so."

"Yes, but they are asking for feedback, I do not know, probably not formal meetings, but they want to know if they are doing well. Due to time constraints, personally sometimes I try to avoid these discussions."

"I agree with X's (Manager 2's) point. I have done several informal reviews and I discovered the atmosphere very open and the discussions very rich. They are very different to the formal performance review interviews, where my experience is that people try to defend their position."

"The problem with these mid-year interviews is that we need to prepare the interviews in a similar way to the December interviews. That takes time, and I do not usually have this time".

The conclusion is that managers are in a performance trap similar to the sort highlighted in the literature. It is difficult and it takes time to get the information and the evidence required to do a performance appraisal, thus managers attempt to avoid the discussion. Meanwhile consultants ask for feedback and would be willing to have these discussions with managers.

- About a new process:

"If we accept the idea of the electronic performance appraisal, the system might do the work for us. It would collect the data and the evidences, and suggest an appraisal. Then we could just focus on the action plans."

"It is not a bad idea, and if we do it in October for instance, far from salary, bonus or promotion pressures. Probably conversations will be more real, more open and more useful."

"It could be, I do not see the way to redesign the process, but I like the idea of getting rid of the December appraisal conversations."

- About manipulating the system:

"It is true that I still think that consultants may manipulate the system, but I also see many more advantages in this concept idea. If eventually you could include some more variables, some of them just for control, you will probably limit the room for manipulation of the system, I do not know..."

"Yes, it is just a question of the number of variables. We may start to think how to increase the amount of data we have recorded in the systems and how we can increase that. I really trust in algorithms: look at Client X (a client, where they predict customer behaviour), more and more it works! (Lot of laughs)."

- About updates to the system:

"The accountability to say if a consultant is performing well or not is a manager's accountability. My point is that managers should somehow be involved with the system updates."

"Yes, I agree with X (Manager 5). We know better than nobody else who is performing well and who is not. It is great that a machine would do the work"

for us in terms of the calculations, but I feel accountable to tell the machine where to look and how to calculate.”

“This is something I miss every year when I have to appraise my team. For each one of the criteria (engagement, collaboration, etc.) there is a dummy scale from 1 to 5, but there are no criteria to say when we should consider 1 and when we should consider 5. In other words, what I consider a 4 someone else might consider a 3 or a 5. This alignment has never been done, and this is exactly the alignment we need to define in order to be sure that the machine provides accurate and fair appraisals. As managers of this company, we are all accountable for doing this.”

“I don’t know how it should be included in the process, but it is clear that as managers, we need to understand and to agree with the criteria that are embedded in the model.”

To wrap up, the findings from the managers’ focus group:

- They agree with the insights taken from the individual interviews.
- They feel accountable for the performance appraisal, whatever the appraisal instrument might be.
- They accept that an electronic system to take performance decisions would be helpful, especially in the appraisal phase.
- They go still further when suggesting the possibility to reengineer the process with the help of an electronic system.
- They definitely support the idea of starting up of an electronic performance appraisal system.

5.2.4 Consultants’ focus group discussion

The same conclusions and the same questions were discussed among the consultants’ focus group. The results are quite similar. The process is challenged and a new process would be welcomed by consultants.

- About how the process is currently run and introducing a new process:

“The performance process is the performance interview. Everything is discussed at that meeting, so it is not a process; it is a one-off event. Personally I think it’s impossible for a manager to look ahead when planning, to look backwards when appraising and to look ahead again when defining the action plan, which is outdated two weeks later. The process does not exist.”

“I agree with this point. When I joined the company I was told that performance was managed as a continuous improvement process. After two years in this company I have never felt the process. So, we are not talking about a process re-engineering, but a first-time process implementation.”

“Managers do not manage performance; this is far from a process. They just evaluate what they think we do according to the scales, and there is no improvement or action plan. Any kind of process reengineering would be welcome, it can’t get any worse”.

- About updates to the system:

“I think this is an important issue. Company strategy is all about the CEO and the Board, so as performance should be. The CEO is accountable for defining how present and future performance looks like for consultants and then managers should be accountable to implement that vision. If managers are not doing their job, it is another problem. I think it is great if a machine does it, that would be helpful for managers, and of course it would be helpful for us.”

“I agree with the idea that the CEO is the ultimately accountable for defining performance. So, my vision is that there should be regular project for updating the performance system. The CEO would be the project manager and other people would collect the data and build the algorithms. Like many other projects we do every day.”

To wrap up, the findings from the consultants’ focus group:

- They agree with the insights taken from the individual interviews.
- They accept the idea of an electronic system appraising their performance.
- They consider the CEO as the final accountable person for performance appraisal.
- They go still further when suggesting the possibility to reengineer the process with the help of an electronic system.
- They definitely support the idea of starting up an electronic performance appraisal system.

5.2.5 The CEO’s perspective

The CEO of the company used in this case study as part of the current research was interviewed at the beginning and at the end of the process (second and third research phases). The aim of the first interview was to understand the issues and challenges the performance management system is facing, framed within the company strategy. Below are the main insights from the first conversation:

5.2.5.1 Company performance

“The consulting business, especially IT, requires continuous update in know-how and technology. This implies that a significant part of the revenues (sometimes more than 5 per cent) should be invested in research and development. The acquisition of this state of the art know-how is crucial to maintaining a leading position in the market and to serve to ‘blue-chip’ clients. On the other hand, the company is financially weak,

as the professionals own it. This means that cash flow is the most important financial statement.”

Thus, the two key aspects in terms of company performance that really matter to the CEO are know-how acquisition and cash flow.

5.2.5.2 Value provided by the performance system

“Considering the two aspects defined above, the performance system considers the appetite for know-how in one of the clusters, but there is no mention of cash flow or any other financial statement. That is important in the sense that all of the professionals should understand that without financial success there is nothing behind us.”

“Good performance is a combination of several and different things. This combination varies depending upon the different figures or jobs within the organisation. This is not being considered in the system. For instance, a principal is a key role in developing know-how and understanding the need to adopt or not a new technology. A bad decision at this level may be very costly. On the other hand, a junior consultant should learn quickly to become productive as soon as possible. That difference is not clear in the system and its elements.”

“The culture of the company is something not defined, based on generic values such as quality, client satisfaction, confidence, professionalism, etc. When trying to make those values practical, the words that arise are ‘commitment to what you are doing’, ‘teamwork and generosity’ and finally ‘appetite for learning and discovering new things’. But it is not clear whether the performance system makes a direct contribution to reinforce the culture of the company.”

From these statements, a sense is gained that the current performance system is failing to cover the key elements that support business strategy. As a summary of this first interview, it seems that the CEO has a very clear idea about company performance and not such a clear idea about how individual performance contributes to that company performance.

Still, there are many questions left unanswered by the performance system. What is the final goal of the performance system? Why is performance disconnected from the bonus system? Why are financial results not included in the performance system?

But in addition, by way of a conclusion, the company has put in place a performance system that has been running for three years and the CEO is committed to it. Although it is not perfect, it may be a good starting point to begin the analysis.

During the second interview, the conclusions of the different analysis and research that were run in the company were shown to the CEO. Below are his reactions:

5.2.5.3 About the possibility to predict performance

“This is great! I think we should definitely move towards this direction, I see so many advantages... First of all, managers are relieved from collecting evidence. I know this is a stressful period, even I am asked often about my views regarding this or that consultant. And I do not know them well enough. For me, the timelessness is also a great advantage. Having the possibility to check performance appraisal at any time, gives the option to look at performance carefully. I love this idea!”

“On the other hand, I see that the predictions are not bad at all. In some cases, they are even closer to my perception than the current performance appraisals. I understand the managers’ position that maybe consultants might manipulate the system when they have learnt how it works, but I think the solution is simple: we need more data in order to crosscheck. We should increase the use of Tibbr [the corporate social network] in order to capture more and more data, more and more evidences.”

5.2.5.4 About a new process

“This is also great! I think this sounds like a solution to my frustration regarding performance appraisals and performance management. I don’t know if it will work, but it is clear this is something new that in principle handles all the problems that our practice has at the moment. I will definitely support it for next year as a test, maybe in the Madrid office. If it works, and I am convinced it will work, we may extend it to the whole company in the years to come.”

5.2.5.5 About how to update the system

“This is a must. We need to update the system as far as we are able, to collect more variables, and to align those variables with our strategy. I don’t know how often, maybe every eighteen months or every two years. Now, with a timelessness process, I don’t care about when the tool ought to be renewed. They are separate processes, indeed.”

“I think my job is to define the strategy, communicate it, and make sure it is delivered (this is what I read recently about the CEO’s job role). It is in this third aspect where I think individual performance fits. I agree with the consultants more than with the managers, as it is my job to define what success looks like at all levels, and it is the managers’ job to be sure everybody understands and behaves according to that. If we put in place this system, I am sure that the way performance is appraised will be consistent across the whole organisation. And then, the managers’ job would be to make sure everybody gets better and improves, towards that success.”

These reactions prove that one of the main concerns about technology adoption, that is, the CEO’s stance concerning the new system, is in this case very positive. The CEO feels accountable concerning performance and understands the connection between peoples’ performance and company performance.

5.2.6 Conclusions for Phase II

The main conclusions from Phase II of the research are the following:

- Like any other new technology, the determinants of adoption of an electronic performance appraisal system are very complex, and highly dependent upon the different stakeholders involved. There are three different stakeholders in this case: the CEO, the managers and the consultants. Each one of them has different interests, different perceptions, different wills and different fears. Everything should be taken into account in the implementation plan.
- All of the stakeholders accept intellectually the concept idea, an electronic system that is able to capture information and predict performance at an individual level.
- Managers believe that consultants might manipulate the system, as far as they have control over most of the variables that predict performance. The CEO shares this perception, although both CEO and consultants believe that this might be fixed just by incrementing the number of variables considered.
- Behind the managers' perception, there is a fear that managers will lose control over very basic decisions such as promotion, salary review or bonuses for the consultants. This would imply a significant loss of managerial power.
- On the contrary, consultants perceive more fairness in a process where all of them have the same opportunities and nothing is left to the manager's arbitrariness. This perception is very much aligned with the previous perception of managers losing control and power.
- All interviewees (CEO, managers and consultants) accept and support the idea of re-engineering the performance process towards an electronic appraisal, a timeless review, and focusing on action plans and not on action reviews. Each interviewee had different reasons for supporting the introduction of a new system, but no one was against it.
- The system's update may be defined as a separate process, but it is absolutely necessary to improve the system, avoid behaviour traps among consultants and to drive the performance system towards the company strategy.

6 Discussion

6.1 Main conclusions

The main conclusion that can be derived from the research is that the electronic performance appraisal concept is feasible. At least in the context and within the limitations of this research.

The literature explains how difficult it is for organisations to appraise and manage performance. This basic idea, that individual performance systems do not work, was confirmed in the first part of the research, where professionals from different organisations acknowledge that they are open to new ideas in order to re-engineer the process.

The help IT is able to provide to the measurement process was confirmed in the research. By considering available data directly while working, putting that information into context and properly analysing the relations of cause-and-effect, an algorithm is able to predict individual performance by considering not only quantitative results, but also qualitative behaviours and qualitative know-how. This is a fundamental starting point, as there is no human (manager, job incumbent, peers, etc.) intervention in the measurement.

The crucial issue regarding the feasibility of this concept idea is its adoption among the different stakeholders involved in a performance appraisal system, mainly managers and employees, as well as top-level management or even the CEO. The way that this idea was accepted by all of them may determine the real feasibility of it in the future. In order to ease the adoption of a system such as this, several issues should be considered. First of all the concept idea itself: many people still doubt that a system might be able to appraise human performance within organisations. Secondly, the suspicions managers may have regarding how employees (Consultants) will behave and also the suspicions employees (the Consultants) may have regarding how managers will behave in the new environment. Finally, all stakeholders should be expected to accept the system and its consequences.

6.1.1 Potential benefits

Still there is a long way to go bridging the gap between measurement and appraisal. But the main shortcomings in performance appraisal can be somehow addressed by an electronic performance measurement:

Disagreement among raters

There is a consistent evidence that raters do not agree in their evaluation of ratees (Facteau & Craig, 2001). An algorithm can play the role of the universal rater, and as a consequence, measurement will be more reliable and independent of the rater and the ratee.

Weak criteria for evaluation ratings

Almost 80 years ago, Bingham (1939) identified what would come to be called “halo error” in ratings. There is a substantial literature that analyses rating errors (Pulakos, Schmitt & Ostroff, 1986), concluding that there are deeply flawed criteria behind these errors. Electronic performance measurement applies the same criteria to all circumstances, being independent of the rater, but dependent on the algorithm construction.

Contextual effects on rating

One of the non-performance determinants of performance ratings can be described as the political use of rating (Tziner & Murphy, 1999). According to these authors, political aspects of performance appraisal suggests that raters pursue a variety of goals when completing performance appraisals and that these goals substantially influence the ratings they give. Once again, the electronic performance measurement algorithm eliminates the different political determinants different raters may have.

Conflicting purposes

Ratings are used for many purposes (salary increases, promotions, and even to provide documentation for legal purposes). These purposes may come into conflict (Murphy & Cleveland, 1995). The electronic performance measurement provides a timeliness opportunity to present facts, and depending on the purposes, different judgments might be observed.

Feedback is not accepted

There is evidence that employees dislike giving or receiving performance feedback (Cleveland, Murphy & Lim, 2007). Differences in self-ratings versus others’ ratings are not a shortcoming of performance appraisal per se but rather a reflection of broadly relevant processes in the way we understand our own behaviour versus the behaviour of others. People usually attribute success to internal factors (skills, effort, etc.) and attribute failure to external ones (lack of opportunity, etc.). Data are often argued, evidences become a source of quarrel and performance feedback becomes the ultimate lose-lose scenario. Once again, electronic performance measurement brings neutral information, neutral evidences, that employees cannot challenge.

6.1.2 Potential limitations

Despite the technical limitations of the research, which are discussed in section 6.4, the benefits of the exercise are clearly limited to performance measurement, whilst performance appraisal and performance management, that is judgement and decisions, still need human intervention.

One specific limitation is related with potential future behaviours. As far as employees find out what is needed in order to deliver the “right performance”

according to the algorithm, those behaviours might be enhanced. For example, the number of “likes” might be influenced by the potential gain in performance measurement.

It seems difficult to imagine, at this stage of development of IT techniques, an AI algorithm making judgements about such a complex topic as individual performance appraisal within organizations. That implies that the help of an electronic performance appraisal system is to provide analysed data and information to the appraiser, not to deliver the appraisal.

Moreover, it seems difficult to imagine an electronic system managing performance, that is communicating with the employee, suggesting a salary increase or a promotion or even a dismissal. The appraisal and the management phase run in this exercise are the responsibility of the managers.

The technology adoption and the acceptance of the tool set the limits to the concept of electronic performance system. In this exercise, the idea of electronic performance measurement is basically accepted, the electronic performance appraisal is not accepted by the managers and the electronic performance management is not accepted neither by managers nor employees.

6.2 Contribution to the literature

The literature review demonstrates that research around performance has focused mainly on the technical side, that is, on the tools, accuracy and the relationship between individual performance and organisational performance. But most of the literature is based in experiments, frequently reproduced in a “laboratory” setting, far from the real context of a living organisation populated by actual people. Some of the literature, very enthusiastic about the potential of tools, fails to take into account the social and organisational considerations revealed by the current research. The current research combines technical aspects with social aspects; and, here, technical aspects are related not only to performance taking a classical approach, but also using digital technologies, which is data and algorithms.

Phase I of the research demonstrated something akin to a natural experiment, and shows what can be achieved using data produced by IT to explore relationships. Data gathered from diverse sources, and algorithms, may reproduce the classical performance appraisal as run by a manager. The idea of using data and algorithms in order to explore what happens in organisations is not new. There are several pieces of research using workflow data in order to explore the structure of organisational routines, these include those by Pentland et al. (2009), or Hillison (2009). According to Hillison (2009, p. 6), “workflow mining techniques give an unprecedented view into the performing aspects of an organisational routine. The workflow system structures and enables the type and sequence of activities that are performed, while providing necessary data for research.” Performance appraisal is not a routine, but otherwise the idea is similar. The research is limited to one case study, with a limited number of variables, but the results are very promising.

Including more variables and refining the algorithms will probably deliver even better results than the classical performance appraisal tools.

Phase II of the research looked at the social adoption of technology. Not all the technological tools adopted in social systems are used in the way they were developed and conceived. In this case there are concerns about who determines the evolution of the system in the future, changing the rules of the algorithm. Scott and Orlikowski (2012), in their discussion of the impact of TripAdvisor on the evaluation of visitor experiences, point to the importance of algorithms in the public domain. This research has suggested how algorithms also raise important questions for those within organisations. Also, the research reveals that there is a very different acceptance of the concept among different stakeholders, supporting for example the differences that Orlikowski (2000) discovered when investigating knowledge management tools in a management consultancy. It is clear that this analysis should be complemented with more qualitative forms of inquiry in order to explore what the data means to participants.

Predicting performance is a fairly new area of research. Probably this is why there is such a limited field of literature on this topic. Maybe it is still considered science fiction, or maybe among the thousands of applications of digital technology, electronic performance appraisal is still not quite there yet. But according to this research it is possible: technically the possibility is there and socially there is a basic level of acceptance. In consideration of the difficulties to take into account there are different kinds of jobs, different contexts and measures human behaviours, and as all of this needs to be taken into the same equation, it is not so strange that there is not a wide range of applications for this purpose. IT applications regarding performance are usually embedded into HR ERPs, and the majority of them (if not all of them), still record data provided by users. However, this research suggests an alternative direction, the use of data generated automatically by IT applications in the normal course of business. In this, it reinforces the observations of Zuboff (1988) that IT has the potential to “informate” organisations. That is, IT not only automates practices, but it has the potential to supply information about how those practices are carried out. However, realising this potential requires, as Zuboff argues, that organisational actors both recognise the potential and carry out the necessary changes to make it a reality. This research suggests that organisations still have a long way to go in order to fulfil the potential that Zuboff recognised nearly thirty years ago.

6.3 Recommendations to practitioners

The most important benefit for practitioners is possibly the opportunity the findings of this research offer them in terms of thinking about introducing the electronic performance measurement concept as an idea within their organisations.

What the research has discovered is that an electronic performance measurement is not only an additional and alternative tool, but also it might change and re-engineer the performance process right across the organisation.

Indeed, the current performance process is remarkably similar from one company to another. This process, widely described in the literature, is composed of four different phases:

- Planning is about establishing the strategic goals of both company and unit, aligning goals to employees' work and determining the performance level criteria.
- Assessment is about the annual appraisal of performance. This provides ongoing feedback about how the employee is performing, and a final conversation between the employer (generally the immediate superior) and the employee.
- Recognition is about correlating incentive programmes with performance, as well as providing information about future base salary increases and possible awards.
- Career development is about developing an Individual Development Plan considering strengths and weaknesses; the employer and employee have a discussion about particular talents, and how best to utilise training facilities in order to improve performance in the next cycle. This may also inform the organisation about future promotions.

The process is typically conducted around a budget year; so each one of these phases is run once a year. As the literature widely states and companies confirm, the process does not work for many different reasons.

Figure 1 shows the current process in a highly schematic way:

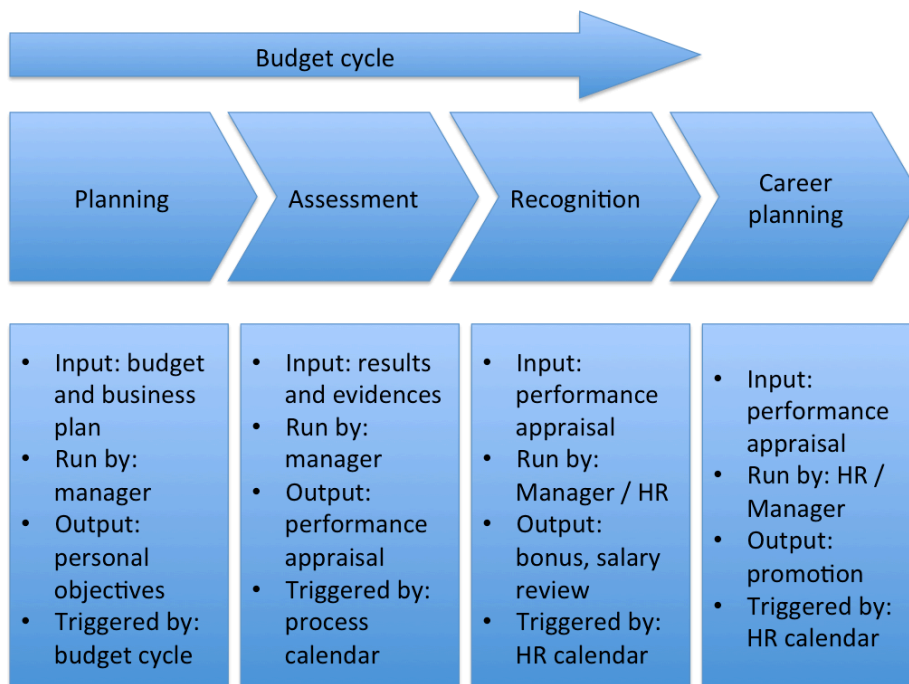


Figure 1: *Current performance process*

The introduction of technology opens up a new perspective. The appraisal phase can be completely informed by the system and can be run anytime. This allows managers to run performance appraisals and performance interviews at any time over the year, probably more interviews and probably more focused on specific issues, as well as allowing employees to receive feedback more often.

The timelessness allows the company to disconnect the consequence phase (recognition and career development) from the process. Neither manager nor employee should be thinking about the salary review or promotion when discussing performance.

Finally, the discussion between the manager and the employee will focus on the action plan (“what are you going to do?”), instead of focusing on the appraisal (“what have you done?”). The focus shifts from the past to the future, more on the action plans than on endless reviews of the past.

These changes in the process may be very helpful in fixing the majority of issues that mean the performance process is stuck in the majority of organisations today. Parallel to this performance process, a new process should be defined in order to permanently fine-tune and improve the algorithm that appraises performance. Finally, the consequences derived from individual performance should be embedded into the talent-management processes.

Figures 2, 3 and 4 illustrate the proposal of three independent and parallel processes to manage performance.

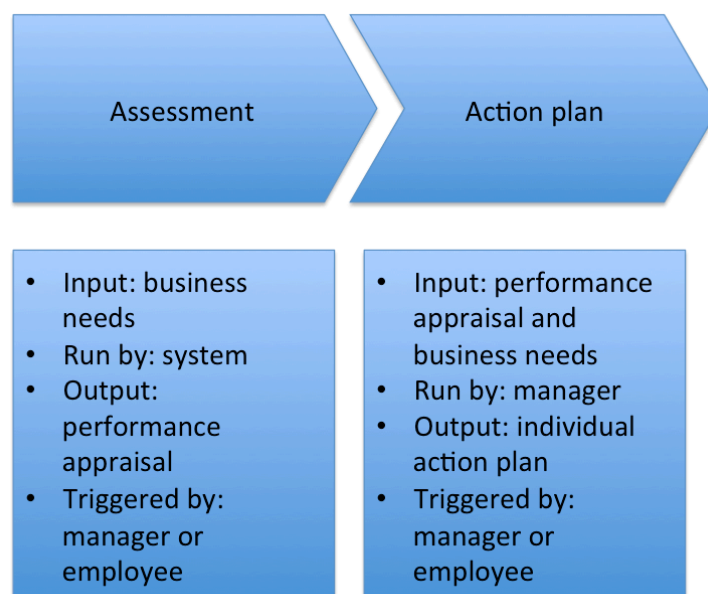


Figure 2: *New performance appraisal process proposed*

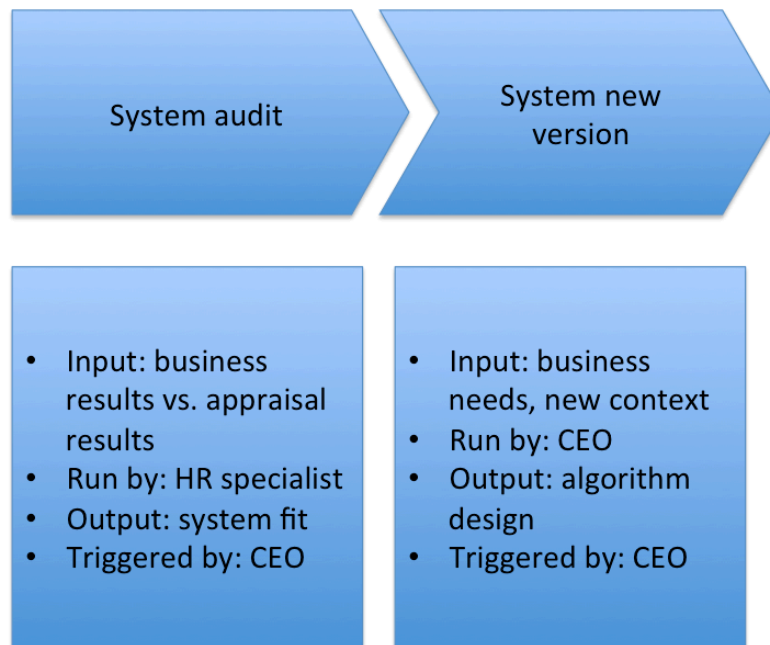


Figure 3: *New performance system review proposed*

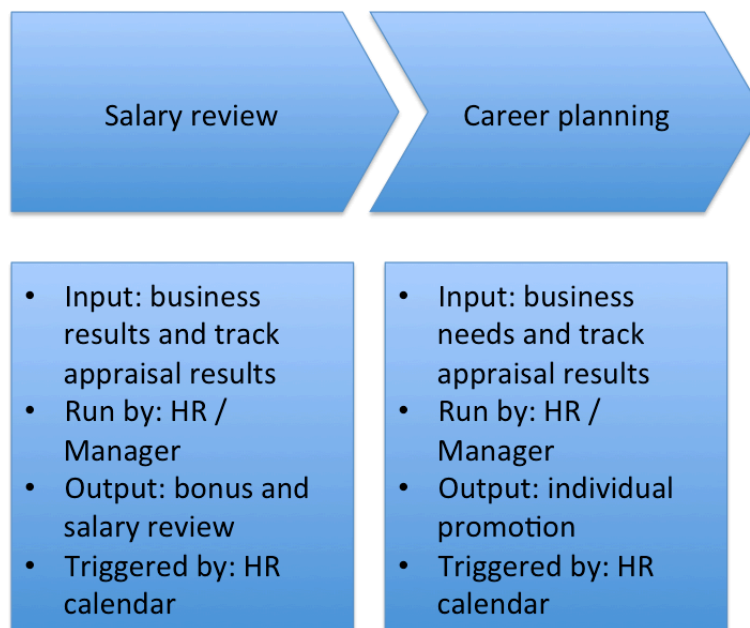


Figure 4: *Consequences of performance appraisal to be included in talent management processes*

Practitioners should also carefully consider the implementation plan for this kind of system. As shown in the third research, technology adoptions within an organisation may vary depending on the stakeholders. Apart from the technical issues related to system development, communication, involvement and engagement of the key stakeholders are all crucial to guarantee the new system's success.

6.4 Limitations of the study

The main limitation of the study is related to the core research method: the case study. It is impossible at this stage to extrapolate to other kinds of organisations the proof of concept and the technology assumption within the organisation.

The proof of concept was being carried out for one specific job role, the Consultant within a consulting firm. In addition, as noted in chapter 4, the respondents were selected jointly with the CEO. While the benefits of access were argued to outweigh any bias that this might have introduced, it is recognised that this selection process imposes a further contrast on the degree to which this research can be generalised. Due to the importance of the context in performance appraisal, it seems at this stage there is not a universal system that might appraise performance in any job role, within any organisation. On the contrary, every job in every organisation may have a different model to be appraised. Maybe in the future, jobs could be clustered, in order to apply similar models, for instance, commercial jobs, support function jobs, managerial jobs, project management jobs, etc.

The technology adoption is a critical limitation. It must be taken into account that the research has been run within an IT company, where young consultants and managers work with this kind of concept anyway. On top of that, not all the consultants have been interviewed to analyse the acceptance of the model, but a sample agreed with the CEO has been selected. Even in this environment, the first reaction after hearing about the model was scepticism, although in the end, everyone acknowledged that it was feasible. Other industries, maybe more traditional, and other populations, maybe older or with a cognitive distance from IT, may be more reluctant to the concept idea.

The way this research has addressed the problem would be applicable only for core job roles in larger organisations, as in order to create a proof of concept a significant sample is needed.

6.5 Recommendations for future research

According to the literature, the current research is probably one of the first attempts to use artificial intelligence or AI in order to measure individual performance at work. As this is very much an emerging topic, there are ample opportunities to develop new research in the future.

There are three main fields for future research:

Prove the concept idea in other populations and other industries

It is clear that the limitation of this research is that it has been tested in one company and in one specific population within that company. How will this concept idea work in other kind of populations and other kind of industries?

Proof of the value for the people and for the business

According to the literature and to the interviews carried out, performance management does not work, and it is not delivering value to either the businesses or its employees. The idea suggested in this research offers a completely different approach, and one that might be valid. But the only way to implement such an idea is to prove the value for both the business and the people working within it.

As the literature review showed, among employees a vast majority consider the current performance management systems as useless. With all the innovations shown in the processes, it would be interesting to understand whether employees would perceive more value in the new process.

Regarding business performance, De Nisi and Smith (2014) consider that there is no connection between the addition of individual performances and business results. The new performance process should also add value to the business, allowing somehow the connection of individual performance with business performance. It would also be interesting to understand this connection and the value provided by the system to the business.

Standardisation

The way this research addresses the construction of electronic performance appraisal systems is somewhat hand-crafted. A further line of research would attempt to cluster jobs, standardising most of the elements considered.

This research has combined methods in order to explore in some detail the potential of digital performance appraisal. In doing so, it has taken performance appraisal research out of the laboratory and into a real world setting. There are many difficulties with carrying out this type of research, but it is clear that using data automatically generated by IT systems to supply evidence on performance is feasible. The bigger questions, however, are the acceptance of such evidence and the interpretation of what it means. These are profoundly social and organisational questions. The findings from this case study, however, are that there is much potential in addressing such questions. They indicate that performance appraisal must not be seen as a simple technological fix, but that implementation must tackle questions of standard setting and measurement head on.

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