How performance measurement systems enable or hinder organizational ambidexterity

ABSTRACT

Purpose - We examine how different uses of performance measurement systems (PMS) enable or hinder organizational ambidexterity, intended as the simultaneous pursuit of exploitation and exploration.

Design/methodology/approach – Following a qualitative research design, we gathered data through semi-structured interviews, observations, and reviews of documents at four departments of an automotive firm.

Findings – We contribute to operations management research and practice by demonstrating how PMS, which are typically associated with exploitation, can also foster exploration, and enable organizations to become ambidextrous. Specifically, we show how PMS can be structured and used in more agile ways and, in relation to innovation, we identify which PM practices should be introduced and with what effects, and those that should be avoided. We also contribute to organization theory by highlighting how a single management tool can promote the achievement of both exploration and exploitation.

Originality/value: We provide in-depth insight into how PM tools affect an organization's ability to pursue exploitation and exploration, thus contributing to research in operations, innovation, and organization theory.

Practical implications – In investigating PMS uses and their effects, we identify several positive practices. For example, we show how managers can use PMS more effectively and how targets could be deployed to stimulate creativity and innovation. We also emphasize the need for managers to opt more often for team incentives rather than individual ones to encourage the collaboration needed for organizational ambidexterity.

Keywords: Performance measurement, organizational ambidexterity, innovation, levers of control, qualitative research.

Paper type: Research paper.

1. Introduction

Over the past two decades, academics and practitioners alike have emphasized the importance for organizations to become ambidextrous by exploiting and efficiently managing their current business operations whilst exploring and adapting to environmental changes to ensure their future viability (Andriopoulos and Lewis, 2009; Gibson and Birkinshaw, 2004; Tamayo-Torres *et al.,* 2017). However, organizational ambidexterity (OA) is difficult to achieve and requires practices that can foster exploitative activities such as formalization and alignment and, at the same time, enable exploration by creating opportunities for creativity and innovation (Koufteros *et al.,* 2014; Smith and Lewis, 2011).

Performance measurement systems (PMS) are tools that can help organizations understand and monitor performance, implement strategy, facilitate resource allocation, formalisation and alignment, and, as such, can drive exploitation (Hanson *et al*., 2010; Marchand and Raymond, 2008). However, PMS have also been regarded as having a detrimental effect on exploration, because they may create the rigidity that reduces employee creativity and autonomy as well as the agility that organizations require to respond to changes in the external environment (van Oorschot *et al.*, 2023).

Recent studies have drawn on Simons' levers of control framework and argued that PMS' effects depend mainly on how they are used (see, e.g., Bedford, 2015; Mura *et al.,* 2021). Specifically, whilst PMS can be utilized diagnostically to help organizations monitor performance, track progress, and establish whether the desired level of performance is being achieved, they can also be used interactively to facilitate exploration by encouraging dialogue and debates that create avenues for new ideas and opportunities (Pešalj *et al.,* 2018). Yet, other authors have argued that control mechanisms such as PMS (and specifically the Balanced Scorecard) can neither foster exploration nor bridge the gap between predominantly exploitative and mainly exploratory units in organizations (Hahn and Figge, 2018; Hansen and

Schaltegger, 2018). These scholars claim that whilst exploitative units tend to intensively use measurement systems, most exploratory units do not and therefore caution practitioners against them. These contradictory conclusions make the role of PMS in facilitating or hindering OA unclear.

This study draws on research on organizational ambidexterity, performance measurement, and the levers of control framework to address the following research question: *how do different uses of PMS affect organizational ambidexterity?* In this research, a PMS is considered as a tool that helps signal changes in the internal and external environment where significant information can be attained for making decisions (Baird and Su, 2018; Srimai *et al.,* 2011) and used to influence behaviours (Smith and Bititci, 2017, Ukko *et al.,* 2007). A PMS is also viewed as a vehicle to articulate an organization's strategy to its employees and help align their individual tasks with the initiatives implemented by the organization to achieve its goals (Bourne *et al.,* 2018; Lucianetti *et al.,* 2019; McAdam *et al.*, 2017). Moreover, in line with recent work that has emphasized the social aspects of performance measurement and management, a PMS is seen as a combination of technical and social controls and as a means to engage individuals in conversations about the performance of the organization. This, in turn, can then lead to problem solving, innovation and exploration at different levels (Bititci, 2015; Mackenzie and Bititci, 2023).

Drawing on data gathered through 40 semi-structured interviews, observations, and reviews of documents at four departments of an automotive firm, this study contributes to operations management theory by demonstrating how PMS, which are typically associated with exploitation, can also foster exploration and enable organizations to become ambidextrous. In the context of innovation, it identifies which PM practices should be introduced and with what effects, and those that should be avoided. It also contributes to organization theory by highlighting how exploration and exploitation can be simultaneously

achieved by implementing the same management tool (Birkinshaw and Gupta, 2013; Zimmermann *et al.,* 2015).

This article is structured as follows: it begins with a review of the literature on OA and PMS, and on their relationship. Then it presents the research methodology and the results of the study. The paper concludes by discussing the main theoretical and practical contributions, as well as the limitations and directions for further research.

2. Theoretical background

2.1 Organizational ambidexterity

Organizational ambidexterity refers to an organization's ability to simultaneously engage in exploitative and exploratory activities (Pellegrinelli *et al*., 2015; Sohani and Singh, 2017). Whilst exploitation indicates an organization's ability to use its competences, capabilities and resources efficiently, and improve its products by engaging in incremental innovation, exploration refers to searching for new opportunities, fostering radical innovation, and adjusting to volatile markets (Birkinshaw and Gibson, 2004).

OA has been positively linked to performance improvement and company growth (Mura *et al*., 2021). However, it can be difficult to achieve and comes with tensions that stem from the contradictory demands of exploitation and exploration. These opposing activities tend to compete for scarce resources (Jansen *et al*., 2009) and rely on organizational routines that can be radically different (Gupta *et al*., 2006). Pursuing OA poses significant challenges to organizations and senior executives who are faced with the paradox of whether they should manage trade-offs – for example between alignment and adaptability – seek balance or attempt to achieve both exploitation and exploration simultaneously (Cao *et al*., 2009; Jansen *et al.,* 2008).

Researchers have shown that the difficulty of achieving OA could result in organizations finding themselves at either extreme (Gupta, 2006; Tinco, 2014). However, the sole pursuit of exploitation at the expense of exploration could lead to competency traps because leveraging existing capabilities may result in immediate profits but could cause eventual stagnation leaving firms unable to respond to market changes. On the other hand, a firm could also be prone to failure by gravitating towards exploration – for example by constantly searching for future opportunities – at the expense of its current operations (Andriopoulos and Lewis, 2009; Chandrasekaran *et al*., 2012; Mura *et al*., 2021).

Numerous scholars have investigated the relationship between exploitation and exploration (Andriopoulos and Lewis, 2009; Birkinshaw and Gupta, 2013; Jansen *et al.*, 2009). Earlier research claimed that the simultaneous pursuit of exploitation and exploration was impossible to achieve (Lavie *et al.*, 2010). Later, it was shown that exploitation and exploration could be regarded as orthogonal to each other, meaning that firms could pursue high levels of exploitation and exploration concurrently (Birkinshaw and Gupta, 2013; Marino *et al.*, 2015). Indeed, some authors have argued that exploitation and exploration are not necessarily fundamentally opposed, and can be mutually enhancing (see, e.g., Herzallah *et al.*, 2017; Mura *et al.*, 2021).

Scholars, however, agree that attaining and sustaining ambidexterity is extremely challenging (Andriopoulos and Lewis, 2009). They explain that tensions between exploration and exploitation can be mitigated by considering structural, temporal, or contextual aspects (Sohani and Singh, 2017). Structural ambidexterity is where exploitation and exploration are viewed as incompatible and therefore separate structures are employed to enable specific business units to focus on exploitative activities whilst others focus on exploratory ones (Andriopoulos and Lewis, 2009). Each structure has distinctive strategic intents, competencies, cultures, and managerial teams, and measurement systems and rewards are set accordingly

(Lavie *et al.*, 2010). Temporal ambidexterity is when OA manifests itself in cycles of exploitation and exploration by focusing on one activity and then shifting to the next after a period. Organizations that use this approach can utilise the same unit for either exploitation or exploration at different times (Gibson and Birkinshaw, 2004). Contextual ambidexterity considers exploitation and exploration as complementary and capable of happening in the same unit at the same time (Wang and Rafig, 2014). Whilst initial studies mainly argued for the use and deployment of separate structures, systems, and processes to promote exploitation and exploration (Lavie, *et al*., 2010), scholars have progressively called for the identification of unified systems and approaches that enable synergies between them. However, there is limited knowledge as to what these approaches are (Bedford *et al*., 2019; Mura *et al*., 2021).

2.2 The roles of performance measurement systems

Traditionally, PMS have been noted to enable organizational activities such as to monitor existing processes, ensure alignment, and implement strategy (Henri, 2006). However, more recent studies have emphasized that PMS can also assist the search for novel opportunities and the development of new ideas as well as the generation of double loops of learning within organizations (Bedford, 2015). Also, researchers are increasingly investigating the social aspects of PMS, highlighting the interpretive roles of human agents, sometimes drawing on complexity theory (Pavlov and Micheli, 2023) to regard performance measurement and management as a highly complex, ongoing process of people relating to each other (Stacey et al., 2000), rather than as a technical assessment of organizational practices (McKenzie and Bititci, 2023).

Several authors who have remarked the importance of how PMS are used – rather than just what constitutes them – have drawn on Simons's work (1995) who argued that PMS were not just mechanistic forms of control, but rather dynamic systems that could be utilized in a

variety of ways. In his framework, the Levers of Control, he identified four main uses for management control systems such as PMS: boundary, belief, diagnostic and interactive. Like many recent studies, in this research we focus on the diagnostic and interactive uses (see, e.g., Chenhall and Moers, 2015; Koufteros *et al.*, 2014; Mura *et al.*, 2021). In particular, the diagnostic use refers to formalised procedures that use information to monitor and understand current patterns in organizational activities (Koufteros *et al.*, 2014). As such, the diagnostic use focuses managers' attention on the achievement of existing operational and strategic goals (Bedford, 2015; Mura *et al.*, 2021). This use is similar to what McKenzie and Bititci (2023) refer to as "performance measurement." The interactive use helps senior managers debate and regularly involve themselves in the decisions of their subordinates. Through this use, managers can analyse the root causes of problems and support the allocation of appropriate resources to achieve performance targets. The interactive use also enables the organization to adapt to changes in the environment and pursue alternative goals (Koufteros *et al.*, 2014). Other authors have referred to this use as "performance management" (McKenzie and Bititci, 2023) and emphasized its importance, especially in business environments that are increasingly complex, evolving, and consisting of many interacting elements (Bourne et al., 2018; Pavlov and Micheli, 2023).

2.3 The interplay between the uses of PMS and OA

The Levers of Control framework shows that, in principle, PMS can be used to enable both exploitation and exploration. The diagnostic use can enable exploitative activities by monitoring performance, correcting deviations from standards and, when used as a feedback mechanism, can help identify discrepancies from pre-set targets. Such use fosters goal clarity and employee compliance with organizational procedures and helps reduce lead times. It can also help articulate the activities employees are expected to carry out to ensure that the

organization's strategic goals are met (Lucianetti *et al*., 2019; Smith and Bititci, 2017). However, it can also stifle creativity and reduce the ability of an organization to transform itself (Archilage and Smith, 2013; Micheli and Manzoni, 2010).

The interactive use can enable exploration by encouraging dialogue and debates that generate new ideas and options. According to Bedford (2015), using formal systems interactively promotes the sharing of tactical knowledge that is significant for guiding opportunity search. It presents a forum for debate and helps question the status quo and raise queries regarding the adequacy of current practices (Archilage and Smith, 2013; Bedford, 2015; Simons, 1995). It also facilitates organizational innovation and drives performance (Koufteros *et al*., 2014; Schermann *et al*., 2012) by producing information that helps identify specific areas that need management attention (Smith and Bititci, 2017). By using performance information interactively, managers can encourage a bottom-up approach to organizational change and creativity by allowing frontline staff identify and bring forward opportunities (Pavlov and Bourne, 2011; Pěsalj *et al*., 2018). Such bottom-up inflows of knowledge can then help provide senior management with an increased understanding of changes in products, technology and markets which may lead to novel solutions (Elg *et al*., 2012; Haas, 2010; Zimmermann *et al*., 2015). At the same time, although the interactive use has positive motivational effects and can direct management attention to specific strategic priorities, it can also generate tensions and dissatisfaction if employees do not understand or agree with the organization's priorities (Jordan and Messner, 2012). The interactive use often requires organizations to loosen their performance targets and may reduce employees' sense of clarity (Koufteros *et al*., 2014; Spekle' and Verbeeten, 2014).

Empirical findings regarding the interplay between PMS uses and OA are inconclusive. Some studies show that the diagnostic use of PMS can be detrimental to innovation (e.g., Henri, 2006), whereas others find positive effects of this use on exploration (e.g., Koufteros *et al.,*

2014). Similarly, when examining the effects of the interactive use, some show a positive impact on innovation (Mura *et al.,* 2021), whereas others do not (e.g., Bisbe and Otley, 2004). Other scholars again argue that it is not the task of performance measurement to drive exploration and note that exploitation-oriented business units tend to have PMS in place, whereas exploratory units tend to use fewer measurement instruments, if at all. Indeed, some authors have urged both academics and practitioners to ditch the notion that a PMS can be used as a tool to drive innovation, particularly radical innovation (Hahn and Figge, 2018; Hansen and Schaltegger, 2018). Given this inconclusive evidence, this study aims to investigate how different uses of PMS affect the achievement of organizational ambidexterity.

3. Research methods

To address our research question, we carried out an embedded case study. This qualitative research design is appropriate for theory extension and for addressing "how" and "why" types of questions (Barratt *et al*., 2011; Baxter and Jack, 2008). Using a case study also presents a rich platform to gain an in-depth understanding of the empirical phenomena through close interaction with practitioners who engage in PM practices (Stake, 2013).

3.1 Case selection and company profile

The study was conducted at a large automotive firm in the UK. The company and specific functions within it were theoretically sampled. Specifically, the organization had to engage in exploitative and exploratory activities, and to adopt an approach in line with contextual ambidexterity (Birkinshaw and Gibson, 2004; Zimmermann *et al*., 2015). The company also had to be suitably large to use various PM practices and deploy a robust PMS across all its hierarchical levels (Schermann *et al*., 2012; Tinco, 2014).

The company chosen for the study is well established and known to innovate its products quite frequently. It also actively uses various PM tools, including Balanced

Scorecards, Key Performance Indicators (KPIs), performance targets and dashboards. Four of the organization's departments – R&D, engineering, manufacturing, and marketing – were chosen as units of analysis, and they were all engaged in both explorative and exploitative activities, although in different ways. The R&D function conducted extensive research to identify new product specifications that could eventually lead to the development of novel car features, and had a less stringent PMS than other functions. However, this department also had various performance targets, including the provision of at least two unique features for the new models they launched each year. The engineering department engaged in further research and carried out innovation projects to enhance the design specifications received from R&D. Nonetheless, it had various KPIs and performance targets, including innovation-centered ones. The manufacturing function typically adhered to the design specifications outlined by the engineering department; however, it also engaged in further innovation to enhance the final product. KPIs mainly related to time, cost and quality objectives. The marketing department ensured that customers' requirements were captured and used to inform the design of new car models, thus contributing to exploration (Annual Report 2018-2019; Business Excellence Model Application, 2016). However, as typical for a marketing function, it also had several indicators and targets related to sales volumes and margins.

Each department had its own Balanced Scorecard and regular meetings were held to ensure that team-level performance objectives were aligned to functional ones. During these meetings, managers used a Management Performance Review document to establish whether key deliverables were achieved and how well the department performed. This could then lead to the introduction of continuous improvement initiatives. Senior management also monitored performance using KPIs on a weekly basis, and underperformance often triggered recovery actions.

3.2 Data collection

Three primary data elicitation methods were used: semi-structured interviews, observations, and reviews of organizational documents. Interviews were guided by a protocol to ensure reliability (Patton, 2002; Yin, 2013). Each interview lasted between 40 minutes and one hour. 40 interviews were conducted in total: 36 at three different business sites and the remaining four online. All the interview participants had worked for the organization for at least two years, with the longest serving employee being with the company for over 30 years (see Table I for the full list of roles and units). All the participants engaged in performance measurement practices and used the Balanced Scorecard. Respondents were selected to obtain multiple perspectives and therefore spanned various levels of hierarchy, with some working in senior management positions (e.g., Chief Marketing Officer), some as middle managers (e.g., Project Manager), and others in more junior roles (e.g., Calibration Engineer).

Insert Table I about here

Patton's (2002) approach for conducting semi-structured interviews was adopted in this study. Literature on OA and PMS was used to inform the development of the interview protocol, which was divided into four main sections. In the first one, questions focused on the participant's area of expertise. The second section centred on ambidexterity and aimed at establishing the level and type of ambidexterity (i.e., structural, temporal, or contextual) in the interviewee's function. The third section asked performance measurement and management related questions and investigated the organization's performance objectives, how different types of indicators were used, and their effects. The final section focused on the relation between PMS and OA. The interview protocol is reported in the online Appendix.

Company documents were thoroughly analyzed to enable further understanding of the dynamics beyond the insights gained from the informants (Patton, 2002). In total, 30 documents were reviewed, including the various Balanced Scorecards, annual reports, and other performance-related sources. In addition to the interviews and document analysis, the first author had the opportunity to observe a senior manager give a presentation on a performance-related subject. Questions asked at the presentation provided further insight about PM practices in the company.

3.3 Data analysis

The authors worked collaboratively on data analysis, attempting to reach consensus on their interpretations. The analytical process was iterative and started by departing from a theoretical pre-understanding of the interplay between OA and PMS, i.e., studies show that the diagnostic use could enable exploitation whilst the interactive use exploration. Empirical data and existing literature were simultaneously examined and matched to choose the best explanation, and at the same time new observations were made by exploring themes that emerged from the data (Saunders and Lewis, 2012).

Empirical data on the company's activities that qualified the organization as ambidextrous and data on its PM practices (e.g., how PMS were used in each department and their impact) were explored. Information collected through interviews, observation and review of company documents was coded using the NVivo software. The coding process commenced when initial data were gathered and continued throughout the data collection stage. Data gathered from each department were labelled and then analysed, first separately and then jointly. This categorization process commenced with the identification of "first order codes", which were then grouped into conceptual categories ("second order codes"), and finally into "aggregated dimensions" (Gioia *et al*., 2012) to show the interplay between the uses of PMS

and OA (Figure 1). The authors met frequently to review the coding, discuss potential differences in interpretation, and adjust the coding scheme as needed. The different categories that were identified were compared with each other and with the objectives of the research to ensure that none of them were repeated and that they were all within the scope of this study (Gray, 2004).

Insert Figure 1 about here

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4. Findings

In this section, we first provide an overview of the ambidextrous traits of the company and its main performance measurement and management practices. We then focus on the impact of different uses of performance measurement systems on organizational ambidexterity, identifying several factors as well as positive and negative effects.

4.1 Ambidextrous traits of the company

Interviewees mentioned several examples of exploitation and exploration at different levels. At the organizational one, the company engaged in many incremental innovation initiatives that involved multiple functions; examples included modifications of existing features of vehicles through digital innovation:

> There are improvements we're making in the digital area such as [app name] which is a really cool app on your phone which uses VR technology and also augmented reality, so basically you can use your phone, point at a switch and it will detect which switch you're looking at and show you how to use that functionality on the car screen. (Global Marketing Communications Director)

The company also engaged in exploration and launched new cars with radically new features. For instance, a new model developed only a few years before this study was undertaken created a new product category: *"The [name] is a great example [of radical innovation]. No one else*

had a product like this. We've brought it to the market, and we've made more [name] than any other car in our history" (Business Excellence Manager 2). The Product Marketing Director further explained: "*Ten, 11 years ago, to think that a [name] might exist would seem like a big leap, but now it's obvious."*

While incremental and radical product innovations often emerged through collaborative work across functions, respondents also referred to many exploitative and exploratory activities undertaken within departments. For example, in engineering, in addition to making product design improvements, employees were required to engage in a range of innovation projects to deliver radically new customer features. An excerpt of the Engineering team A objectives is reported in Table II.

Insert Table II about here

Even the manufacturing department, which is typically associated with exploitative activities, engaged in exploration by developing new production processes or ways to implement ideas generated in the R&D department. The Manager of Advanced Final Assembly Facilities 2 explained:

> Manufacturing … is very innovation focussed… we're trying to push innovation projects into different areas, and we've started to build innovation teams in those different areas. So instead of having a research team as a separate group, each of the areas will have their own innovation team to do those projects.

The R&D department, while engaging in high levels of exploration, as expected, also undertook several activities to streamline its processes to enhance efficiency:

> There's the innovation acceleration team so everybody's being forced to innovate all the time…whereas with efficiency, we've got a project police team that generates an awful lot of the metrics around where each of the projects are at and get it right first time. (Research Manager)

The marketing department deployed a quality improvement initiative based on the Define, Measure, Analyse, Identify, and Control (DMAIC) cycle to foster exploitation and

exploration simultaneously by using performance information diagnostically and interactively, as discussed in section 4.3.

Overall, employees working in all sampled functions were asked to work efficiently, but they were given considerable autonomy to use their own initiative and search for new opportunities. The Business Quality and PR Manager explained:

> People have a lot of leeway to do their own thing… we're not saying to them: "you must do this, this and this." We're saying, in order for you to be at this level, this is the level of robustness that you need, and these are the tools that you can use to get there. But if they come up with their own tools, or their own way of doing it, as long as they can satisfy that robustness level, we're quite happy.

4.2 Main performance measurement and management practices

Across the company, a joint top-down and bottom-up approach was deployed when setting performance objectives and targets. Senior managers had their personal objectives aligned to the functional ones. Each employee then created their own individual objectives with the approval or input from their line managers to ensure they were in alignment with the departmental objectives. The Lead Project Engineer explained:

> It comes from above: the Engineering Director writes the scorecard for the year. Then I sit down with my senior manager and write the objectives for my whole team. So, although it filters down… we sort of sit down and detail them specifically to my team. We picked out the ones we felt were relevant and added to them.

The Research Technology Manager also stated, "*I have quite a big say as a manager what I do sign up to, but it is coming from the process of the review with our senior managers… so we're sort of setting our own targets*." Research Engineer 1 agreed: "[My manager] *is quite happy for me to draft them, review them with him - that's personal and project objectives."* This approach enabled managers to exercise discretion in setting objectives that balanced the requirements of exploitation and exploration, and thus fostered ambidexterity at individual and team levels.

Each department had a standardized reporting mechanism and periodically showed accountability to its stakeholders by reporting information in a transparent way. Performance

against short- and long-term targets was critically monitored and reviewed: this enabled the company to develop and implement action plans to meet its strategic growth objectives. Specifically, the company set objectives and targets of various types to promote both efficiency and innovation. For example, a performance document we reviewed reported several "key themes" such as "the big cost challenge" – with several objectives including "improving operational excellence for consistent delivery of product to cost, time and quality" - and "technology for the future", which referred to strategic areas of work for all functions, e.g., "smart, connected, clean, capable, and desirable." This approach intended to promote ambidexterity at the organizational level.

4.3 How different uses of PMS impact OA

Overall, we find that the diagnostic use of PMS could foster exploitation, especially when the PMS was clearly linked to the company's continuous improvement programme, and that the interactive one could promote exploration, particularly when further opportunities for discussion of performance information were created and when stretch targets were deployed. We also identify instances where the diagnostic use alone fostered exploration and where the combination of diagnostic and interactive uses of PMS enabled organizational ambidexterity. These dynamics are explained in detail in the next sections.

4.3.1 How the diagnostic use of PMS promotes exploitation

As expected, PMS were used diagnostically to motivate employees to achieve their objectives fostering exploitation at different levels. At the individual one, some viewed the PMS as essential to drive progress and achieve organizational goals. For example, "*I think [the PMS] is a necessary evil to motivate people and motivate myself"* (Research Manager). Some regarded PMS as mechanisms to foster exploitation at the team level: *"the PMS adds that*

necessary pressure to get something out, it forces us to work towards a specific goal and time, because we know that the vehicle program team needs this idea for November, for example, so we have got to have all our ducks in line, ready to go" (Senior Research Engineer 1). Targets were specifically mentioned as tools to motivate employees to contribute to the company objectives: *"You've got to have targets, because if there are no targets then potentially nothing could get done*" (Paint Manufacturing and Engineering Senior Manager).

At the project level, the company also had sessions where *"we look at the projects, what worked, what didn't work last year, and then it gives me things to build on"* (Research Engineer 4). The Manager of Advanced Final Assembly Facilities 1 also explained, *"we run a quite rigorous lessons learned review for everything we do. And we have some key checkpoints in our schedule to make sure that we're addressing those lessons and having a real reflective view throughout the whole process.*" This was crucial because it "*is relevant to pick up the flaws. Because people looking at the past are going to pick up what went well and go: let's try that again. But it's also useful to look at the flaws and go, what didn't go well and how can we fix that?"* (Manager of Advanced Final Assembly Facilities 1). Capitalising on previous performance and experiences helped inform how modifications could be made to existing projects.

Performance information also enabled the identification of areas that required improvement. For example, the Business Excellence Manager 2 stated, "*it's having that data available, in real-time, in a presentable format with teams to work with immediately, so they can see the performance of the plant, then we can get right on the problems and focus on the real right areas of the business to drive improvement.*" The data also captured the status of projects. For example, projects that were delayed were colour coded red and quickly brought to the attention of more senior employees: "*we have a number of things highlighted every single week and, if there's anything that's red, we discuss it with management*" (Calibration Engineer).

Therefore, performance information was used diagnostically to reveal areas where standards were not met, or where teams had deviated from targets. The Chief Marketing Officer explained:

> My measure of business excellence is whether my team are doing their job versus the objectives we've set, and the important thing is to then review that regularly... If we are not hitting our objectives in some areas, then some remedial action or added focus is required and that is communicated.

Taking remedial action involved searching for internal knowledge that fostered improvements and incremental innovation. To help teams get back on track, performance information was critical because, *"if you have the right performance data and you get the right data to the teams quickly, and it's accurate, and it's well-presented... what it allows them to do then is to understand very quickly the current state. And then they're working on the right things that can drive improvement straight away*" (Business Excellence Manager 2). The Advanced Manufacturing Senior Manager agreed, "*we need the right people to be able to see the right data and react quickly… Right down to engineering level, we need information to understand how we react, control, and ensure alignment.*"

The impact of the diagnostic use of PMS on exploitation was enhanced by clearly linking the PMS with the company's continuous improvement programme. Interview and documentary evidence, and the observation of an internal meeting revealed that the company adopted quality improvement tools such as lean and used performance information to identify performance gaps which led to decisions that promoted exploitation at the organizational level:

> "[Deploying] what we call *Kaizen*, which is continuous improvement, are small improvements, innovation ideas, which you may not think of as being innovative in the first place, but they are generally small improvements in the system or process, which can be quickly introduced and quickly have an impact when performance information reveals gaps in performance" (Paint Manufacturing and Engineering Senior Manager).

4.3.2 How the interactive use of PMS promotes exploration

Performance indicators were not only used to review past performance, but also to establish revised plans. As the Research Engineer 3 explained, "*the right performance data can help you*

identify a problem or identify an opportunity… and the act of discussing and evaluating this, that sort of conversation, that sort of thinking can naturally lead you to some innovative ideas." Functional and team-level performance review meetings were particularly valued as they could create a rich environment where individuals "*can bounce ideas off each other, they're more excited, they're more innovative, they drive themselves and each other forward"* (Lead Project Engineer). This stimulated exploration at both individual and team levels.

The positive effects of using PMS interactively to foster exploration were enhanced in two main ways: by creating further opportunities for discussion, for example by leveraging digital technology, and by introducing stretch targets. Referring to the former, the Research & IT Funding Senior Manager explained, "*one of the big things they put in place is a portal with an online collaboration tool that is designed to foster both sort of company-led challenges, but also employee generated challenges…which is opened up for people to contribute ideas."* In one instance, thanks to the online discussion forum, employees first commented on financial performance information that had revealed waste in production, and then shared ideas on how to develop a new component:

> "In the process of making this widget, we've had all of these inefficiencies or waste. Through the forum … we found a way of producing these widgets more efficiently and have come up with a completely radical approach… after a couple of months we've produced a totally new widget at a cheaper price" (Research & IT Funding Senior Manager).

Several respondents also highlighted the importance of setting stretch targets to drive radical innovation:

> "We're constantly trying to make sure the idea hopper's full and that we've got new projects that are always ready… we set ourselves really ambitious targets… we set ourselves a target of how much money we're going to make for the business this year. … We know we would never reach it, but we said to ourselves: if we had a couple of big win projects, we'd get there. So, the team is constantly doing innovation projects and developing something new" (Lead Project Engineer).

The Advanced Manufacturing Senior Manager agreed: "*you have to have stretch targets, stuff that you wouldn't normally have to do. … Part of the performance monitoring is to be able to recognise appropriate stretch."*

4.3.3 How the diagnostic use of PMS promotes exploration

Although previous studies have mainly associated the diagnostic use of PMS with exploitation (Koufteros *et al*., 2014; Simons 1995; Tessier and Otley, 2012), and in some cases shown that it constrains exploration (Adler *et al*., 2009; Kolehmainen, 2010), this research reveals that the diagnostic use can promote exploration. This was most apparent when a clear understanding of current performance triggered efforts towards radical product innovation, and when innovation-related objectives, indicators and targets were used. The Research Manager argued, *"in an innovation context, I think that the correct performance measures can very much promote innovation and an innovation attitude.*" The InControl Apps and Connected Technologies Manager emphasized the importance of introducing innovation-related indicators: *"unless there's a point, a line item in that performance review that includes innovation … it becomes difficult to see it being pushed.*" Similarly, the Advanced Manufacturing Senior Manager stated, "*I think without staring at [innovation] as a performance objective, you are not going to do anything because there's no driver."* Having such objectives encouraged employees to engage in creative thinking and to participate in innovation-related activities, which stimulated exploration at individual and team levels.

The Project Lead Engineer also gave an example of how her team engaged in radical or explorative activities: "*We also set ourselves an objective of how many innovation projects we wanted to run this year… So, we put ourselves in a different space and innovate and use customer insights to develop new features and come up with new ideas."* Her team had several innovation-related targets (see Table II) including delivering at least two unique selling points (USPs) annually; running one generation Y focused innovation event; filing for four customer feature patents; and holding two "Fed Ex" days, which entailed coming up with an innovative idea overnight, delivering project business cases, collaborating with internal and external working groups, and engaging in the so-called "Project Blue" in delivering a new feature.

These and other targets were seen as ways to promote exploration. For example, the Design and Innovation Research Manager 1 stated, "*the request to have USPs drives us to innovate. I suppose the whole measurement, all the research projects that we are asked to put through are driving us to generate projects and generate ideas.*" Furthermore, "*the company measures patents … and sets targets for patent generation"* (Research & IT Funding Senior Manager) and these were seen as promoting investments and focus on exploration.

Conversely, the Business Excellence Manager 1, whose department had no clear KPIs or targets related to innovation argued that the absence of performance measurement tools reduced their efforts towards it:

> If we had a target to take, you know, even 1% of those ideas and take them through to evaluation, I think you might be able to force a rate of innovation greater than what we're currently achieving. So innovative thinking is encouraged. And there are ways that employees can share their innovative ideas internally. But there are no KPI driven targets to actually drive that.

This study also highlights the vital role of PMS in new product development processes. Specifically, the company had developed a vehicle programme that included targets and KPIs, and which provided a clear structure that helped promote creativity and convert ideas into successful innovations:

> "I think it's good for innovation to have clear guidelines and deadlines. But, of course, you also, at some point, you need to principally stop and say, get it down to paper, and deliver what you anticipate. And try and work on not doing blue-sky research only. Also, align it then to delivery. At the end of the day, get a product out." (Engineering Strategy Engineer)

The Business Excellence Manager 1 agreed that KPIs were crucial for progressing new ideas:

> There is value in having an innovation process that has a gated series of KPIs through it. So, for instance, to deliver an innovation, you need hopper of ideas that gets filtered to enable you to understand, what's worth pursuing? What are the steps in taking one of those ideas, evaluating them? And then, having evaluated them, turning them into a product, a service, or a behaviour.

4.3.4 How the joint diagnostic and interactive uses of PMS promote OA

In several instances, the simultaneous diagnostic and interactive use of PMS fostered OA at the individual level, particularly when 360-degree sessions were used to provide feedback;

objectives and targets were collaboratively reviewed; and performance measurement and management practices were aligned with agile ways of working.

Within the company, employees gave feedback to each other as part of a 360-degree appraisal process. The Project Governance Manager stated, *"we write a report on ourselves, and we then analyse each other, and we do a 360[-degree] sort of performance review. So, you'll say: can you give me some feedback on what I've done over the last year? And then you have reviews with your senior manager to discuss it."* This creates a forum for discussion for *"managers to know what you're doing. It creates an opportunity to come and talk to them about your metrics"* (Business Excellence Manager 2). This also provides an opportunity for managers to have interactive conversations with their employees regarding how they could be more creative and how they could engage more in innovative projects, thus stimulating exploration. For example:

> "I'll sit with my boss, he will be clear about the strategic priorities for the next year, for example, it could be key themes around digitisation, it might be around customer first principles, it might be around the vehicles we've got to launch. I then have to set my objectives within those success factors…as we discuss these objectives, we are able to share ideas, I can pick on his ideas and build on it and be creative with it" (Chief Marketing Officer).

During this type of session, there were also opportunities to discuss project performance which led to the improvement of existing designs, in line with exploitation. For example:

> "A couple of months ago, we had finished one platform, and we came together, and our manager said, "let's have a session where we look at how we've done in the various projects and how we can improve it for the better… then we say for the next release, how can we make this better to increase the customer's experience based on what we found"." (Calibration Lead Engineer 1).

Within all four functions, regular meetings were held to ensure that team-level performance objectives and targets were aligned to the corporate objectives. Scorecards were revisited every year with major performance reviews carried out quarterly and yearly: "*some of [the indicators] just get taken off the scorecard if they're no longer relevant. Some of them might still be relevant but not something big enough we'd need to report on company-wide*" (Strategy and Innovation Coordinator). Misaligned indicators were questioned, root cause analysis was conducted to identify the reasons for such misalignment, and recovery actions

were taken. This also helped focus attention on areas that were deemed to be relevant and highlighted opportunities for exploration.

Discussing the removal of irrelevant or unachievable objectives and targets and finding replacements for old ones in a collaborative forum led to idea generation and sharing. The Business Quality and PR Manager explained, "*just thinking about targets and objectives makes you think about not just what you do but how you do it, and I think the act of discussing those and evaluating those things, that sort of conversation, that sort of thinking can naturally lead you to some innovative ideas*." Furthermore, developing performance objectives and targets collaboratively with cross functional teams in some instances led to the introduction of new projects:

> "We have a rigorous target setting process with our boss and, for example, he had an objective to optimise our customer touch point in every area. So that's basically looking at trying to improve either the efficiency or effectiveness or both, of every touch point. So, by discussing this objective, we came up with ideas, we put a pitch at the Business Planning Conference where basically all of the sales and marketing communities come together, and this has led to new projects which the business is now working on." (Chief Marketing Officer)

Another way in which the joint diagnostic and interactive use of PMS promoted ambidexterity is when performance measurement and management practices aligned with agile ways of working. At the time of the study, the company was introducing an agile approach (Rigby *et al*., 2016) in various business areas. As a result, projects were starting to be done in phases and timelines were revised as they progressed through the development stages:

> "We only do the detailed planning for the next phase. We know what the phases are, but we don't do any detailed planning, we don't do the conventional waterfall. We do agile, and that actually gives us the flexibility to move around. If projects need to take longer or can be done quickly, we get a better idea, and every gateway that we go through we reset the baseline" (Project Manager).

Where agile was being adopted, more flexible performance indicators were used. For example, in the R&D department, "*we've set new targets and we're setting new metrics as we're going along; because research is a changing environment, we have to realign our metrics to what the business needs."* Similarly, the Coordinator of External Communications stated, "*the way we do the targets is quite loosely defined."* Performance indicators were noted to "*drive*

innovation if you word them right and you allow some flexibility in what you're giving them to do" (Project Governance Manager). In some departments, target deadlines were brought forward not only to drive exploitation but also to support exploration: "*we had a look at the compressed launch cycle, shifted the milestones left. And then, from doing that, giving ourselves the ability to manage innovation more effectively*" (Business Excellence Manager 1).

The agile approach required a certain level of flexibility in how performance was measured and managed as well as quick feedback loops when reviewing performance. As the Lead Project Engineer stated, *"in the weekly team meeting everybody gives an update to the team based on targets set… it is like a sprint, and it's used in tech companies as a way of driving innovation and driving projects forward."* From a cultural point of view, developing tolerance for ambiguity and failure was seen as fundamental (Rigby *et al*., 2016). For instance, the Principal Engineer argued:

> Enable them. Support them. Encourage them. Don't worry about mistakes because that's learning. Because it actually makes a better solution… By giving an open framework, let's give it a go. Encourage people to take the extra stride… trust the engineers with their managers to come up with technological proposals for innovation.

Making mistakes and learning from them was regarded positively by some interviewees because "*if we're not failing, we're not pushing ourselves hard enough. This is because you can't guarantee success with something new, and… sometimes the original project fails and no, you didn't deliver it, but you've identified a different technology or way of doing things*" (Lead Project Engineer). From a performance measurement and management point of view, what were originally seen as negative results were sometimes reframed to be more in line with a trial-and-error logic. For example, according to several interviewees, the failure rate KPI was an indication that innovation had taken place. The Advanced Manufacturing Senior Manager explained, "*you have to go through a level of failure mode analysis to understand the relationships and dependencies of the system… So more recently that's driven us to embrace better technologies."* The Project Manager agreed:

> One of the things that we're setting ourselves is: we want to set a certain failure rate. So, we should be failing at a certain level. In order for us to do the innovation we should be saying... "Dare to Try", well done, you had the balls to try this. It hasn't worked, but well done for doing it anyway. Because unless we do risky things, we're not going to get innovation. We've got to work on the basis that there is a certain level of failure that we're prepared to tolerate.

4.4 How different uses of PMS negatively impact OA

While different uses of PMS were found to positively impact exploitation and exploration, there were instances of negative effects. These were particularly evident when PMS reinforced old practices and processes, and when performance indicators were linked to individual incentives or sanctions.

4.4.1 Reinforcing old practices and processes

PMS can have a significant impact on organizational performance by directing actions and behaviours. At the chosen firm, the diagnostic use of PM tools such as KPIs and targets that were either ambiguous or insufficiently relevant to existing operations reinforced old practices and hindered change. The Business Planning Senior Manager explained, "*the reason we've got a pretty crappy process is partly fuelled by our KPIs: they are pretty poor and when you look at our KPIs most of them are lagging indicators."* Many interviewees emphasized the danger of using PMS only to incrementally improve existing processes. For example: *"if you decide to measure performance and then you use a scorecard that just shows outputs only, then you are in danger of driving efficiency alone without innovation"* (Calibration Lead Engineer 1). Focus on efficiency at the expense of innovation was seen as reinforcing old practices and creating resistance to change because:

> "With the old people, they don't necessarily react well to being performance managed. They think they know best, and they tend to lean back on experience and stuff like that. It can be very difficult with those guys to have a conversation around performance, and this is even worse when the measures are outdated as it just reinforces what they are doing." (External Affairs Technical Coordinator)

The Business Planning Senior Manager also explained:

> We've got departmental scorecards and individual objectives, but they don't integrate, so everyone's measuring different things and it doesn't all tie in, some are outdated… I think the only way to improve it is to start off by using better KPIs, we can use some KPIs which people might find useful, rather than telling them something that they already know.

A graphic used to report a "current state assessment" of poor performance measurement and management practices confirmed this view (see Figure 2).

Insert Figure 2 about here

4.4.2 Linking PM to individual incentives or sanctions

The company had numerous innovation programmes and employees received an award or pay rise if they delivered exceptional results. While these schemes were intended to promote innovation and recognize success, most interviewees were quite critical of them. For example, the Principal Engineer asserted, "*the problem with the reward is that it penalises those people that, I'm not saying it's through their own fault, haven't been able to meet the target or objective, maybe because it wasn't possible."* The Strategy and Innovation Coordinator also stated, "*if you haven't met that target, and for quite valid reasons, it can be a little bit demotivating.*" This could trigger behaviours that were not conducive to exploration if employees genuinely felt the targets were unreachable: *"a lot of engineers' pay and reward is based on the performance against their objectives. And if their objectives are geared to a 12-month cycle, but the project is not possible in 12 months, then that creates anxiety, tension, and fear"* (Principal Engineer).

Individual rewards based on financial indicators appeared to negatively affect collaboration and idea sharing, and discouraged employees from helping their colleagues if they felt their efforts were not valued. For example: "*if you only measure the output and say: "oh, he was the one that came up with the solution," you overlook the other people that participated… the next time that happens people tend to say "well, the last time I was involved but I didn't get recognised, so what's the point?""* (Calibration Lead Engineer 1). Although employees could achieve their performance goals, this sometimes came at the expense of achieving greater

performance through team collaboration. The Principal Engineer highlighted, "*at the moment, people are working in isolation because they're looking for their own financial reward… From the individual perspective, they can achieve the performance goal but, actually, the company is losing on the fact that it's not fully realised the potential of the whole team*." The Business Excellence Manager 2 also explained, "*with money it's almost a de-motivating factor because you get lots of discussions about who's got more than the other person. Why didn't they get more?"* This also fostered a culture that stifled innovation because "*often, you'll find with a lot of the engineers, they're not prepared to share their knowledge. Because, if I share the knowledge with somebody else, I'm going to give them an advantage. So, it disables sharing*" (Principal Engineer).

The main findings of this research are reported in Table III.

Insert Table III about here

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5. Discussion

Drawing on research on organizational ambidexterity and performance measurement and management, this study identifies various ways in which the diagnostic and interactive uses of PMS can enable organizational ambidexterity, and how some performance measurement practices may hinder it. In so doing, it makes five main contributions to theory and practice.

First, we highlight how the diagnostic use, despite being regarded as constraining exploration by some authors (e.g., Henri, 2006), is critical for it. In particular, within all the sampled business units, efficiency measures and controls were used to define the scope of exploration and to provide the guides within which exploratory initiatives should be carried out (Gualandris *et al.*, 2018). In addition, PMS were found to stimulate individual ambidexterity

when flexible, innovation-centred indicators and targets were used. In so doing, and in line with research on contextual ambidexterity (Birkinshaw and Gibson, 2004), our data show that performance indicators and targets can enforce a level of discipline, whilst flexibility in their design and use can simultaneously foster autonomy. Deploying PMS to promote such attributes could encourage employees to deliver high quality results; make them accountable for their actions; and give them the latitude they need to perform. Also, introducing a balanced set of targets and KPIs could create a good equilibrium between efficiency and creativity, and limit the risk of employees solely focusing on exploration at the expense of exploitation and vice versa (Koufteros *et al*., 2014).

Second, we provide an in-depth illustration of how performance measurement can promote exploitation. In doing so, we extend previous research findings (see, e.g., de Leeuw and van den Berg, 2011) by showing how the diagnostic use of PMS can direct attention on areas that require improvement. For instance, at the chosen firm, performance information was used to enhance capacity planning and resource allocation. Also, real time data helped to better understand crucial aspects that determined the company's organizational and operational performance by identifying constraints and bottlenecks. The interactive use of PMS could also lead to exploitation; a case in point is the introduction of the target of generating at least two USPs yearly, which led to discussions on how to improve particular aspects of a process or product. Thus, this research does not only emphasize the effects of PMS uses on exploitation, but it also explains how these are achieved (Mura *et al.*, 2021).

Third, we show that the combined uses of PMS can foster OA in three main ways: by identifying and acting upon areas that would benefit from exploitation or exploration, by leveraging the use of lessons learnt, and through performance review sessions. The first two extend research in performance measurement and innovation (Bedford, 2015; Widener, 2007) by linking uses of PMS with aspects of individual and organizational learning. In relation to

the third, and in alignment with studies in behavioural operations (e.g., Letmathe *et al.*, 2012; Mura *et al.*, 2016), we argue that performance review sessions can support both exploitation and exploration because they activate a positive cognitive process which helps employees better understand the requirements of their tasks and gives them confidence and guidance in revising their actions and priorities. For example, we found that 360-degree performance reviews enabled employees to elaborate on and learn from their experiences. This practice could help individuals understand not only the consequences but also the causes of their behaviours; also, it could provide a basis for achieving performance goals and triggering continuous improvement (Letmathe *et al.*, 2012). Furthermore, performance review sessions could create a rich platform to drive the search for new knowledge and better or novel solutions, eventually leading to the reformulation of strategic goals (Saunila *et al.*, 2013).

Fourth, this study shows that the diagnostic use could constrain exploration if PM tools reinforce old practices and processes, and if they are linked to individual incentives or sanctions. Specifically, this research suggests that the diagnostic use of PMS can lead employees to work in silos if PM tools and rewards are mainly linked to individual performance. Also, ambidextrous individuals tend to be creative and future-minded, and to act autonomously when choosing their working methods (Caniëls *et al.*, 2017). While individual-level aspects, e.g., personality traits, were not explicitly considered in this study, our findings highlight the need to take these elements into account when developing measurement tools. For example, employees with strong interpersonal skills could be measured against their level of engagement in project activities, whereas those with less developed interpersonal skills, but stronger analytical ones, could be measured against the outcomes of specific tasks and not penalised for not being able to freely interact with others.

Finally, we extend the literature on performance measurement and management: while most studies have looked at the impacts on organizational performance (e.g., Micheli and Mura,

2017), we consider the effects on OA with a particular focus on behavioural mechanisms. In doing so, we identify practices that combine technical and social aspects of performance measurement and management (Mackenzie and Bititci, 2023). Moreover, we not only provide an in-depth examination of the role of PMS in making organisations more efficient and effective, but we also show how PMS could be structured and used in more agile ways. This is particularly important because such uses are likely to become more commonplace as organizations operate in an increasingly complex world (Bourne *et al.*, 2018; Pavlov and Micheli, 2023; Stacey et al., 2000). More broadly, our findings raise questions as to whether other concepts such as alignment, formalization, and standardization, which are regarded as positively linked to exploitation but detrimental to exploration, could actually be conducive to exploration.

This study has specific implications for managers and policy makers. For example, it shows how managers could decide to use PMS in different ways, depending on their main objectives. Also, it highlights how innovation-related objectives, indicators and targets could be deployed to drive innovation and it emphasizes the need for periodic reviews of PM tools to ensure their relevance and their ability to promote efficiency and effectiveness. Furthermore, it highlights the importance of not penalising employees for failures, but of encouraging them to learn from mistakes, and for managers to opt more often for team-based incentives as opposed to individual ones. Overall, our findings call for practitioners to re-consider how they design, implement and review PM tools in light of their effects on an organization's ability to pursue exploitation and exploration.

6. Conclusions

Our findings contribute to theory and practice by investigating the effects of different uses of PMS on exploitation and exploration. We show that performance information could be used

diagnostically to stimulate exploitation by revealing areas where there are deviations from pre-set objectives, waste in processes or areas that require improvements, and by directing attention towards recovery action plans. Performance information could also be used interactively, leading to collaboration, idea sharing and opportunity search, thus fostering exploration. Furthermore, we illustrate how the diagnostic use could drive exploration. For example, setting targets for innovation may not only motivate employees to think creatively, but it could also stimulate the necessary actions required to achieve the objectives. Overall, this study shows how PMS can have positive effects on ambidexterity at individual, team, and organizational levels. For instance, employee appraisals and 360-degree assessments helped individuals identify areas requiring improvement and innovation; the collaborative review of performance objectives and targets supported to both exploitation and exploration at team level; and the flexible design and use of performance indicators, coupled with an agile approach, fostered both improvement and innovation within the organization.

As with all in-depth qualitative research, this study has limitations that call for further research. First, we carried out a detailed exploration of a single embedded case: future studies could consider multiple cases in order to cover a wider variety of contextual aspects (e.g., industries, organizational practices). Also, we did not consider the Levers of Control framework in its entirety: further research could include beliefs and boundary systems. We collected data from a very large organization with formal control systems. Future studies could explore similar dynamics but in the context of SMEs and/or organizations with less formalized systems. We also examined the interplay between OA and PMS in organizational units that aimed to achieve contextual ambidexterity. Such units tend to view exploitation and exploration as complementary organizational activities (Wang and Rafig, 2014) as opposed to contradictory, as commonly viewed in temporal and structural ambidexterity contexts

(Andriopoulos and Lewis, 2009; Chandrasekaran *et al.*, 2012). Future studies could include these latter types of settings too.

Further research could explore how PMS should evolve over time to facilitate exploitation and exploration in dynamic environments. For example, it could examine factors such as whether measures should be changed at the end of a project, particular lifecycle, or activity or when there is particular pressure from external actors such as competitors. Finally, future studies could examine in more depth whether and how flexible indicators and targets can facilitate and nurture contextual ambidexterity at the individual level, also by investigating emotional and behavioural aspects (Beer *et al.*, 2018; Bourne *et al*., 2013; Mackenzie and Bititci, 2023; Smith and Bititci, 2017).

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Table I: Job title and number of participants in each department

Department	Job title and number of participants
R&D	Head of Research Strategy (1) Research Manager (1) Research Technology Delivery Manager (1) Senior Research Engineer (3) Design and Innovation Research Manager (2) Research & IT Funding Senior Manager (1) Lead Research Engineer (2) Research Engineer (4) Strategy and Innovation Coordinator (1) Project Manager (1) Project Leader (1) External Affairs Technical Coordinator (1) Business Quality and PR Manager (1)
Marketing	Global Marketing Communications Director (1) Product Marketing Director (1) Chief Marketing Officer (1) Business Planning Senior Manager (1) Experiential Marketing Manager (1) Business Excellence Manager (1) Coordinator of External Communications (1)
Manufacturing	Paint Manufacturing and Engineering Senior Manager (1) Project Governance Manager for Global Manufacturing Innovation (1) Manager of Advanced Final Assembly Facilities (2) Business Excellence Manager (1) Advanced Manufacturing Senior Manager (1)
Engineering	Principal Engineer (1) Calibration Lead Engineer (2) Calibration Engineer (1) Lead Project Engineer (1) Engineering Strategy Engineer (1) In-control Apps and Connected Technologies Manager (1)

Table II: Engineering team A objectives

Develop key initiatives into an established team	• Team skills matrix and training plan for upskilling team. • Support graduate & manage graduate placements (setting objectives & regular 1:1s). • Process creation for the team to help new starters. Build links with relevant teams to improve efficiencies. • Keep SharePoint up to date. • Team has correct tools to do their job- access to workshop, funding, and vehicles. • Demonstrate collaboration with internal and external groups (working level).
Deliver new customer features	• Deliver 2 Unique Selling Points. • Run 1 generation Y focussed innovation event. • File 4 customer feature patents. • Deliver 4 predevelopment projects. • Enable 6 Graduate/Undergraduate development placements. • Hold 2 "FED EX" days- must deliver something overnight. • Deliver project business cases delivering more than £X annual revenue. • Demonstrate collaboration with internal and external groups (working level). • Mentor project blue team in delivering a new feature (developing design & engineering skills).
Personal development plan	• Upskill myself in line with skills matrix & team vision.
Active participation in continual improvement	• Employee development project in line with new era of engineering. • Working with group to deliver team off site and improved team satisfaction.

Table III – Summary of findings

How the diagnostic use fosters exploitation	How the interactive use promotes exploration	How the diagnostic use fosters exploration	How the joint diagnostic and interactive uses promote OA	How diagnostic and interactive uses negatively impact OA
Target setting to ensure operational efficiency	Performance review meetings to discuss innovative ideas	A clear understanding of current performance to trigger efforts towards radical product innovation	Employee and project performance measurement and feedback to help identify areas requiring improvement and innovation	Outdated KPIs could reinforce old practices, thus constraining search for opportunities
Performance information to identify areas that require improvement	Leveraging digital technology to increase dissemination of data and promote discussion	Innovation-related KPIs and objectives to engage employees in creative thinking and to participate in innovation-related activities	Collaborative review of performance objectives and targets to promote both exploitation and exploration	Using lagging indicators aimed at only incrementally improving existing processes could reduce exploration
Clear links between the PMS and the continuous improvement programme to enhance exploitation	Agreeing stretch targets to drive radical innovation	KPIs used to support new product development processes	Flexible performance indicators coupled with an agile approach to foster both improvement and innovation	Linking PM tools to individual incentives and rewards could hinder the information sharing and collaboration needed for exploitation and exploration

Figure 1: Data structure

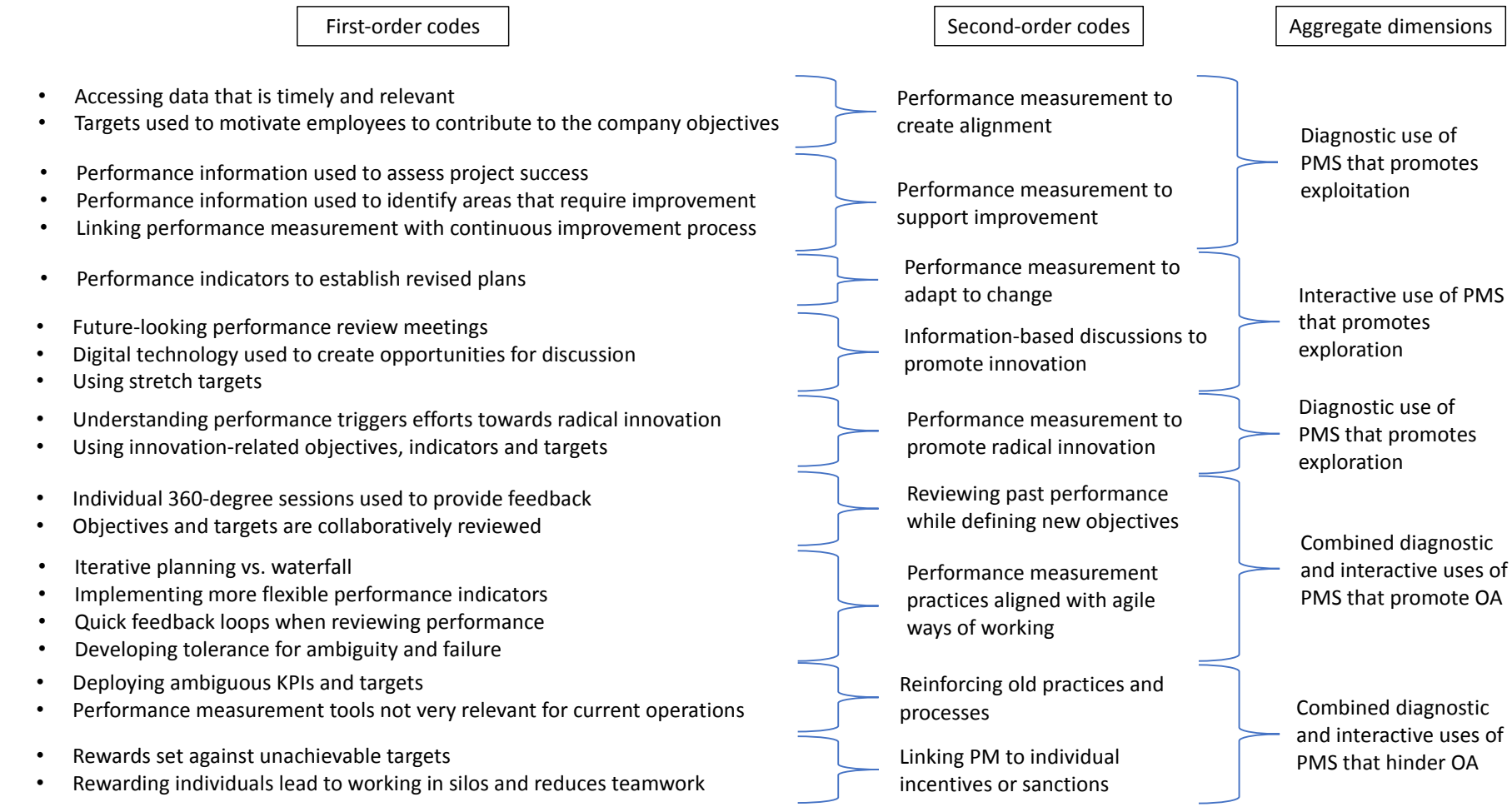
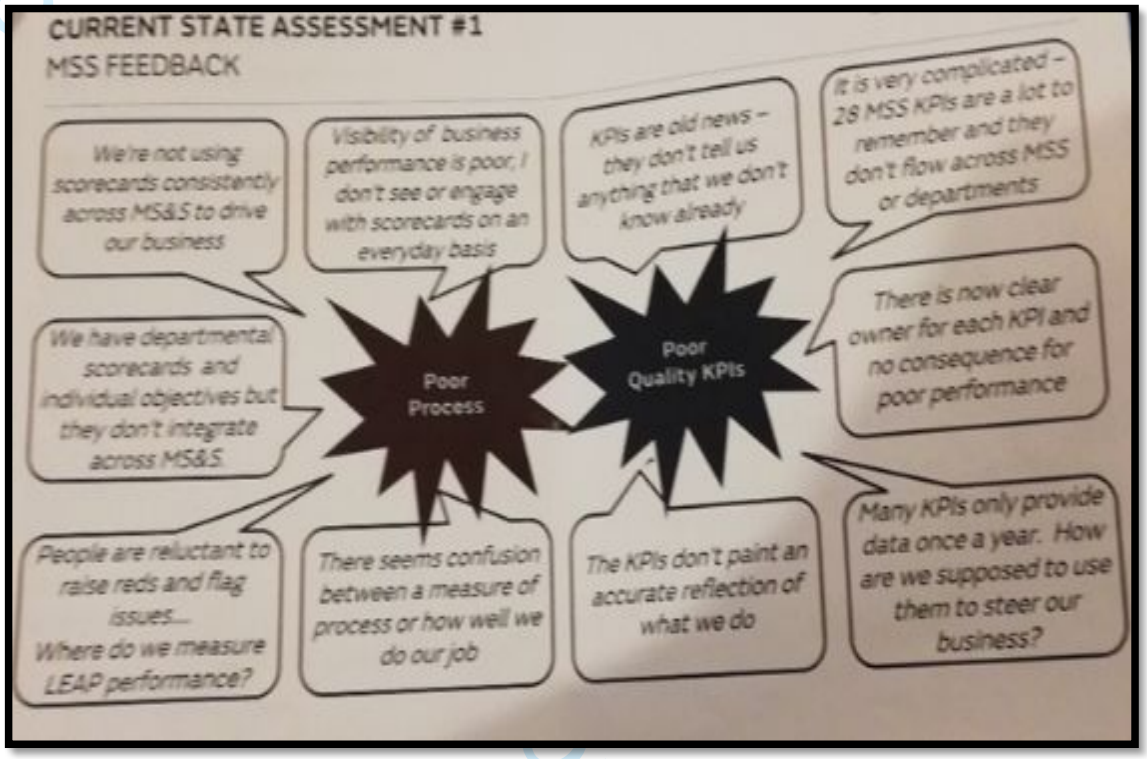


Figure 2: Current state assessment



Appendix - Interview protocol

Questions related to the participant's job role

1. Could you kindly confirm your job role?
2. How long have you held this position?
3. Can you briefly describe what your job role entails?
4. How many people work within your department?

Questions related to OA

1. In your opinion, what is the organization's priority? To ensure efficiency in existing processes and to satisfy existing customer requirements or to develop new products and look for new customers?
2. Does your job role encourage you to exploit or improve in the way you carry out your day-to-day tasks or does it encourage you to find radically new ways of doing things?
3. Are employees encouraged and given enough autonomy to explore new products/ technologies or are they expected to improve already existing products/technologies?
4. Is there a team that solely commits to and engages in innovative projects and another that commits to ensuring the effective running of business operations or is everybody encouraged to do both?
5. Does the organization find it easy or difficult to engage in incremental and radical innovation simultaneously?
6. Do you experience any conflicts in trying to do both?
    a. If yes, how do you manage such conflicts?
    b. What resources are required to manage such conflicts?
    c. Is it time consuming to manage such conflicts?
    d. Are additional financial resources required to manage the conflicts?
7. Does your company invest enough financial and other resources into innovative projects?

Questions related to PM and the uses of PMS

1. What is performance to you and how is it measured?
2. What are your main performance objectives?
3. What is the rationale behind these objectives?
4. What type of PMS do you use?
5. How is it used?

6. What type of information is on your BSC and how is it used?
7. Are your department's performance measures predominately financial or non-financial? Or are they balanced?
8. How often are your measures reviewed?
9. Do your performance indicators and target reflect your objectives?
10. Can you give me examples of some of your department's KPIs and targets?
11. How many KPIs does your department have and what are the dominant ones?

Questions related to PMS and OA

1. How are your KPIs and targets developed? Collaboratively or individually?
    a. What impact does this have in an innovation context?
2. What kind of performance information do you generate? does it drive efficiency or innovation?
3. Does the performance information generated help employees become more efficient or innovative?

Additional questions directed to senior management

1. What PM practices does your department engage in and what impact does it have? Does it encourage employees to engage in continuous improvement or radical innovation?
2. How are your performance objectives cascaded down to different departments?
3. Do the KPIs drive incremental or radical innovation?
4. What communication mediums or platforms is PMS used to facilitate exploitation and exploration?