



Driver performance appraisal using GPS terminal measurements: A conceptual framework

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ABSTRACT

Objective measurement for performance appraisal is vital but rarely conducted in a methodologically sound manner. In this paper, we provide a thorough assessment of how objective and fair performance appraisals of drivers can be conducted. Furthermore, a unique conceptual framework is provided for evaluation of safety interventions and operational performance through monitoring quantitative driver performance measures. The conceptual framework makes use of online-measurements obtained from Global Positioning System (GPS) terminals, and the data are evaluated using statistical process control (SPC) tools. SPC tools are useful in comparing individual driver performance to overall performance as well as for identifying time-dependent factors that influence performance. Quantitative performance measures considered in the study include speed violations, vehicle idle duration, and fuel consumption. As an illustration of the concepts and implementation at a logistics firm is provided.

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1. Introduction

Human resources management (HRM) requires performance appraisals in organizations to gain a variety of benefits, such as improving operational performance, creating an opportunity for superior–subordinate communications, making employment decisions, and creating personal development plans (Coens and Jenkins, 2000). Although the aim of performance appraisal systems is to motivate individuals and to drive their behavior towards the objectives of the organization (Khoury and Analoui, 2004; Mondy and Noe, 2005), application of performance appraisal is neither always smooth, nor necessarily always productive. Indeed, performance appraisals can be destructive if the performance appraisal system does not have objective criteria and fair procedures (Coens and Jenkins, 2000). As Banks and Murphy (1985) stated, it is widely believed that performance appraisals are prone to bias, that they do not demonstrate high levels of accuracy, and that they are not readily accepted by users. Consequently, performance appraisal systems have often been linked to increased dissatisfaction, lack of motivation, resistance, and refusal, for both raters and employees (Kammerlind et al., 2004; Silverman and Wexley, 1984). To overcome the potential destructive effects of performance appraisals, the organization should implement fair appraisal procedures that contain objective and measurable performance criteria.

Fairness and objectivity of HRM-related operations have been studied in the justice discipline for more than four decades. Research has demonstrated that perceptions of fairness result in important employee attitudes and behaviors, such as organizational commitment (Folger and Konovsky, 1989), employee turnover (Dailey and Kirk, 1992), and intentional idleness

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and absenteeism (Skarlicki and Folger, 1997). The justice concept is three-fold: distributive, procedural, and interactional justice (Robbins and Judge, 2009). While distributive justice focuses on employee's perceived fairness of the amount and allocation of rewards among individuals, procedural justice refers to the fairness of procedures by which performance is evaluated (Robbins and Judge, 2009). Interactional justice is perceived degree to which one is treated with dignity and respect (Bies, 2001). In this sense, the concept of justice, as perceived by both employees and performance raters, is important in performance appraisal processes. Even when the outcome of the appraisal is fair, procedures used to arrive at those outcomes may be unfair (Erdogan, 2002).

While there has been a growth in the deployment of performance appraisal systems in, objective measurement for performance appraisal is rarely conducted in a methodologically sound manner. In this study, we provide a thorough assessment of how objective and fair appraisals of drivers' performance can be conducted to improve operational performance and safety. Furthermore, a conceptual framework is provided for evaluation of operational performance and safety interventions through monitoring quantitative driver performance measures, which has rarely been achieved. The study is based on measurements provided by GPS data terminals installed on transportation vehicles used by the firm. The paper is organized as follows. Section 2 addresses the importance of drivers' performance appraisal. In Section 3, a conceptual framework for performance and safety appraisal of drivers is presented. Implementation at a logistics firm is discussed in this section to better communicate the analysis suggested. Some implementation issues and future research directions are discussed in Section 4. Finally, conclusions are provided in Section 5.

2. Performance appraisals for drivers

One of the challenges in fleet management is determining the most appropriate driver. Fleet managers generally consider quality characteristics, such as safe and just-in-time transportation, referring to transportation of the right parts at the right time and in the right quantity (Ohno, 1982), and at minimum costs; however, there is a lack of standardized methods to achieve better fleet decisions (see, for example, Dena et al., 2010; Ohno and Mito, 1988). Drivers are one of the most important factors in targeted performance for these quality characteristics. In this regard, drivers' performance appraisal is a sensitive and important topic in fleet management systems.

In practice, many transportation firms assess drivers' performance through mostly subjective performance criteria because of the lack of objective numerical measures. These subjective criteria generally do not utilize information such as how fast drivers drive the vehicle or whether they violated any rules during their delivery. In fact, lack of numerical and measurable data may cause insufficient, ineffective, and unfair performance appraisal for drivers in many transportation firms. In a similar vein, there are limited studies that include fleet driver assessment using numerical data. For instance, Darby et al. (2009) applied online fleet driver assessment to help identify, target and reduce occupational road safety risks. As another example, Newnam and Watson (2011) compared the driving behavior between remunerated and volunteer drivers using a self-reported questionnaire.

A profitable transportation business necessitates better utilization of the fleet as well as qualified drivers. Qualified drivers can be considered to be the ones that are rated as low-risk and better-performing through a performance appraisal system. Consequently, driver performance appraisal systems might consider using speed for risk as well as vehicle idle times and fuel consumption to evaluating driver performance. An effective control of these measures and corresponding corrective actions can increase safety and decrease losses resulting from accidents, fuel consumption, and fines, as well as other potential problems.

3. A framework for driver performance appraisal

In this section, we propose a performance appraisal framework for transportation firms to manage their drivers' operational and safety performance. The framework consists of seven steps, as shown in Fig. 1. Following subsections explain the details of the steps, along with the implementation at a logistics firm.

The proposed framework begins with determining performance appraisal objectives. Varying objectives may end up with different results. As a next step, performance appraisal criteria are determined. Performance appraisal method is selected on the basis of the performance appraisal criteria. In this framework, Statistical Process Control (SPC) is utilized as performance appraisal method. To evaluate the drivers' performance, data are collected through GPS systems and analyzed with SPC tools in detail. Results are used to improve feedback interviews and drivers' performance.

3.1. Determining performance appraisal objectives

Organizations that seek to gain competitive advantage through their employees must be able to manage the behavior and results of all employees (Noe et al., 1996). Through an effective performance appraisal system, companies can benefit from; (a) Developmental uses: e.g., measure performance goals, relocate employees for developmental purposes, identify employees training needs, (b) Administrative uses: determine salary, promotion, retention or termination, layoffs, (c) Organizational maintenance: plan human resources, determine organizational training needs, evaluate goal achievement (see Fisher et al., 2006; Andrés et al., 2010). Bretz et al. (1989) found that over 90% of Fortune 100 firms use performance appraisals for admin-

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