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Analysis of a train-operating company's customer service system during disruptions: Conceptual requirements for gamifying frontline staff development

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A B S T R A C T

This paper provides an account of an action research study into the systemic success factors which help frontline staff react to and recover from a rail service disruption. This study focuses on the effective use of information during a disruption to improve customer service, as this is a priority area for train-operating companies (TOCs) in Great Britain.

A novel type of systems thinking, known as Process-Oriented Holonic (PrOH) Modelling, has been used to investigate and model the 'Passenger Information During Disruption' (PIDD) system.

This paper presents conceptual requirements for a gamified learning environment; it describes 'what', 'how' and 'when' these systemic success factors could be gamified using a popular disruption management reference framework known as the Mitigate, Prepare, React and Recover (MPRR) framework.

This paper will interest managers of and researchers into customer service system disruptions, as well as those wishing to develop new gamified learning environments to improve customer service systems.

1. Background

The number of rail journeys across Great Britain's (GB's) rail network hit a record-breaking 1.65 billion in 2014-15 (Rail Delivery Group, 2015). The network has become increasingly overcrowded and, for decades, has been perceived by its users as lagging behind the performance of those in other leading national economies (DfT, 2004). In light of this and with increasing dissatisfaction by passengers in Great Britain, the GB's Rail Technology Strategy (RTS) stated that the management system for 'Passenger Information During Disruption' (PIDD) had to be significantly improved (RSSB and TSLG, 2012). Similarly, the Passenger Focus 2014 report revealed that three of the top twelve rail passengers' improvement priorities directly related to information use during disruptions: "*train companies [need to] keep passengers informed about delays*" (5th), "*accurate and timelier information [must be] available at stations*" (8th), and "*accurate and timelier information [must be] provided on trains*" (12th) (Passenger Focus, 2014). Disruptions cause the re-planning of services and can last from hours to days (Pender et al., 2012).

On a more positive note, the processes, procedures and information systems for planning tactical or operational services during normal periods of service operation are, on the whole, considered as coping adequately, but, during disruptions, the systems, channels of communication, decision makers and fora for decision-making often become quickly overloaded and currently lack the ability to characterise disruptions accurately enough and reschedule services quickly enough (Narayanaswami and Rangaraj, 2012).

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This is because normal planning systems struggle to react to ever-changing operational characteristics such as the dispatching of trains (Caimi et al., 2012), dynamic movements of trains (Kraseman, 2012), changing network capacity (Luéthi et al., 2007; Törnquist and Persson, 2007), route conflicts (Goverde and Meng, 2011) and other dynamic real-time operating characteristics (Corman et al., 2001; D'Ariano et al., 2008; Diaz et al., 1999; Gatto et al., 2009; Wüst et al., 2008) during the course of a disruption.

To date, research has tended to focus on mathematical optimisation and rescheduling of trains and networks, which usually requires high computational processing power which is difficult to deliver in real-time for use by frontline staff faced with hundreds (or thousands) of frustrated customers. Perhaps this is because deciding on a real-time set of objective criteria for rescheduling is just too difficult to define (Yoko and Norio, 2005) and/or too impractical to implement. In contrast, this research has focused on the immediate interface between frontline staff and customers and the generation of requirements for a heuristic (Espinosa-Aranda and Garcia-Ródenas, 2013; Törnquist, 2007) and game-based experiential learning capability (Deterding et al., 2011) for frontline staff with emphasis on learning rather than on optimisation. Other such non-optimisation approaches have been used to investigate other types of delays in rail also not well suited to mathematical optimisation models (e.g. Harris et al., 2013; Tschirner et al., 2014), but these previous studies do not lay out any requirements for gamifying frontline staff development and customer service improvement, as in this paper.

In contrast, the aim of this action research project was to increase a TOC's customer satisfaction rates whilst simultaneously reducing its operational costs through better use of information during disruptions by frontline staff. To do this, this paper states *what* holistic systemic success factors affect the Passenger Information During Disruption (PIDD) management system (as per Golightly and Dadashi, 2017; Tschirner et al., 2014); it also recommends *how* these may be improved using a gamified learning environment and *when* they should be used within the Mitigate, Prepare, Respond and Recover (MPRR) emergency/disruption response framework (Drabek, 1996; Fischer, 1998). This research particularly focuses on the latter response and recovery phases of MPRR (Espinosa-Aranda and Garcia-Ródenas, 2013) and defines conceptual requirements for a gamifying them in a low-risk learning environment to improve the overall PIDD management system (as per van Lankveld et al., 2017).

This project has been conducted with Chiltern Railways (CR) which operate a mainline passenger service between the West Midlands (Birmingham and its surrounding counties) and London (Marylebone); they run approximately 126,000 services per annum (2% of all GB services) and have higher-than-average passenger satisfaction rates for the sector (ranked 3rd out of 23 GB's TOCs in 2015). Chiltern is part of the Arriva Group owned by Deutsche Bahn. CR aims to improve their customer ranking by making systemic improvements to their people, process and technological resources. This study took place between November 2013 and April 2015. For reference purposes, a map of the CR network is given in Appendix 1 and, due to the high level of rail-specific terminology used in this paper (Golightly and Dadashi, 2017), a glossary is given in Appendix 2.

2. Approach

2.1. Abductive Canonical Action Research (CAR) – an overview

The Canonical Action Research (CAR) ontological process (Susman and Evered, 1978) was followed to ensure that an effective action research project was delivered; to facilitate this, a novel type of Soft Systems Methodology (SSM) (Checkland and Scholes, 1996) was used, known as Process-Oriented Holonic (PrOH) Modelling (Clegg, 2007) (see Section 2.2). The ontological process of Canonical Action Research (CAR) (Susman and Evered, 1978) was suitable for this project as it allows real-world situations to be selected, respective roles to be assigned to people *in situ* (participants) and enquiries about situational conditions (as per Checkland and Scholes, 1996) to be made for retuning elements of the "real world" PIDD management system. Together, this action research team made sense of such situations by referring to the Mitigate, Prepare, React and Recover (MPRR) intellectual framework (see Section 2.3). Checkland has stated that "*there must be an intellectual framework, declared in advance, in which general learning outcomes can be defined. Without such a framework, action research can quickly become indistinguishable from mere action*" (Checkland, 1981, p.400). In this project, PrOH Modelling served as the specific modelling methodology to enquire into and depict the PIDD management system (see Section 2.2) while the MPRR framework served as the declared intellectual reference framework (see Section 2.3).

2.2. PrOH Modelling Methodology

Clegg's PrOH Modelling Methodology (2007) was used to facilitate the canonical action research process. Systemic models, constructed via PrOH Modelling, are considered *holons,* where a holon is a defensible model of a *system under observation*—which has subsystems within it and may also be part of a higher-level system (Edwards, 2005; Koestler, 1967). PrOH modelling, like all SSMs, is built upon action research principles; however, unlike other SSMs, PrOH modelling's novelty lies in the fact that it can explore systemic issues by modelling process-oriented holons, and building sets of holons into holarchies as necessary.

PrOH modelling can also, quite uniquely, be story-boarded to facilitate discussion around complex systemic success factors. As such, PrOH modelling has previously successfully helped organisations form consensus about radical systemic change (Clegg, 2007) and helped overcome aspects of the operations management improvement paradox (Keating et al., 1999). Fig. 1 gives the generic template for a PrOH model on which all PrOH models are based. The initial model for this project was also based on this template and re-iterated after each action research cycle in which disruptive incident types were time-lined and work-shopped using a story-boarded version (a scene-by-scene account) of the latest PrOH model iteration. PrOH models may be thought of as a "mental model" used to explore the PIDD management system as "*operators need clear goals, about what to achieve: mental models are their necessary*