A gamified approach to improving customer service delivery in a train operating company

Richard Orme (r.orme@aston.ac.uk)
Aston University

Ben Clegg (b.t.clegg@aston.ac.uk)
Aston University

Andy Poole
UK Train Operating Company

Andy Yeoman
Focus Games Ltd.

Chris Owen
Aston University

Panagiotis Petridis
Aston University

Pavel Albores
Aston University

Abstract

The management of passenger information during disruptive network incidents is of key importance to the UK rail industry. Such incidents are unpredictable in nature and rely heavily on the knowledge and behaviour of industry staff in order to achieve successful and timely resolution. Educational approaches for staff and process development in such cases are often practice-based as opposed to game-based learning. This paper will report on an industry funded research project which aims to develop a gamified learning capability (e.g. game) to improve the management of Passenger Information During Disruption (PIDD).

Keywords: Gamification, Customer Service, Improvement

Introduction / Management Problem

The rail system in the UK has shown unprecedented growth, with over 20,000 services run every day and 1.7 billion passenger journeys made in 2016/17 which are both set to grow (RSSB, 2017). As such, the rail system is a vital part of the UK economy and heavily relied upon by commuters for travel.

In recent years customer satisfaction rates have been a concern for the UK government and since 2012 the 'Rail Technical Strategy' (RSSB, 2012) has prioritised the management of disruption as a primary area for improvement.

To some extent disruptions to the rail system can be mitigated; however they can be neither accurately predicted nor totally eliminated. Consequently, to limit the impact of disruptions on customers, the effective use of travel information is vital to minimize the effects of disruptions on customers' experiences. Thus '*Passenger Information during Disruption*' (PIDD) is a key issue for the UK rail industry and significantly impacts customer satisfaction. To illustrate the Rail Delivery Group (2016) reported that:

- Only 26% of customers consider PIDD to be well managed
- 77% of customers became aware of disruption at the departure station or during the journey by interacting with customers / Customer Information Systems (CIS)
- 54% of customers believed that disruption was handled fairly poorly or very poorly
- Disruptions resulted in up to 75% of customers feeling frustrated and up to 38% feeling resignation and anger
- Overall the report concludes that information provision is rated poorly and identifies 4 areas in need of most attention
    - Ease of understanding the information provided
    - Relevance of the information provided
    - The delivery style
    - Consistency of the information provided.

Consequently the capabilities of customer-facing and operational staff are considered critical to the timely, accurate, and efficient delivery of information during disruptive incidents.

Appropriateness of Gamified Learning Approach

The recent special issue of *International Journal of Operations and Production Management* (Brandon-Jones et al., (eds.) 2012a) aimed to stimulate the development of more effective and innovative approaches to the teaching of operations management to business students and the wider practice base. Additionally, in fields which focus on application, such as operations management, the contributors question the adequacy of the traditional lecture, and by extension, traditional classroom approaches to teaching. In these fields benefits are not simply from the transfer of knowledge but from its application to the 'real world'. A number of approaches are discussed in practice to teach Operations Management (OM), including conventional lectures, group exercises, experiential teaching methods, business simulations, role plays, live cases and virtual learning environments (Brandon- Jones et al. 2012b). Other recent development in the teaching of OM has been the development of gamified learning approaches, particularly 'experiential learning' and 'co-production of knowledge' (Lewis and Maylor, 2006).

In OM education it is important to not merely acquire technical knowledge, or in real world operations to remember procedures, but to understand the role of OM within the organization. Education should help prepare students for the complex real world business problems that they will face and provide exposure to the multi-criteria decisions that they will have to make. Problem-based learning approaches (e.g. planning and scheduling) have been shown to be successful for these situations where students apply their existing knowledge and find new knowledge in order to solve a given problem; in operations these tend to be process-based problems (Lewis and Maylor, 2006). In situations where there is existing knowledge held within a group of learners,

such as practitioners, social learning theory also suggests that learners can gain knowledge and understanding from other experienced or subject matter experts (Benson et al. 2016).

Often some key issues when applying problem-based learning are the authenticity and representativeness of the tasks and problems being addressed and the associated outcomes being effectively transferred into desirable learning and skills to create positive practical impact (Léger et al., 2012; Costa-Santos et al., 2012). Addressing these issues can make experiential learning more effective and can provide a shared 'concrete experience' Kolb (1984) from which participants can learn. Experiential learning approaches are thus directly relevant to the management of disruptions (i.e. 'the problem') and, the team-based sharing and learning of extensive tacit organizational knowledge through social-based learning (using company staff), can be used to improve effective operations management in times of disruption. Such game approaches can allow more rewarding and memorable learning experiences and facilitate 'play as experimentation' (Haapsalo and Hyvonen, 2001).

The management of disrupted rail operations is characterized by uncertainty regarding the current status and likely outcomes, and the need to balance customer service with operational requirements. Also practice may differ and competing priorities may exist in different functions and geographical regions. These learning approaches would seem particularly relevant to educating staff about the management of PIDD by providing opportunities for learners to practice real world scenarios in a risk free environment, share practice and tacit knowledge, and identify opportunities from improvement and practice that could or should be adopted. This would be difficult to achieve in a traditional classroom approach, which is inherently removed from context, or through 'on-the-job' training during a busy and complex disruption. Problem-based, social-learning and experimentation approaches also provide the opportunity for learners to practice desirable behaviours such as sharing experience and team-work (Miller and Maellaro, 2016; Grasas and Ramalhinho, 2016; Battini, et al. 2009).

Hence the use of a gamified learning approach has the potential to provide an authentic and representative risk free problem based learning environment to engage and educate subject matter experts in the management of PIDD.

The aim of this project was to develop a game-based learning capability that would give participants a greater understanding of PIDD and offer the opportunity for players to share knowledge and develop ideas for the improvement of the management of disruption.

Literature on the development of serious games

Serious games incorporate elements of games in order to achieve specific learning outcomes including the management of crisis situations (Link et al., 2008) which exhibit similar characteristics to rail disruption. Recent studies show that the use of serious games has had positive results in large sample groups (Lameras et al., 2016). Achievement of such learning outcomes are based on the assumption that learning is a constructive process, encompassing collaboration, through which knowledge creation emerges from discussion and negotiation between individuals and groups; as employed in this project.

Although the literature does not provide a definitive theoretical framework for the development of serious games there is plenty of good practice (Gibbs, 1974; Hitchcock, 1988; and Fripp, 1993). Key elements include (Lameras et al., 2016):

- Competition and goals - competing against other players or the game itself to achieve specific goals

- Rules - which define how the game is played
- Choice - players are provided with choices to make
- Challenges - players are provided with problems to solve
- Coaching, debriefing - and feedback: to reinforce learning
- Performance assessment – so players know how they did
- Mechanics: the elements of the game that control gameplay.

We use these elements in our new game ('The Disruption Game') to help staff manage disruptions to rail operations more effectively.

The application of serious games in such scenarios has been shown to improve soft skills, cognitive skills, problem-solving, knowledge acquisition, content understanding, behavioural change, and motivate greater empathy in participants (Connolly et al., 2012; Lavender, 2008). These elements are all desirable in the improvement of PIDD management and it is believed that such an approach will lead to clearer understanding amongst front-line staff and promote greater customer focused behaviours.

The gamified learning capability was developed in collaboration with a UK train operating company (TOC) where it is believed that the gamification of disruption can facilitate risk free review of incidents and experimentation with processes and procedures - resulting in superior learning outcomes when compared to traditional pedagogical methods (Wouters et al., 2013). This paper describes the development of a gamified learning capability to improve the management of PIDD and provides empirical evidence for the development and implementation of such approaches in practice.

Methodology

The development and use of serious games is an emergent discipline that aims to achieve superior learning outcomes by combining learning design with components more usually associated with games (Deterding et al., 2011). There is not a definitive framework which facilitates the development of serious games or the gamification (integration of games elements) of learning designs; however, "*Meaningful gamification is the integration of user-centered game design elements into non-game contexts.*" (Nicholson, 2012). Thus in line with the motivations of this paper, and to provide a preliminary methodology for the development of a serious game, a generic new product development methodology as shown in Figure 1 (Tidd and Bessant, 2013) was modified using the experiences of other educational game developers (Gibbs, 1974; Hitchcock, 1988; and Fripp, 1993) to give a suitable development approach for this project as shown in Figure 2.

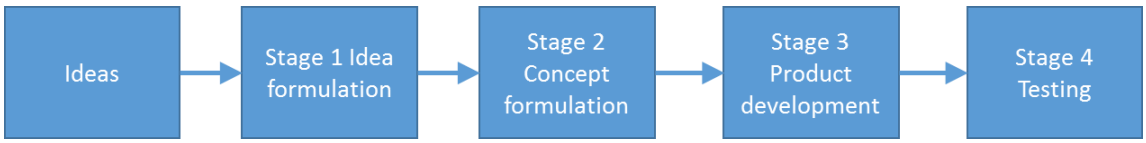

Figure 1: Generic new product development methodology adapted from Tidd and Bessant (2013)

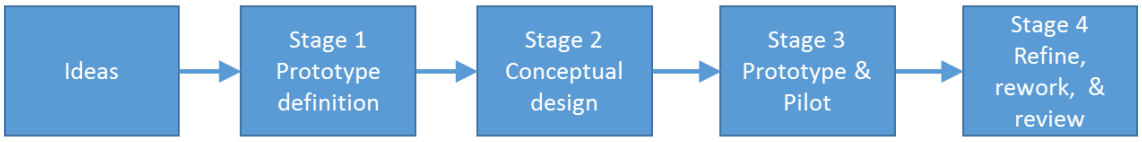

Figure 2: Game development methodology applied in this research

The elements included in each stage of the development were:

- Stage 1: Prototype definition: requirements for the game outcomes were derived from interviews with senior managers and employees involved in the management of PIDD, subsequently a pilot scenario, supporting dataset, and pilot users were identified.
- Stage 2: Conceptual design: specific learning objectives and game dynamics were identified based on best practice derived from the literature.
- Stage 3: Prototype and Pilot: a rapid prototyping approach was taken incorporating data from the pilot scenario and interviews with subject matter experts (SMEs). The game was subsequently tested in workshops with SMEs whose feedback informed design iterations.
- Stage 4: Refine, rework and review: production of the final design and methods of commercialization and implementation in the participating TOC.

Detailed discussion of game development stages

The project team consisted of a collaboration between a UK TOC and academic partners which built on a prior existing research project (Clegg et al., 2016a).

Prototype definition

The purpose of the first stage of the design process was to achieve three primary outcomes; firstly, to identify the requirements of the end-user, the TOC, and more specifically define desired learning outcomes that the serious game should achieve; secondly, a literature review of serious games literature and research of commercially available games to identify serious games that were designed to achieve similar outcomes that could form the basis of the initial designs; and thirdly, the identification and acquisition of organizational data relating to the management of PIDD.

The requirements definition for the serious game was derived from a combination of focus groups and individual interviews with stakeholders at director, management, and supervisory levels within the TOC. Such approaches are appropriate for gaining an in-depth understanding of the opinions of stakeholders and to formulate a representative overview of the requirements for the serious game (Yin, 2009). This stage was key to the user-centred design approach necessary to ensure a meaningful use of gamification (as discussed by Nicholson, 2012).

The outcomes from this stage were data relating to the high-level requirements for the serious game, general themes and learning objectives for inclusion in the serious game and any additional learning capabilities, the identification and acquisition of representative data for the management of PIDD which included records of disruptive incidents and internal processes and industry protocols (Clegg et al., 2016b). Also the pilot users of the game were identified.

Conceptual Design

The high-level requirements identified in Stage 1 formed the basis for the development of the initial conceptual design. In order to facilitate this process a commercial developer of serious games – with 14+ years' experience developing and producing serious games for a range of commercial clients – was contracted into the design team. This resulted in three perspectives, pedagogical (the university), user (the TOC), and professional developer (the games company). The design team developed, and iteratively refined, the requirements for the game into specific learning objectives which were subsequently validated by the Learning and Development Manager of the end-user TOC.

At this point the initial possibilities for game designs were able to be considered; this focused firstly on *mechanisms* by which the participants were going to learn from the game. Given the nature of the PIDD scenario and the knowledge within the player cohort it was decided that much benefit could be gained from sharing existing tacit knowledge and risk free discussion of PIDD scenarios. Subsequently an initial concept was defined consisting of:

- Identification of a specific, representative and frequently occurring PIDD scenario
- Need for a game board and mechanisms capable of realistically representing the chosen scenario
- Need for further interviews with supervisory management, social media teams, customer service staff, and front-line staff at the TOC to gain more detailed insights into the interaction, local occurrences and characteristic of PIDD scenarios
- The development of questions to prompt discussion that was relevant to the learning objectives identified
- Identification and recruitment of a facilitator to manage the game
- An iterative process of design and testing through a series of 3 'dry-runs' of the game with the project team and subject matter experts to establish game playability and potential to stimulate desirable discussion.

This process concluded with an initial prototype design that had been validated by subject matter experts at the end-user TOC, including the Head of Customer Service Quality, and the Learning and Development Manager. Furthermore the game concept was reviewed and approved by members of the Rail Safety and Standards Board (RSSB), the co-funder of the research, who are experts in rail industry training.

Prototype and Pilot

Stage 3 began by playing the game with a selection of front-line (customer facing) staff from the TOC. The purpose of the game was explained to the participants followed by the 'live' playing of the game and workshop. On completion the players and facilitator were invited to provide feedback, using a questionnaire, to establish learning outcomes and potential improvements that were considered as part of the iterative design process. Additionally, game workshops were observed by non-participant members of the project team who noted the effectiveness of the game and areas for improvement.

This approach was consistent with the notion of user-centred design approach (Nicholson, 2012), and attempted to make the structure and development of the game transparent and facilitate honest reviews to ensure that meaningful gamification was achieved. Thus each prototype session attempted to assess whether the design would benefit users' learning experience and result in a positive change in users' mind-sets. Four such workshops were run, approximately every 2 weeks, with the design being iterated between each as in 'experience prototyping' and 'collaborative prototyping' (Buchenau and Suri, 2000; Bogers and Horst, 2014; Thomke, 1998). Each cycle consisted of learning from the previous cycle to conceive design improvements, the subsequent building of a new prototype for testing, the testing of the new design with the user group and the collection of data by questionnaire and observation.

The outcome of this stage was a finalized game design and workshop design that had been validated through testing with the end-user group.

Refine, Rework, and Review

Stage 4 involved four additional 'live' running of the game workshop with continued non-participant observation by members of the project team. In parallel processes were developed to integrate the game outcomes (learning and improvement suggestions) into the current processes within the TOC. Finally promotional activities were undertaken including presentations of the game workshop and preliminary results to the Board of Directors at the TOC, the Customer Experience Improvement Board at the TOC's parent company, and the co-funders – the RSSB.

Findings

As detailed in this paper the initial results suggest that iterative design processes are good for serious game development, as is the inclusion of subject matter experts, and it is important to properly develop end-user requirements prior to the design process. In addition it is beneficial to include experiential prototyping as part of the process and include as many users' perspectives as possible in order to develop effective solutions.

In total the 7 workshops elicited approximately 150 individual improvement ideas. A few examples are given in Table 1 where ideas are classified into people, process and technology categories for the individual and wider systemic impact.

Table 1: Example improvement ideas derived from game workshop

<table>
<tr><th></th><th>Individual</th><th>Systemic</th></tr>
<tr><td rowspan="2">People</td><td>Be more focused on what the customer is asking or saying in the future</td><td>The service windows should be closed during disruption to enable more face-to-face contact with customers</td></tr>
<tr><td>Try to think more about the correct procedure rather than acting on instinct</td><td>A video of control during disruption should be used in training to help staff understand what is involved</td></tr>
<tr><td rowspan="2">Process</td><td>There should be a formal process for submitting feedback after a disruption to help improvement</td><td>There should be a process to ensure that feedback after disruption is constructive and in particular highlights positive elements and helps understand what decisions were made and why</td></tr>
<tr><td>There should be more empowerment in control to challenge disruption resolution estimates from Network Rail</td><td>'Hub' stations should be the point of contact for staff during disruption – communication with control should be via the hub stations to help reduce 'double-handling' and mixed messages</td></tr>
<tr><td rowspan="2">Technology</td><td rowspan="2">Service information controllers cannot answer emails during disruption - because of time pressure a better method of communication should be developed</td><td>TIMIS app should be made available on smartphone or tablet to provide real time information on the status of the service.</td></tr>
<tr><td>There should be an open Skype channel to control during disruption</td></tr>
</table>

The game workshop was well received by the participants, who believed it was a valuable approach that improved their ability to manage PIDD, and which provided them with a greater understanding of the operational management of the railway network and the decision making processes in other geographical regions and departments.

Feedback from users was captured and comments such as those given below were captured:

- *"I think it is a really useful tool"*
- *"You learn so much from each other's experiences"*
- *"It makes you feel far more confident"*
- *"It is interesting to hear other people's views"*
- *"We worked really well as a team and it is good to feel we did our best".*

Users were also given feedback questionnaires to rate the game. Players were asked to rate whether they *agreed* with 8 statements about the game (e.g. '*The game realistically represents the range of choices characteristic of disruption', 'The coaching, debriefing, and feedback improves understanding of the management of PIDD"*). An average response of 4.3 was reported (using a range of 1 - 5 on a Likert scale where 1= 'strongly disagree' to 5 = 'strongly agree') suggesting that across the sample all aspects of the learning outcomes were perceived as being mostly achieved.

Similarly participants were asked to rate the *importance* of each statement, with an average response of 4.5, range 1-5, where 1 = 'not important' to 5 = 'very important' suggesting that nearly all statements about game features were considered to be important.

Initial observations of the 'live' game workshops, by the project team and members of the Learning and Development department at the participating TOC, found that the workshop and the players exhibited a number of positive attributes. Firstly, the players were able to quickly understand the structure of the game and, as the game progressed, increasingly managed the gameplay themselves allowing the facilitator to concentrate on observing player interactions and reinforce specific learning points. Secondly, there was significant and spontaneous knowledge sharing, including specific elements of practice, third party technology – apps – and explanations of the decision-making processes involved in different roles within the organization and player cohorts. This provisionally suggests that players found the opportunity to discuss and work together to 'experience' disruptive incidents - a worthwhile activity from which they could derive individual benefit. Thirdly, players increasingly considered the effect of the disruption on the customer, in addition to operational aspects, and focused on how the customer would be feeling and what they could do to minimize the impact of the situation on their journey. Fourthly, the players demonstrated desirable behaviour such as teamwork and showed improvement in addressing customer problems as the workshop progressed. Finally, the workshops identified a number of areas for the improvement of the management of PIDD, both directly, as a result of eliciting improvement ideas from players, and indirectly as identified by the facilitator where players were unclear on particular processes or levels of empowerment required to manage particular situations.

These findings would support the use of a problem-based learning approach and the benefits of social learning through a serious game as envisaged in this project's aims.

Relevance / Contribution

Gamification is still an emerging field. This paper contributes to theory by building upon existing game approaches and outlines a successful approach for user-centred game development. The research is highly valuable as the gamified learning capability was developed in conjunction with and evaluated by subject matter experts in the subject area.

The development and testing of this serious game also has significant potential impact for the management of disruption, both within the rail industry and wider transport systems. Game workshops have been observed to increase the systemic

understanding of the wider rail network, beyond the direct experience of players, and develop an increased focus on customers and the impact that disruptions may have on their journeys. In particular the elicited improvement ideas (see Table 1) have the potential for application not only in the participating TOC but in the wider transport service industries (e.g. air, tram and bus) with minimal modification.

Limitations

The research is based on an individual company case but could be generalized to other UK TOCs that operate in similar contexts. However presently there are no other comparative control studies to compare or contrast it to.

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Future

The game should be applied to other contexts to test the game's effectiveness beyond the development organization and a controlled experiment should be made using other learning methods to test its effectiveness.

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