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Gamification of warehousing: exploring perspectives of warehouse managers in the UK

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ABSTRACT

Contemporary warehouses are key links in the supply chains in competitive global business environments and with rapidly evolving trends in technology they need to adapt to the evolving needs of customers. Gamification recently emerged as a potential means of improving employee engagement leading to increased operational efficiency. This article therefore explores the perspectives of warehouse managers in the UK on gamification of warehousing activities. The findings suggest that gamification is applicable in the warehousing context with potential benefits such as improved worker engagement, increased morale and productivity, enforced competition, increased accuracy, and skills development. However, there are also significant barriers to effective implementation – these include resource constraints, gamification efficacy over time, ethical considerations, and ensuring fairness for all players. The findings from this study provide some valuable insights, thereby providing a rational basis for potentially fruitful future research in this area of growing interest.

1. Introduction

Contemporary warehouses are key links in the supply chains in competitive global business environments. In this context, there is a need for continuous improvement in all aspects of warehouse efficiency and productivity (Richards 2011). Rapidly evolving trends in warehousing and distribution processes and technology need to adapt to the evolving needs of customers with a view to delivering world-class, error-free levels of service (Frazelle 2002). According to Keller and Keller (2014), any warehouse is only as good as its personnel and warehouse managers need to carefully consider the many factors that have the potential to increase employee motivation.

Gamification can be defined as 'the presence or addition of game-like characteristics in anything that has not been traditionally considered a game' (Harris and O'Gorman 2014, 8). It has recently emerged as a potential means of improving employee engagement as part of the warehouse re-design and improvement process (Korn and Schmidt 2015). The exploratory research described in this paper aims to explore the perspectives of warehouse managers on gamification of warehousing activities and to compare practitioner perspectives with the body of academic knowledge.

Following this introduction, the authors' literature review first provides an overview of relevant extant literature on gamification in a logistics and supply chain management (LSCM) context before focussing on the major challenges facing warehouse managers and some of the motivational techniques

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used to stimulate productivity improvements. The potential benefits, challenges and applications of gamification are then discussed. This provides the basis for the rationale of the current study – this is explained and the authors' specific objectives are set out. The methodology employed to address these objectives is described in Section 3. The authors discuss the key results and findings from the research in Section 4 before highlighting some of the main limitations and contributions of the paper in Section 5. Section 6 highlights some key messages from the research by way of conclusion.

2. Literature review

A review of the relevant extant literature was carried out with a particular focus on gamification in a LSCM context. The review process and keyword selection was informed by the recent literature review on gamification by Warmelink et al. (2020). It uses several keywords – 'gamification', 'logistics', 'supply chain' and 'warehouse/warehousing' – to search the SCOPUS database. The SCOPUS database was selected for its quality standards, broad coverage of academic literature including leading LSCM journals and an ease of constructing search queries. The literature review process described in Section 2.1 demonstrates that a quite limited number of articles exist on the specific theme of this study. Therefore subsequent discussions are aided by the body of knowledge sourced from Google Scholar and Web of Science (Harzing and Alakangas 2016), with Section 2.2 focusing on warehousing challenges and motivational techniques used to encourage productivity, then Section 2.3 discusses gamification benefits and challenges. The potential application of gamification in warehousing and the wider LSCM context is discussed in Section 2.4, leading to the development of our research objectives and questions.

2.1. Literature review process

In order to understand and review literature on the topic of gamification within a LSCM context, a database search query was constructed by modifying and extending a set of keywords found in Warmelink et al. (2020). These keywords are 'gamif*', 'logistic*', 'supply chain' and 'warehous*' with an asterisk denoting a wildcard search (for example, gamification and gamify or warehouse and warehousing). For the sake of limiting findings only to peer reviewed journals and conference papers in the English language, search query limitations were added. Keywords and database respective queries and search limitations are presented in Table 1.

The literature selection process utilised the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses, Moher et al. 2009) four-tiered approach: identification, screening, eligibility and inclusion. A search in the SCOPUS database identified 49 articles matching the queries. During the screening two duplicates were removed with the remaining 47 articles then screened initially based on titles and abstracts, and subsequently on their full text using the eligibility criteria set out in Section 2.1.1. In order to guard against potential study selection bias in screening and eligibility assessment, the process was modelled after the practice outlined by Lim, Bahr, and Leung (2013), whereby the two authors independently evaluated the articles and reconciled any

Table 1. Keywords and database search queries and limitations.

Keywords	Database search query	Limitations
Logistic*	TITLE-ABS-KEY (gamif*) AND TITLE-ABS-KEY (logistic*) AND (LIMIT-TO (DOCTYPE, 'cp)' OR LIMIT-TO (DOCTYPE, 'ar)') AND (LIMIT-TO (LANGUAGE, 'English)')	Articles: peer reviewed journal and conference papers Language: English
Supply chain	TITLE-ABS-KEY (gamif*) AND TITLE-ABS-KEY ('supply chain') AND (LIMIT-TO (DOCTYPE, 'cp)' OR LIMIT-TO (DOCTYPE, 'ar)') AND (LIMIT-TO (LANGUAGE, 'English)')	
Warehous*	TITLE-ABS-KEY (gamif*) AND TITLE-ABS-KEY (warehous*) AND (LIMIT-TO (DOCTYPE, 'cp)' OR LIMIT-TO (DOCTYPE, 'ar)') AND (LIMIT-TO (LANGUAGE, 'English)')	

disagreements through debate and discussion until a consensus was reached. The literature selection process is shown in the PRISMA flow diagram in Figure 1.

2.1.1. Inclusion and exclusion criteria

The authors used a number of criteria to assess the eligibility of papers for inclusion. First, only peer-reviewed academic papers published in a journal or conference proceedings and written in English were considered. This criterion was achieved by using SCOPUS database limiters (DOC-TYPE, LANGUAGE). Second, included articles had to be closely aligned with the topic of the study. Articles that did contain relevant keywords but did not pertain to the main topic of this study were excluded (some had a focus on, for example, the use of games in LSCM education). Third, the authors assessed the remaining papers for their quality using a checklist developed by Kmet, Lee, and Cook (2004). They also investigated the reputability of conferences as four out of five shortlisted articles were published in proceedings. Shortlisted articles included in this paper are enumerated in Table 2.

Table 2 shows that only five articles were found to match the specific theme of this study and these form the basis of Section 2.4. Sections 2.2 and 2.3 provide context for this by introducing warehousing and gamification themes that are particularly relevant in the context of the current study's focus.

2.2. Warehousing

Warehouses are considered a key part of the supply chain (Gu, Goetschalckx, and McGinnis 2007) and operations within warehouses are concerned with the efficient and effective flow of materials.
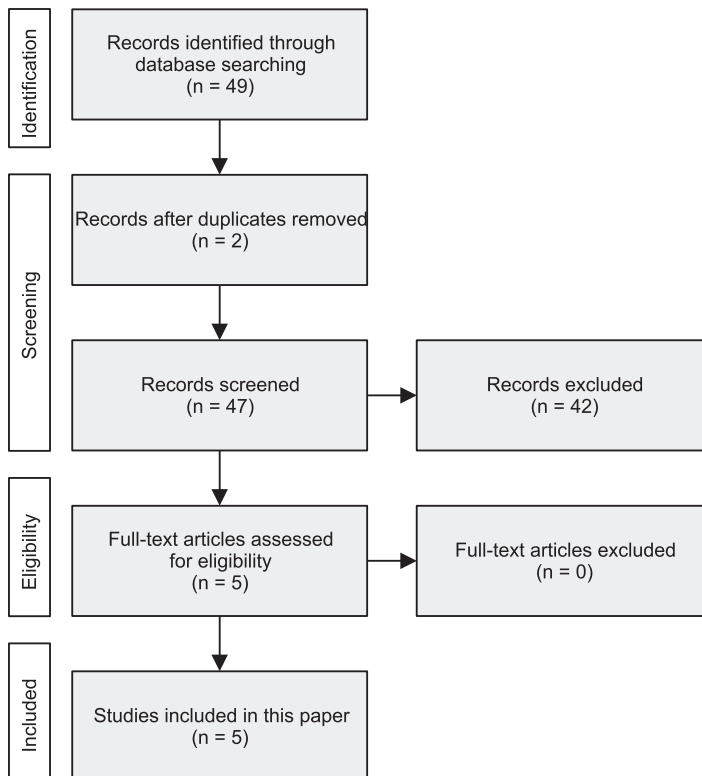

Figure 1. Literature selection process.

Table 2. Shortlisted articles.

Reference	Title
Warmelink et al. (2020)	Gamification of production and logistics operations: Status quo and future directions
Putz, Hofbauer, and Mates 2019	A vignette study among order pickers about the acceptance of gamification
Bräuer and Mazarakis (2019)	Badges or a leaderboard? How to gamify an augmented reality warehouse setting
Teras et al. (2016)	NDiVE: Gamified virtual reality environment for logistics and supply chain management training
Remi-Omosowon, Cant, and Langensiepen (2016)	Applying gamification principles to a container loading system in a warehouse environment

The specific core activities are: receiving, put-away, storage, order picking, and dispatching/shipping. Among these activities, order picking is the most labour-intensive and costly process at approximately 60% of total labour activities (Drury 1988; Gamberini et al. 2012) and constitutes approximately 55% of the total operating expenses (Roodbergen 2001; Frazelle 2002; Richards 2011). Warehouse managers are under constant pressure to: minimise cost and time, reduce spoilage and increase efficiency (see, for example: Frazelle 2002); consider environmental impact (see, for example: McKinnon et al. 2015; Fichtinger et al. 2015; Ries, Grosse, and Fichtinger 2017; Konur, Campbell, and Monfared 2017);manage warehouse space and layout (see, for example: Vrysagotis and Kontis 2011; Cheung et al. 2009; Zupan, Debevec, and Herakovic 2017);meet customer expectations (see, for example: Madurapperuma, Ebert, and Kuruppuarachchi 2018);and, efficiently manage warehouse personnel (see, for example: Keller and Keller 2014; Kim, Dekker, and Heij 2018).

According to Keller and Keller (2014), the warehouse is only as good as its personnel and warehouse managers need to consider factors affecting employees' motivation: achievement, recognition, growth, payment, feedback, rewards, and empowerment (Emmett 2005; Tella, Ayeni, and Popoola 2007; Kamalian, Yaghoubi, and Moloudi 2010; Manzoor 2011; Capobianco 2014). Increased motivation can improve performance and more recently gamification emerged as a potentially new way to improve morale and engagement.

2.3. Gamification

As noted in the introduction, gamification can be defined as 'the presence or addition of game-like characteristics in anything that has not been traditionally considered a game' (Harris and O'Gorman 2014, 8). 'Use of game design elements in a non-game context' (Deterding et al. 2011, 9) improves productivity and performance by way of provoking basic human desires (see, for example: Burke 2014; de-Marcos et al. 2014; Hamari 2013; Papastergiou 2009).

Typical elements of a gamified activity include (Dale 2014; Korn and Schmidt 2015; Kapp 2012; Zichermann and Cunningham 2011; Cardador, Northcraft, and Whicker 2017):

- Points – distributed to players for high-value achievements or behaviours;
- Achievements – provide satisfaction for high-value user behaviour;
- Levels – highlight the level of engagement of each player and reinforce them for new challenges;
- Missions – are sets of behaviours which enable players to get specific rewards;
- Contests – specific rewards for players who finish effectively and quickly;
- Leader board – increase competition by posting rankings; and,
- Notifications – encourage players towards the desired action.

Gamification of business activities has a potentially positive impact on employees for a variety of reasons. These include, but are not limited to improved engagement, increased morale, faster learning and skills development, increased productivity, competition, and performance tracking (Narayanan 2014; Dale 2014; Marczewski 2013; Burke 2014). By providing levels, badges or other

types of rewards and gaming elements, companies can actuate the employees' interest and engage them on a more personal level (Warnlof 2014).

There are also a number of challenges facing gamification. Firstly, the effective implementation of gamification is a quite complicated business process. It requires detailed planning, thereby consuming not insignificant amounts of time and other resources (Harris and O'Gorman 2014). Furthermore, the fact that individual players vary from each other in many ways challenges designers to develop a good understanding of that variability (Robson et al. 2015). For example, some players may be more interested in the social aspect of the gamified experience in order to learn more and interact with others, while others may be more competitive and thinking more about personal growth and achievement. As people differ from each other designers need to consider behavioural characteristics as an integral part of developing the mechanics of gamified processes (Werbach and Hunter 2015). Some studies also indicate that gamification may not keep players motivated for a long time (Farzan et al. 2008; Hamari 2013). This sometimes requires that the mechanism of the gamified experience be regularly changed in an effort to keep players motivated. Lastly, creating a competitive environment to increase engagement and motivation has some ethical implications as cheating in various guises can sometimes emerge (Jiang 2011; Eyal 2014).

2.4 Applications of gamification in warehousing and LSCM

While gamification has been successfully implemented in jobs that are primarily office-based (for example: Freshdesk (Robson et al. 2016); DevHub (Kuo 2015; Dale 2014); Microsoft (Narayanan 2014; Smith, Bean, and Moeur 2015); and, Deloitte (Dale 2014; Meister 2013)), there appears to have been very few attempts to implement gamification within the warehousing and broader LSCM context. Putz, Hofbauer, and Mates 2019 conducted a vignette study among warehouse order pickers about acceptance of gamification and concluded that it may be a suitable approach to increase motivation and performance. However, experiments with gamification badges and leader boards in a warehouse setting indicated that while there are benefits to be gained, the competitive game design elements can have unintended negative side effects such as a feeling of incompetence among workers and associated decreases in motivation (Bräuer and Mazarakis 2019). Two relatively recent studies suggest that gamification may be successfully used in various aspects of logistics workforce training. Teras et al. (2016) reported on successful training with gamified virtual reality (VR) scenarios for logistics staff, while Remi-Omosowon, Cant, and Langensiepen (2016) applied gamification to training in container loading problems which empowered warehouse operatives to use optimal methods of loading without resorting to complicated optimisation algorithms. Lastly, Warmelink et al. (2020) reviewed extant literature on a broad theme of gamification in logistics and production operations concluding that it can have a significant impact on workflow and operational strategies, encouraging researchers to develop this emerging field of study. Thus, Warmelink et al. (2020) echoed a statement from warehouse consultants Manhattan Associates that 'we are still in the early stages of seeing gamification elements [embedded] in labour management systems, but it holds great promise as a tool to help revolutionise the warehouse workforce' (Schnorbach 2015). As such, this indicates a gap within the current body of knowledge. It is this gap that the current work aims to begin to fill.

The literature review indicates the potential importance of undertaking some research aimed at generating deeper and richer insights into the practitioner perspectives on gamification of warehousing activities. Based on the above the specific objectives of this exploratory research study are to explore perspectives of warehouse managers on gamification of warehousing activities and to compare practitioner perspectives with the body of academic knowledge. The research questions (RQs) are set out as follows:

- RQ1: What is the applicability of gamification in warehousing?
- RQ2: What are the main potential benefits of gamification in warehousing?

- RQ3: What are the main potential obstacles to applying gamification in warehousing?

The nature of these RQs means that it is probably impossible to provide definitive responses to them. Their main role is, therefore, to ensure that the key issues identified in the literature review are addressed in a logical and systematic way.

3. Research design

The authors developed a research design aimed at generating the required insights into their RQs. Section 3.1 outlines the key elements of the author's overall research strategy Section 3.2 then describes how the required qualitative data will be collected with Section 3.3 then highlighting some of the key analytical considerations.

3.1 Overall research strategy

As noted above, the purpose of this article is to gain deeper and richer insights into the practitioner perspectives on gamification of warehousing activities. As indicated by the literature review, the relative scarcity of work in this specific area means that the current study is primarily exploratory in nature. By employing a pragmatic philosophical approach and mainly inductive approach, the authors plan to contribute to conceptual understanding of the role of gamification in warehousing rather than making claims to empirical generalisability (Croom, Romano, and Giannakis 2000). To generate the required insights, the authors conducted interviews with warehouse managers working in the UK. In essence, this approach adopts the lesson of Geertz (1973, 5) who stated that 'if you want to understand what a science is, you should look in the first instance not at its theories or its findings … you should look at what the practitioners do'.

3.2 Data collection

The author's data collection used focussed (i.e. semi-structured) interviews. Semi-structured interviews lend itself well to 'examining [an] uncharted territory with unknown but potential momentous issues' and give a chance to the 'interviewers to spot useful leads and pursue them' (Adams 2015). The interview sample comprised eight warehousing managers with at least four years relevant working experience. The UK is a suitable context for this research given its importance in the wider European and international logistics landscape and its relatively highly developed logistics infrastructure as indicated in the World Bank Logistics Performance Index (Arvis et al. 2016). The relatively small sample of interview respondents mirrors data collection guides of other studies where insights from a pool of experienced practitioners were sought (see, for example: Lummus, Krumwiede, and Vokurka 2001 who used six). Table 3 presents some of the interviewees' characteristics.

Table 3. Interviewees' characteristics.

Code	Position	Years of experience	Goods/services orientation	Company presence
WM1	Warehouse Manager	4 years	Warehouse solutions	UK
WM2	Warehouse Manager	13 years	Consumer goods	Global
WM3	Warehouse and Logistics Manager	24 years	Grocery stores	UK
WM4	Warehouse and Logistics Manager	13 years	Manufacturing and production solutions	UK
WM5	Warehouse Manager	12 years	Logistics services	Global
WM6	Warehouse Manager	27 years	Consumer goods	Global
WM7	Warehouse Manager	13 years	Furniture	UK
WM8	Head of Logistics	10 years	Consumer goods	Global

This sample of companies handles a wide variety of product groups thus enabling the authors to generate a breadth of perspectives. Individual respondents were in senior positions with responsibilities for warehouse management. Each person was sent information about the authors' RQs as an indication of topics to be discussed during their upcoming interviews. The research then involved carrying out focussed (i.e. semi-structured) interviews with each respondent. The core of each interview was built around the RQs. Interviews were recorded and transcribed.

3.3 Data analysis

Easterby-Smith, Thorpe, and Jackson (2008) describe two approaches to analysis of interview data: content analysis and grounded analysis. The data analysis process in this work involves a combination of both methods. The transcript analysis used by the authors is shown in Figure 2 and involved four main stages in distilling the raw transcript data into information that was analysed based on comparing and contrasting the main issues set out by respondents. This comparing and contrasting essentially involves the identification of both points of convergence and divergence among the responses provided.

4. Findings and discussion

As noted above, the authors three research questions (RQs) were developed primarily to ensure that all facets of interest were addressed. The following sections highlight the main issues that emerged from the eight interviews in relation to each RQ. In each case, the empirical findings from the interviews are related back to the relevant issues from the extant literature.

4.1 RQ1: applicability of gamification in warehousing

RQ1 asks about the applicability of gamification in warehousing. In this context, the majority of warehouse managers support a view that order-picking is the most labour-intensive and costly activity (WM2, WM3, WM4, WM6, WM7 and WM8), which is in line with academic literature (see, for example: Frazelle 2002; Coyle, Bardi, and Langley 2002; Tompkins et al. 2010; Richards 2011; Van Den Berg 2012; Gamberini et al. 2012). However, WM1 pointed out that quality control is the most labour-intensive and costly activity in his business, as a bad quality product can lead to dissatisfied customers and negative reviews being disseminated online. Furthermore, for WM5 it is the training of employees that is most costly and labour intensive due to high forklift and crane training costs, and the required health and safety precautions during the training sessions. The most monotonous and boring warehouse activities for personnel were order-picking (according to WM2, WM3, WM4, WM5 and WM8), loading of trucks (WM7), crane driving (WM6) and quality control (WM1). In these activities workers usually perform the same movements and tasks with little variety, with attendant declines in work performance is directly linked to motivation levels (Emmett 2005). All managers indicated that money and rewards were crucial motivational factors for their employees (Tella, Ayeni, and Popoola 2007). As such, all interviewees highlighted that those warehousing activities often considered mundane would be applicable for gamification.
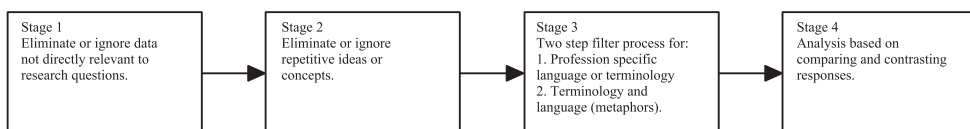

Figure 2. Transcript analysis process.

Gamification can increase employees' productivity, engagement and morale (Narayanan 2014; Dale 2014; Marczewski 2013; Burke 2014) and this was the perception of the majority of interviewees (WM1,, WM3, WM4, WM5 and WM8). WM5 and WM7 stated that gamification may be a way to develop 'a fun environment' which will boost employee morale and create a healthy competitive environment (WM1, WM2, and WM8). WM5 even speculated that having better motivated and more engaged employees can increase the quality of any given task. However, WM6 warned that workers would not like to be ranked and identified on a leader board, as he has tried a similar tactic in the past and workers protested against it, which corroborates the findings of Robson et al. (2015) and Bräuer and Mazarakis (2019). While all respondents agreed that gamification may be applicable to warehousing environments, they were generally cautious about potential benefits (RQ2) and envisaged several implementation obstacles (RQ3).

4.2 RQ2: gamification benefits

RQ2 asks about the main potential benefits of gamification in warehousing. Gamification benefits that can potentially be achieved in business environments in general include increased employee productivity, increased engagement and morale, competitive environment, easier performance tracking, better feedback, skills development and employee learning (Narayanan 2014; Dale 2014; Marczewski 2013; Burke 2014). Interview data from warehouse managers corroborated these potential general benefits in warehousing environments specifically, as well as suggesting some additional more specific benefits. Interviewees suggested that the main potential benefits of gamification will be in increased productivity and morale (WM1, WM3, WM4, WM5 and WM8). Furthermore, the development of 'a fun environment' to work in (WM5 and WM7) and a healthy level of competition between employees (WM1, WM2 and WM8) were highlighted as the factors that could lead to achieving these benefits. Interestingly, the majority of interviewees were much more interested in discussing potential obstacles (RQ3).

4.3 RQ3: gamification obstacles

Gamification literature enumerates a number of challenges and obstacles such as tolerance with time, ethical implications, resources and differentiation of players (Harris and O'Gorman 2014; Robson et al. 2015; Werbach and Hunter 2015; Farzan et al. 2008; Hamari 2013; Jiang 2011; Eyal 2014) and interviewed warehouse manager also shared these concerns. It also confirmed that these general concerns are widely shared in warehousing environments, interviewees raised a number of other issues.

WM1, WM2 and WM7 stated that strict budget limitations will certainly be difficult to overcome. A successful gamification needs intensive planning, time and resources to be well designed and implemented (Harris and O'Gorman 2014) and managers predicted that implementing it will not be a priority within their financial constraints.

Another obstacle mentioned by WM1, WM2 and WM8 is the sustainability of gamification over time. This relates to the concern that as employees/players fulfil their personal satisfaction needs their incentive levels simultaneously reduce, thereby lessening its impact and attendant ability to motivate staff. This view corroborates with existing literature which suggests that gamification may not keep players motivated for long periods (Farzan et al. 2008; Hamari 2013).

Ethical issues surrounding gamification appear to represent a serious challenge to its application in warehousing. WM1, WM2, WM3 and WM5 noted a number of ethical concerns related to employee behaviour. These included, but are not limited to: cheating, neglecting health and safety procedures, extreme risk-taking and other unethical actions aimed at taking individuals quickly to the top of a leader board. Issues of bluffing and cheating, which may occur when gamification is applied within a business context were highlighted by Jiang (2011) and Eyal (2014). In this context, WM1 mentioned that gamification systems must be fair for all employees. For instance, in order

picking, pickers should have the same routes to traverse at the same level of difficulty and, the words of WM1, 'it is not fair if one picker picks only heavy items at the back of the warehouse and the other only picks small items on the eye level racks at the front of the warehouse'.

Interestingly, WM3 stated that while gamification can 'positively affect the social life of workers while they feel that being valued for what they offer to the warehouse' it can also have a negative effect on underperforming workers. As such, it was suggested that any gamification system should be designed in a way that takes employee well-being and mental health into an account. This is in line with the work of Johnson et al.(2016) and also corroborates the findings of Bräuer and Mazarakis (2019). This suggests that that the competitive game design elements potentially have negative side effects such as a feeling of incompetence among workers and an attendant decrease in motivation.

Finally, all interviewees indicated that while gamification may be achievable at state-of-the-art warehouses with very good IT systems it will not be suitable for low-tech operations, which hints at a digital divide between large operators and their small and medium enterprise (SME) peers in the logistics sector (see, for example: Evangelista, McKinnon, and Sweeney 2013).

5. Research limitations and future work

Reflection on the validity and reliability of this research facilitates a clearer understanding of the main limitations of this exploratory study. This reflection was carried out through the lens of the four qualitative criteria recommended by Lincoln and Guba (1985) – credibility, transferability, dependability and confirmability.

The credibility criterion involves confirming that the results of qualitative research are credible from the perspective of the participants in the research. Whilst there is room for improvement in this area in the research described in this paper, one of its strengths is that in-depth discussions with key informants facilitates the development of fresh insights that reflect very accurately the issues being faced by practitioners. This was supported by inviting interviewees to comment on summaries of the research findings.

The small sample used in the current research is not intended to be definitive and transferability or generalisability is impossible, but in the exploratory context of this paper a small sample size rather than being a detriment achieves 'a close association with the respondents, and enhances the validity of fine-grained, in-depth inquiry' (Crouch and McKenzie 2006, 483). Use of the focussed interview methodology enabled some potentially useful contributions to be developed inductively. The process of directly relating the empirical findings from the interviews back to the relevant extant literature helped in this regard. The next stage of the work is to build directly on our initial findings through empirically testing using a larger survey of warehouse managers. This will facilitate the development of more generalisable insights, thereby building directly on the contribution of this exploratory study.

Dependability in qualitative research emphasises the need for researchers to account for the changing contexts within which research occurs. In this regard, the authors ensured that the complete empirical research process was comprehensively documented – from initial design through to analysis and feedback. This facilitates replication of the study in other contexts. From a LSCM perspective, it would be interesting to generate insights from other parts of the supply chain – i.e. procurement, manufacturing, transportation and retail. The current study was restricted to the UK for the reasons explained earlier. Another potentially fruitful avenue would involve the implementation of the current methodology in different geographical contexts. Given the importance of behavioural and other culture-related variables, such international data collection and analysis offers the opportunity to explore gamification applicability at the national/local nodes of increasingly international/ global supply chain configurations.

Confirmability refers to the extent to which the results could be confirmed by others. Future work should build on the findings of this research using a combined inductive/deductive approach

based on methodological triangulation. This builds on the larger scale surveys of warehouse managers referred to earlier by incorporating focus groups, case studies, action research and other appropriate elements into an overall integrated research design. The implementation of a methodologically pluralist design that uses mixed methods and data collection and analysis is the key to taking the current exploratory study forward.

Furthermore, the authors recognise a limitation of using solely SCOPUS database for their literature search. Future work on this topic would benefit by following the broadly recognised practice of using multiple databases for conducting systematic literature reviews (see, for example: Lim, Bahr, and Leung 2013; Bramer et al. 2017).

6. Conclusions

The first objective of the research described in this paper was to explore perspectives and gain insights on gamification of warehousing activities, with the focus on its applicability, potential benefits and obstacles. To this end, the views of warehouse managers have been solicited through a series of focussed interviews. The findings suggest that gamification is applicable in the warehousing context with potential benefits such as improved worker engagement, increased morale and productivity, enforced competition, increased accuracy, and skills development. However, there are also significant barriers to effective implementation – these include resource constraints, gamification efficacy over time, the need for careful and detailed planning, ethical considerations, and ensuring fairness for all players. The findings from the current study provide some valuable insights, thereby providing a rational basis for potentially fruitful future research in this area of growing interest.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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