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# Train-for-life (T4L): an interactive learning platform for logistics, safety and security professionals

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## Abstract

The ageing workforce and the changing nature of jobs make it critical for education providers to include life-long learning skills and training provisions for adult learners already in the workforce. Learning a topic online via Massive Open Online Courses (MOOCs) has gained a lot of popularity due to their scalability and efficiency of knowledge distribution. However, participating in these courses usually means fully committing to the course for at least a few months in some cases and the dropout rate is high. Providing engaging online education is even more challenging for industry trainees due to their lack of time and daily distractions at work. In this paper, we describe Train-For-Life, an interactive training platform for non-academic audience in transport, logistics, security and safety industry. Several design ideas are proposed to make the courses short, flexible and interactive to keep the trainees interested and engaged with the content. We evaluated the effectiveness of our approach with employees from a large company in the UK ( $n = 884$ ). Results show that most of the trainees completed the courses they enrolled in, they were engaged with the content during the duration of the study, and the majority passed the course test after first attempt. In addition, the employees found the learning materials valuable and enjoyed their learning experience.

**Keywords:** Lifelong learning, Interactive learning environments, Smart learning environments, Distance education, Teaching/learning methods, Work-based learning

## Introduction

Current training provisions and tertiary education are mainly designed to meet the learning needs of those preparing for entry into employment and/or specific occupation. Yet, new work requirements, ageing workforce and the ongoing need for employability across lengthening working lives make it imperative that this educational focus be broadened to include continuing education, training provisions and life-long learning skills for adult learners already in the workforce (Choy et al. 2013; Button et al. 2014). To keep the learning process rolling, especially for certain types of courses targeting certain types of professions, most of the training bodies ask the trainees to come to the training centre. This imposes a huge cost on the employers, not to mention the burden of organising and managing such events. With the permanent availability of the Internet, online training has become very popular in offering cost effective learning materials anywhere and anytime (Kim et al. 2014; McCutcheon et al.

2015; Seaton et al. 2014; Gaebel 2017.; Cisco Networking Academy n.d.). A number of studies have been conducted to investigate the critical factors affecting learners' satisfaction in e-Learning. The results show that learner computer anxiety, course flexibility, length and quality, perceived usefulness, perceived ease of use, and diversity in assessments are the critical factors affecting learners' perceived satisfaction (Sun et al. 2008; Chen and Huang, 2012; Kizilcec et al. 2013; Kim et al. 2014; Knowles et al. 2015; Walker and Leary 2015).

Learning a topic online via Massive Open Online Courses (MOOCs) has gained a lot of popularity due to their scalability and efficiency of knowledge distribution (Kizilcec et al. 2013; Kim et al. 2014; Gaebel 2017). Students enrol in MOOCs mainly to learn a new topic or increase current knowledge and the courses can run for long hours, days and weeks. Despite all efforts in developing and delivering MOOC education, the dropout rate is still high; only 10–20% of students complete a course they are enrolled in (Hew and Cheung 2014). Providing long-life training and engaging online education is even more challenging for industry/non-academic trainees mainly due to their lack of time and daily commitment and distractions at work (Aamodt 2016; Knowles et al. 2015; Button et al. 2014; Choy et al. 2013; Robson et al. 2012; Hager 2004). In (Wall and Ahmed 2008) a simulation game was developed to address professional development in construction industry using the blended learning approach. The learning material was delivered in a form of slideshow, then feedback was given about the performance progressively. Most adults learn by experience and exploration, and critically examining, questioning and validation are key aspects of their learning approach (Hardman and Rob 2012). Our own experience, based on feedback from our trainees, also shows that some of these learners do not find the lengthy online courses engaging enough and see them as more of an obstacle to do the real work.

Traditional education providers usually set up the first formal assessment after five or 6 weeks of delivering the course materials and give feedback to students 10–14 days after the assessment has been submitted. For some learners, it might be too late to change their study habits as a result of this delay and they might not have realised that they were struggling before getting the feedback. Receiving late feedback can also result in lowering learner's motivation (Auvinen et al. 2015). Studies have recommended routine quizzes to be introduced in any course in which objective learning goals need to be assessed. This is to improve students' motivation and their self-assessment capabilities (Balter et al. 2013; Kenis 2011). For example, in (Balter et al. 2013; Nehring et al. 2017) it was reported that the students' results had improved after introducing early feedback in form of quizzes.

When it comes to specific types of training, such as security and safety training in transport and logistics, the time for training and receiving feedback is more critical. Employers usually instruct their employees to finish the training as fast as they can and return to the operational duties. Proper and fast feedback is very important, as employers are obliged to increase the employees' awareness on how to deal with difficult and emergency situations that will affect their health, safety and the security of the products and organisations, such as Lorry Hijacking, Deception and Rubbery (Burke et al. 2011; Robson et al. 2012).

We propose Train-For-Life (T4L), an online interactive educational platform for industry trainees in transport and logistic area,<sup>1</sup> to maintain the safety and security of

trainees in their workspace. Several design ideas are proposed to keep the trainees interested and engaged with the content. With online availability of these courses, drivers, admin staff and others are flexible to take the required training anytime and anywhere. All courses are built with the following goals in mind:

- Duration is short (30–50 min long), as we are targeting industry participants, who most of the time find it very difficult to find large gap in their schedule to do training, and who get bored and/or distracted very quickly.
- Courses are interactive. Beside simplicity, the courses are built with many interactive features to engage the participant and improve their perceptions (Harris n.d.).
- All courses are followed by short tests of multiple choice questions to test the understanding of participants.

Although the courses are short, but this did not compromise the quality of the material delivered, because of the smart support of the interactive sections. The right and wrong actions are explained to trainees and so are the consequences of such actions. Repetition is avoided, and learners are encouraged to try variety of activities throughout the interaction time.

The updates and maintenance of the courses is done in a smart way. After the approval of a course by the senior management team of the company and deploying of the course for the employees to take, the users can reflect their own opinions about the learning material, format of the course, the interactive sections, etc. and can individualise the courses based on their preferences. The collected feedback will enrich the courses with users' practical experience and keep them up-to-date and fit for the purpose, as indicated by subjective evaluation described later in the paper.

The proposed training system consists of four access levels. Level 1 allows users to access most of the available training materials. Level 2 gives permission to registered users to access extra courses only registered under their companies. Level 3 is the audit bartrail which allows the managers to monitor the progress of their employees and check some statistical information. Level 4 is the system administration where the system administrator has a full control over the courses and users. We built our own management system for the training courses, with the concentration on simplicity, as users should be able to navigate through the system without any training. Data is collected and analysed to support and improve the research learning concepts introduced by the T4L platform. Three research questions we are investigating are: 1) given the online nature of these short courses and the particular type of audience (industry trainees), will they be able to complete their courses? 2) what is the uptake of the training content provided by the platform? 3) will the employees show interest in learning other courses offered by T4L apart from the required one(s)? We will answer these questions in the results analysis section.

The paper is structured as follows. Section "[Training Courses](#)" presents the T4L platform and gives a brief description of the available courses, the areas they cover and the mechanism to follow to create new courses. Section "[Interactive Design Ideas](#)" describes the interactive design ideas used to engage the users. The system architecture is presented in section "[System Architecture](#)", with a description of the four access

levels. The results are presented in Section “[Evaluation Study](#)”. We conclude by detailing the future work.

## **Training courses**

### **Courses categories**

Train-for-life offers four main categories:

- **Transport and Logistic:** Concentrates on drivers and how to improve their security awareness, for example in case of hijacking and theft.
- **Personal Security:** Focuses on how to improve the person’s own security at work and during everyday life routine, such as scam awareness.
- **Security and Protection:** Concerns on the safety of individual and the precautions that are needed to be taken, such as manual handling of heavy objects, and robbery response.
- **Security Skills:** Enhances the skills related to security and various awareness issues, such as conflict and stress management.

In addition to these courses, which are publicly available, companies can ask for proprietary materials under these categories. They will only be available for certain participants when they log into the system.

### **Course creation mechanism**

The creation of the courses goes through several stages, as explained below.

#### ***Requirement analysis***

A clear objective for each course is defined, how it gives benefit to industry and provides training to a large sector of audience (especially if the course targets government concerns) and is supported by professional bodies. Many stakeholders are consulted to ensure the analysis satisfies the rules and regulation and the content delivers the right information. The interactive parts are also planned to enrich the course and make it more interesting to the type of audience.

#### ***Design***

The course is divided into several short sections; each section consists of few pages followed by the interactive parts. The content of each page is a mixture of text, images and video, where the text does not occupy more than 33% of the page. Figure 1 shows an example of a used page template. A progress bar indicates to the reader how far they are from finishing the contents of the page.

Designing the interactive parts happens at this stage. It involves shooting video clips, taking photos, and editing to suit the course under development.

#### ***Implementation***

Where everything comes together. The course is implemented using PHP and JavaScript to build the pages and the interactive parts.



**Fig. 1** Example of page template on Conflict Management

### **Testing and validation**

This includes technical and non-technical verification and validation, and involves customers and different stakeholders for the final acceptance phase.

### **Maintenance**

To ensure that each course is fulfilling the requirements of industry and professional bodies, they are subject to continuous update, especially when feedback starts to come from users.

### **Tests**

After finishing the learning part of any course and to ensure that the trainee has absorbed the essential concepts, the trainee needs to take a short test of 20 questions maximum with multiple choice answers to complete the course. To maintain the fairness of the test, the questions are chosen randomly from a large bank of questions, and every time a trainee takes a test, he/she will face different selections of questions. The results are recorded in the management system together with other essential information such as the date and time of the test and the answers. After finishing the test, the trainee can revise the questions that have been answered incorrectly, but they cannot change their results. The trainee can take the test of any course as many times as they want, independent of the learning material, until they reach the passing results.

### **Interactive design ideas**

The interactive features included in the courses are aimed at making the learning process engaging and interesting, compared to more conventional approaches. After each learning section, the trainee will go through interactive parts to challenge their understanding and reiterate some important concepts in the learning material for that section. With every choice they make, a brief explanation appears to comment on their action and the consequences that might happen. It would be ideal for users to try all

the wrong ways to see the consequences. The interactive design ideas we proposed are listed below (Barmada and Baghaei 2017):

- *Panoramic training*: The trainee can take a tour inside a building or a room, move between buildings / rooms, and click on points of interest to emphasis on some important ideas.
- *Drag and Drop*: The trainee can drag some objects and drop them in their right or wrong places, or sort objects in a particular order.
- *Using arrows*: The trainee clicks on different arrows (up/down, front/back, and right/left) to change the value of some parameters and experience the right and wrong ways. Figure 2 gives an example of using arrows from a Manual Handling course.
- *Video clips*: These are short clips (3 min maximum) and they are coupled with text and narrative to explain some important concept in a visual way.
- *Quizzes*: Come as multiple choice questions or True/False. Again, with every answer the trainee chooses comes an explanation.
- *Cyber tutor*: is virtual character that is used to comments on the learning material, explain particular points and emphasis on some important issues. The cyber tutor can be seen as an alternative way to provide a trainer for the course. The trainee has the option to skip the cyber tutor section if they wish. Figure 3 shows an example of Cyber Tutor from Theft by Deception course.
- *Click on Region of Interest (ROI)*: The trainee clicks on some points of interest to fire up extra explanation.
- Combination of different interactive features together for larger scenarios.



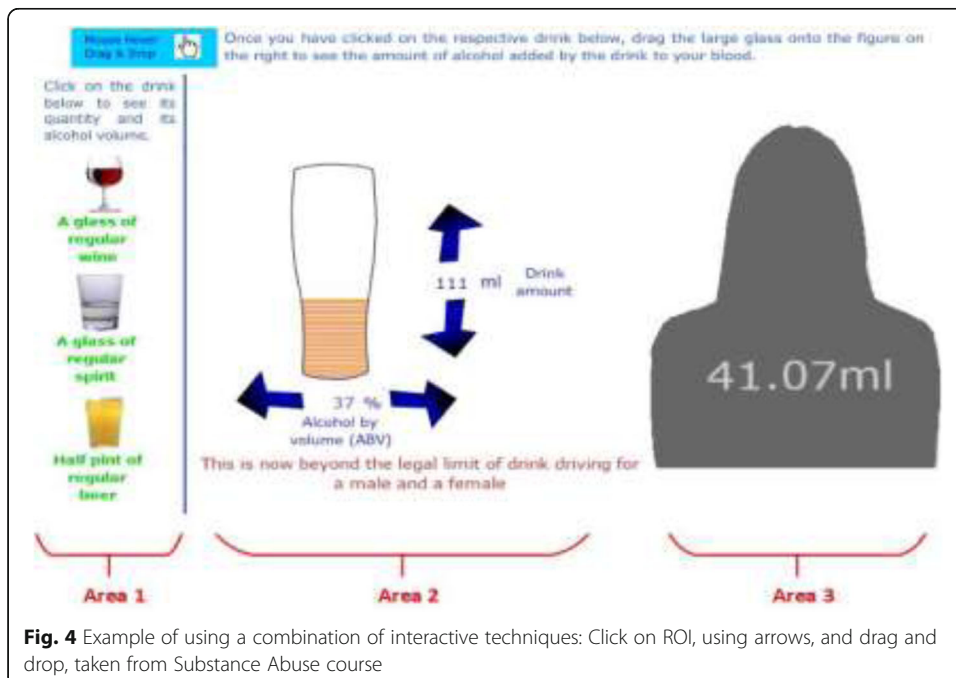


**Fig. 3** Using Cyber Tutor as an interactive method to provide extra explanation and emphasis on some important points, taken from Theft by Deception course

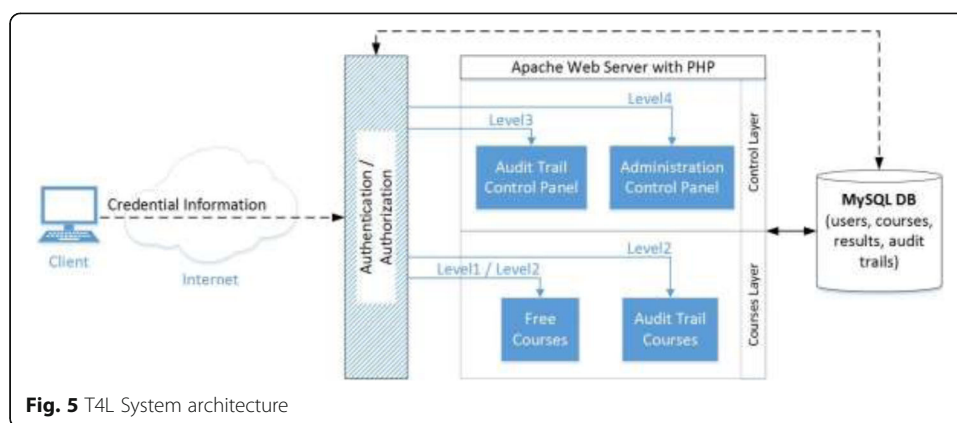
Figure 4 shows a combination example of different interactive techniques: Click on ROI, Using arrows, and drag and drop, from substance abuse course. The trainee can click of the class image of area 1 to set the drink amount (in ml) and the alcohol by volume (ABV) in the class image of area 2. In area 2 the trainee can use the arrow to change the drink amount and the ABV. The number of bars in the glass changes according to the drink amount, and the darkness of the bars changes according to ABV. Once the amount exceeds a certain threshold a red warning message appears (the message in this example shows that the amount of alcohol has exceeded the limit of drink driving for male and female). The trainee can drag the glass of area 2 and drop it on the shadow shape of area 3 to see the amount of alcohol in the body.

### System architecture

Figure 5 shows the system architecture, which uses 3-tier architecture. The server is an Apache web server with PHP and linked to MySQL database to store all the data.



**Fig. 4** Example of using a combination of interactive techniques: Click on ROI, using arrows, and drag and drop, taken from Substance Abuse course



**Fig. 5** T4L System architecture

### Access control

To control the access, the system offers four levels:

- *Level 1 – free user access:* any user can create an account and have full access to the public training materials. They can take the test at the end of each course and check the test result once they have finished to see their understanding of the topic. However, they cannot recheck any previous results.
- *Level 2 – users with audit trail code:* these users are registered with companies where they are provided with audit trail codes that represent their companies. The level gives the users access to extra courses registered only to their company. All their access activities and test results are recorded and can be checked later by their employer through an audit trail panel.
- *Level 3 – supervisor with audit trail:* Besides access the training courses under the jurisdiction of their audit trail code, these users can access the audit trail panel and monitor the activities and test results of users under this audit trail code. Audit trail panel is explained in more details below.
- *Level 4 – system administrator:* this user controls all other users, audit trail codes, courses and view statistic about the courses and test results. The administration panel will be explained in more details in the following section.

To impose security, accessing any level in the system requires the user to provide a username and password for authentication. All passwords are protected and stored with their hash values in the system database.

The levels can also be seen as Courses Layer, where users have direct access to the courses, and Control Layer, where supervisors and administrators can control and analysis the data and activities in the system.

### Audit Trail

Audit trail is a service in the system to allow managers to monitor the progress of their employees regarding the training activities. The company manger has to register to access this service where they are provided with audit trail code. The employer can track many features, such as the test results, the date and time of the test, which



courses the employees are taking and how far they have got through the training material (as a percentage). Figure 6 shows an example of the audit trail panel. The features available through the audit trail panel are described below:

- Filtered Search by Users: Shows the test results for a particular user over the courses they are taken. The displayed information includes the date/time of the test, the start date/time of accessing the learning material, and an option to check which questions the user answered incorrectly.
- Filtered Search by Test Results: Shows the test results for a course over a discrete period (today, week, fortnight, month). It also provides the option to give the results for all courses taken by users over that discrete period. The audit trail supervisor can sort the results according to different criteria (i.e. user name, course name, date of the test, etc.).
- Filtered Search by Test Results (previous month): same as the option above, but the supervisor can choose any month of past years.
- Filtered Search by Course Usage: Shows the course usage by users over a discrete period of time. It shows when a user started the course and the status of the progress (see Fig. 6).
- Filtered Search by Login Details: Shows the login details of users to the system over a discrete period.
- Preferences: The supervisor will have a limited control over the audit trail. They can modify the company information, create departments and job titles for their trainees to use once they log on to use the online training courses.

According to the audit trail code the logon features are determined. By default, a user needs only to provide a valid username and password to logon to the public learning materials. If a user provides a valid audit trail code when logging on, extra fields are prompted which are related to their companies, such as the department name and the job title. In addition, the proprietary learning material will appear under the course categories.

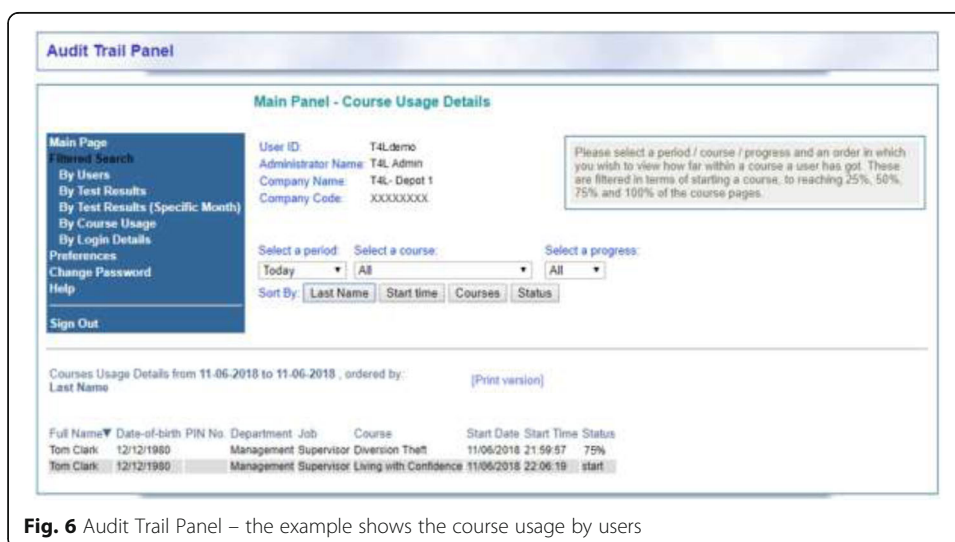


Fig. 6 Audit Trail Panel – the example shows the course usage by users

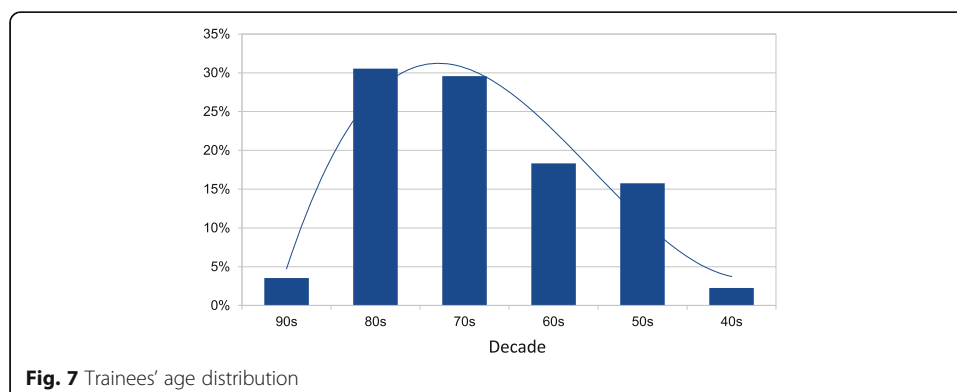
### Administration panel

This panel provides the system administrator with a full control over the users, courses, test results, audit trails and the questions /answers bank for each course. The panel consists of the following major parts:

- Courses: Allows to add new courses, add and modify the tests questions / answers to a course, and view courses' usages.
- Users: Lists all the users, adds new users and modifies existing ones, view their tests results, courses usages and their logins information.
- Results: Views tests results for users with the ability to filter according to time, courses and other criteria.
- Audit Trail: Views the audit trails and their associated companies and allows to modify the company information, adds new and modify departments, and other information related to each audit trail.
- Logins: Provides statistical information about who is logging on to the system.

### Evaluation study

We conducted an evaluation study with 884 employees of a large UK company, aged between 20 and 70 years old. The company name is anonymised in the interest of discretion. Figure 7 show the age distribution of the employees according their decade of birth. The figure shows clearly that the majority of the users were born between 1970s and 1980s (mid-30 to mid-40 years old). The trainees of this company are classified according to their job titles into four categories: Admin staff, Warehouse staff, Management staff and Drivers. Figure 8 shows the distribution of the trainees according to the job titles. The largest category is the drivers, where they form 49% of the trainees. Figures 7 and 8 emphasise that the learners are adults who are seeking training in workspace. The estimated time to finish the learning material of a course, including the interactive sections, was between 30 min to 50 min. This is without the doing the test toward the end of the course. Once a course became longer than 60 min, the chances of a trainee completing the course was reduced. For these courses, the training part was independent from the test, and a trainee could take the test any time once they logged in.



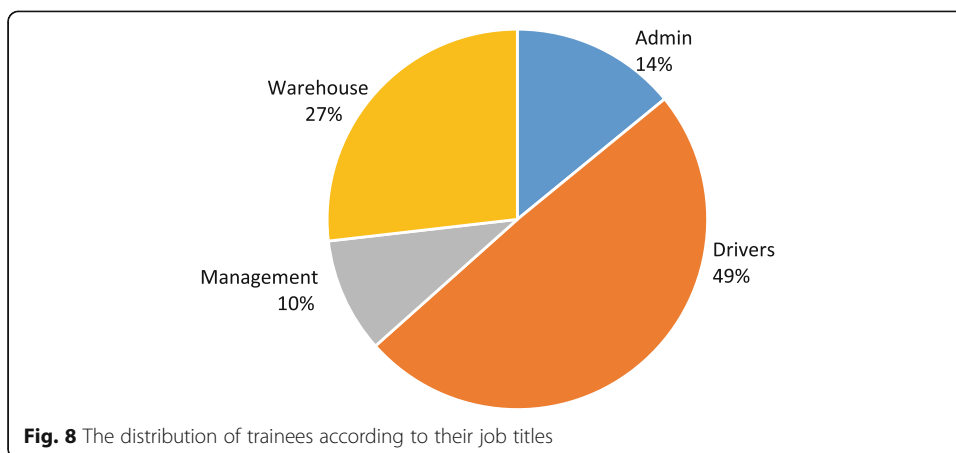
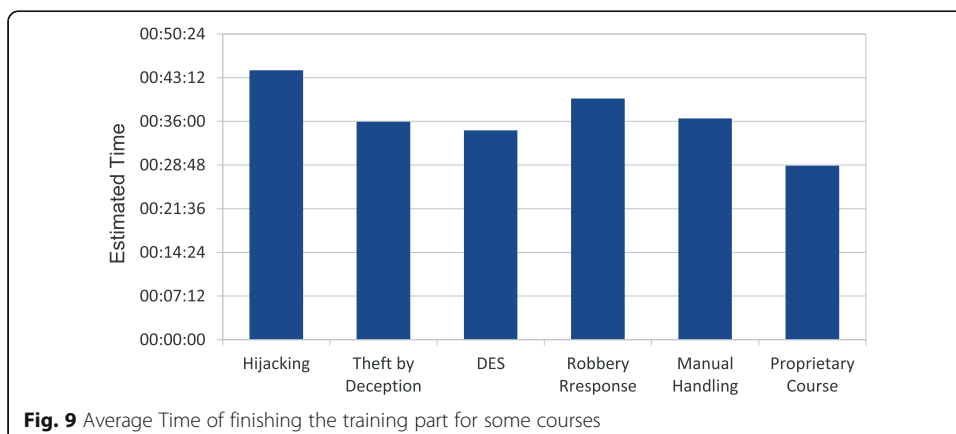


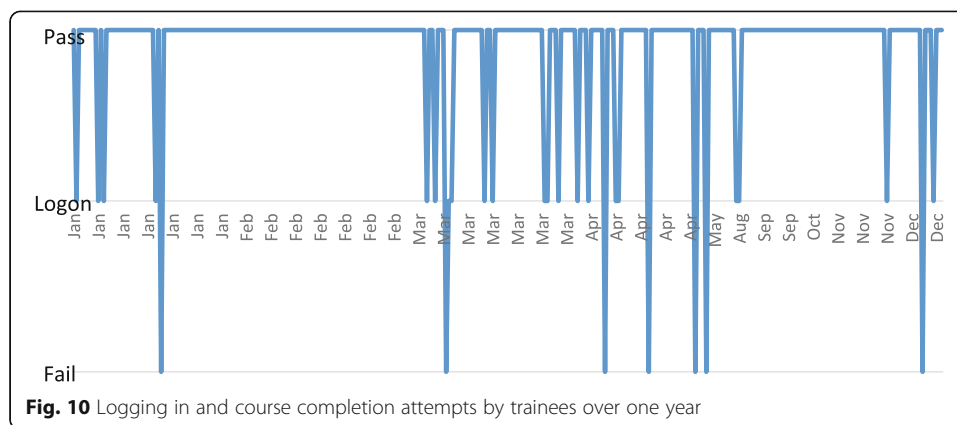
Figure 9 shows the average time taken by trainees to finish some of the training courses. It is between 29 min for the proprietary course, and 45 min for Hijacking course.

To address our research questions, we also logged the progress percentage as part of studying the performance of the trainees. The managers of the company we approached were mainly interested in a few courses that were of importance to them and asked their employees to do those particular courses. The results show that 91% of the employees finished the training parts for the courses of their interest. Figure 10 shows the login attempts by users in one year and whether they continued with some courses to the end. Most trainees managed to finish at least one test.

Zooming into January, Fig. 11 shows that more than 70% of employees took three courses of interest during a single login. This indicates that most users wanted to finish all the compulsory courses in a single session to get the training out of the way, so it would not interfere with their daily operational tasks. Saying so, since the courses were put in blended and interactive ways, we believe it encouraged them to continue doing more than one compulsory course in a single session. This is confirmed by looking at the subjective evaluation data, in which trainees gave their opinions about the interactive sections within the courses.

To show user commitment in completing all training courses of their interest, we looked at the percentage of users managing to complete the courses in their first





attempt. Figure 12 shows that more than 90% of the trainees managed to pass their courses in their first attempt, while few of them required a second attempt.

We also conducted a subjective evaluation to seek feedback of the trainees about their learning experience. Every trainee had the chance after finishing the test to submit a brief survey of five questions and rate each one of them from 1 (strongly disagree) to 5 (strongly agree). The questions were:

1. Did you find the course informative?
2. Was the information easy to understand?
3. Was the content up to date and relevant?
4. How do you rate the course information?
5. Were the interaction sections helpful?

Table 1 shows the average user rating and the standard deviation for four courses completed by the trainees. The results showed that the participants found the platform informative, easy to understand and helpful, with average score of 4.5 (out of 5). Robbery Response was the most popular courses for its interactive sections, as seen from the score of Q5 in the table.

This survey equipped T4L platform with very important tools to provide an independent feedback and criticism of the courses. Many feedback messages were constructive and helped to improve the quality of the courses and kept them fit for the purpose. Example of a constructive criticism from a trainee: *“Sealing of tautliner trailers not covered”* for the proprietary course of this company, *“There were no interactive sections on this”* for Hijacking course, and *“should cover the type of resistances better”* for Robbery Response course. As indicated looking at the feedback, users tend to prefer the interactive activities provided as a learning material. Other positive feedback about the courses in general: *“Very well put together”*, *“perfect and helpful”*, *“keep staff more informed bravo good idea”* and *“all in all a very good exercise”*.

### Conclusions & Future Work

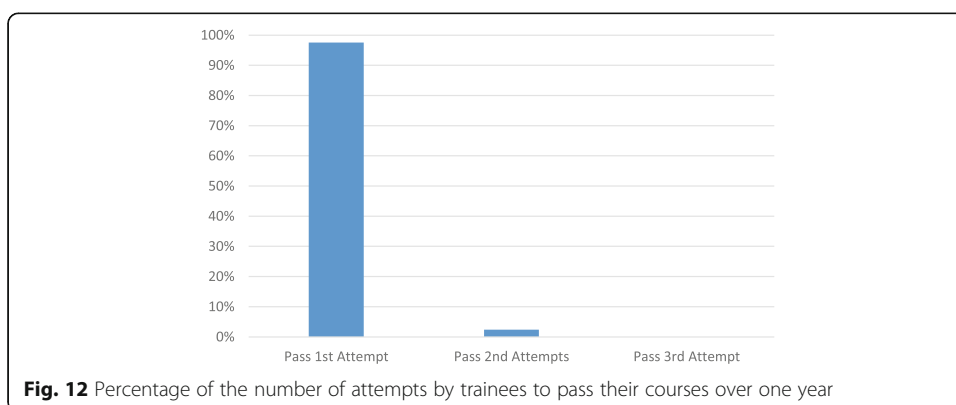
We presented T4L, an interactive platform for offering training in a form of short courses to industrial non-academic audience. The interactive design ideas used with



these courses included drag and drop, using arrow buttons to change positions, short video clips, cyber tutor, and clickable points of interest. A trainee was given the opportunity to view the correct and incorrect ways of performing each task with short explanation for any chosen action.

The system offers four levels of access control. Level 1 allows users to view most of the training material available. Level 2 allows its users to access extra learning material registered only for their companies. Level 3 allows supervisors to track and monitor the test results and activities of their employees through audit trail panel. Level 4 provides administration control for users and courses.

The results of our evaluation study were very encouraging. It showed that the average completion time of trainees was within the range of 30 to 50 min, which suits this particular type of audience. In monitoring their performance, we found that more than 90% of the users completed the training courses of their interest, the majority of them passed the test in their first attempt, and that they preferred to take all the compulsory training courses in a single session. The response of the survey questionnaires toward to end of each course showed the popularity of T4L platform among the users. The majority strongly agreed with the contents, found the courses informative and easy to understand and enjoyed their learning experience, with an average score of 4.5 out of 5 for four courses. Even though the evaluation study is



**Table 1** The mean and standard deviation of the trainees rating of the five questions in the survey for four courses

		Hijacking	Theft by Deception	Robbery Response	Proprietary Course
	No. of Samples	334	415	305	187
Q1	Mean	4.84	4.67	4.85	4.10
	STD	0.43	0.65	0.43	0.86
Q2	Mean	4.87	4.64	4.85	4.14
	STD	0.37	0.72	0.43	0.89
Q3	Mean	4.84	4.62	4.83	3.84
	STD	0.44	0.79	0.51	1.17
Q4	Mean	4.85	4.63	4.80	3.96
	STD	0.41	0.77	0.65	0.95
Q5	Mean	4.81	4.64	4.83	4.04
	STD	0.56	0.72	0.52	0.92

completed, the portal is still open, and we can see a high uptake rate of content and completion rates among the new trainees.

As part of future work, we plan to implement a framework to allow managers to create course content and interactive features via a flexible web and mobile interface. We also plan to evaluate the effectiveness of the portal in other industries. Another plan is to study the impact of T4L training courses on the actual performance of the employees on the job. We believe our research paves the way for the systematic design and development of full-fledged online training platforms dedicated to providing life-long learning skills for adult learners in the workforce.

## Endnotes

<sup>1</sup><http://www.trainforlife.co.uk>

## Abbreviations

ABV: Alcohol by volume; HSE: Health and Safety Executive; MOOC: Massive Open Online Courses; ROI: Region of Interest; T4L: Train-For-Life

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## Authors' contributions

BB has been working on T4L platform as a software engineer and recently as a consultant. BB contributed to the research questions and design of the study, implemented the system (interactive courses and management portal), analysed the data and wrote the first draft of the paper. He was also responsible for the overall structure of the manuscript. NB supported the ideas introduced in T4L interactive courses and helped with shaping the research questions. She was responsible for the literature review and the scientific argument of the concepts. NB also contributed to the data analysis and editing and enhancing several sections of the manuscript. At the end, all authors read and approved the final manuscript.

## Competing interests

The authors declare that they have no competing interests.

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