Development and production of an e-Learning resource using Cognitive Theory of Multimedia Learning (CTML) on General Data Protection Regulation (GDPR)

By

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Abstract

In May 2018 General Data Protection Regulation (GDPR) came into effect. The implementation of GDPR was far reaching, all organisations within the EU, and all organisations outside the EU who handled personal data of EU citizens or residents were impacted. To ensure compliance, staff training was needed.

The researcher set out to design and produce an e-learning product aimed at a specific audience of employees from different organisations to address a complex issue like GDPR. She would use an interactive product which would allow for the inclusion of multimedia elements which would be viewed on multiple devices.

The research objectives were:

- To design and produce an e-learning product for part-time lecturers or trainers in private industry on the topic of GDPR.
- Evaluate the effectiveness of an e-learning product which adheres to the Cognitive Theory of Multimedia Learning (CTML) by comparing it with another e-learning product which doesn't adhere to this theory.

The research methodology used for this dissertation was a phenomenological/interpretivist approach using qualitative research. The data collection methods were via semi-structured interviews and a focus group.

There was a positive response to the e-learning product. The findings were that by designing it well, keeping it short with focused content, the participants engaged with the product. The product was designed using the Cognitive Theory of Multimedia Learning (CTML), this allowed for participant interaction and the use of multimedia within the product. This design had a positive reaction from the participants, it proved that interactive learning was more effective than passive learning.

Within microlearning, personalisation was identified as important. The personalisation of content, how they interacted with it and how it was delivered were all important issues for the participants.

The development of the microlearning product was more intuitive than the researcher had originally believed, therefore it wasn't necessary to be an IT expert to develop the training it was more important to be a subject matter expert. Microlearning as a method of delivering training, was very effective and has many other opportunities for organisations designing staff training, whether it is Continuing Professional Development (CPD), compliance training or onboarding training.

Keywords: accessible, assessment, Cognitive Theory of Multimedia Learning (CTML), Continuing Professional Development (CPD), e-learning, flexible, GDPR, interactive, microlearning, personal

Declaration

I hereby certify that this material, which I now submit for assessment on the programme of study leading to the award of the MA in Training and Education, is my own; based on my personal study and/or research, and that I have acknowledged all material and sources used in its preparation. I also certify that I have not copied in part or whole or otherwise plagiarised the work of anyone else, including other learners.

Signed: 

Dated: 21st August, 2018

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Glossary

CLT	Cognitive Load Theory, is an instructional theory based on the human cognitive functioning, which addresses the limitations of the working memory.
CPD	Continuing Professional Development, is a way of tracking formal and informal learning acquired during a year, different professions have formal requirements which must be achieved to maintain professional status.
CTML	Cognitive Theory of Multimedia Learning, is a theory of how people learn from a combination of words and pictures by processing via dual channels; one for auditory and a second one for visual.
Data Controller	Is an individual or entity that alone or jointly with others, determines the purposes and the way in which personal data will be processed (Art.4 No.7 GDPR).
Data Processor	Is an individual or entity who processes the data on behalf of the controller, they do not make decisions on how data is processed (Art.4 No.8 GDPR).
Data Protection Officer (DPO)	Private organisations who are systematically processing personal data are obliged to appoint a Data Protection Officer (DPO) who is responsible to monitor the GDPR compliance of the organisation (Voigt and Von dem Busshe, 2017, p. 61).
Data Subject:	Is a person whose personal data is being processed by a controller or processer (Art.3 No.2 GDPR 2016).
Dynamic Learning Object	Dynamic Learning Object is a collection of visual learning aids including interactive 3D models, videos and clickable infographics.
e-Learning	Instructional or educational information delivered via digital devices that is intended to support learning.
Induction Training	Training typically given within organisations for new staff members within their first few days of joining. (Also known as Onboarding Training)
Microlearning	The delivery of bite sized information (typically under five minutes) on specific topics, where the learner accesses information at the time that suits them.

Millennium Bug	A perceived problem that computers would not be able to read dates for the new millennium.
Moodle	Moodle is an VLE used by some colleges, universities and private training providers
Multidevice	Term used to describe multiple devices like a computer, laptop, smartphone, tablet etc.
Multimedia	A combination of different forms of media to deliver the message i.e. text, graphics, video, audio and pictures
Onboarding Training	Please see Induction Training
Paradigm	A worldview through which knowledge is filtered (Kuhn cited in Saunders, Lewis and Thornhill, 2016)
Personal Data:	Personal data, relates to an identified or identifiable individual (Art.4 No.1 GDPR 2016). Data is personal if by using the available data a person can be identified.
Screencast	A screencast is a digital recording of data being displayed on a computer screen which is then created into a video.
SCORM	Shareable Content Object Reference Model (SCORM) is a standard used to create learning objects that can be shared easily on different or VLEs
Sensitive Personal Data:	Sensitive Personal Data are personal data revealing racial or ethnic origin, political opinions, religious or philosophical beliefs, trade-union membership, and data concerning health or sex life (Art.8 No.1 GDPR 2016). Sensitive Personal Data offers the data subject with additional protection rights.
Student Data	This is a colloquialism used within colleges, universities and the training industry to describe the Personal Data of their student community. When used within this research, it refers to Personal Data.
Supervisory Authority:	Each Member State within the EU appoints an independent public authority to act as the Supervisory Authority (Art.4 No.21 GDPR).
Virtual Learning Environment (VLE)	A software application used to distribute course content to students in numerous formats; allows for communication from lecturer to student, and among students via fora and for submission of assignments among other functionality.

Chapter 1

1.1 Overview

As the implementation of General Data Protection Regulation (GDPR) in May 2018 approached there were articles on all news channels, whether it was newspaper, trade paper, on radio and TV stations, or websites about how GDPR would impact each organisation within the EU and organisations outside the EU who collected, stored or processed personal information about EU citizens or people residing within the EU.

The headlines surrounding GDPR certainly caught everybody's attention when they warned of the potential huge fines for non-compliance, at a maximum of €20 Million or 4% of global turnover. In addition to huge fines, a loss of reputation was a huge concern for each organisation (Gabel and Hickman, 2016). GDPR standardised and strengthened the data privacy rights of European citizens and at the same time emphasised transparency, security and accountability by data controllers and data processors. (Gabel and Hickman, 2016, Voigt and Von dem Busshe, 2017).

With GDPR a data subject i.e. an individual, has the right to take a legal action against an organisation that fails to comply with GDPR. A data subject can claim financial compensation, including compensation for nonmaterial damages (EU Publications Office, 2016 Article.82).

GDPR raised a lot of questions for small and large companies alike. How could they achieve compliance on a complex topic like GDPR? Training would be the answer, but this in turn led to another question, how could Learning and Development departments, ensure that they delivered this training to all staff in a flexible and accessible way? Traditionally Continuing Professional Development (CPD) training was delivered in classrooms, which didn't allow flexibility. Designing training products in the traditional way would not make it accessible.

Developing a compliance training for such a complex topic as GDPR was a problem, not every Learning and Development departments had the IT skills or resources to address the issue, and developing an e-learning product may be considered too difficult and costly.

1.2 Scope of this research

With GDPR becoming effective, the onus on each organisation within the EU to become aware of the implications of this new Regulation could not have been underestimated. All organisations within the EU were responsible ensuring their compliance and staff training became the vehicle for ensuring same.

From a college or university's perspective, taking a complicated topic like GDPR, for the training, there was a need to break it into relevant sections for different groupings of staff members because one size did not fit all. Avoiding the classroom scenario because not everybody is on campus and available to attend. The solution was to deliver it online and make it available and accessible

Creating an e-learning product will help move away from the traditional CPD or compliance training. As mentioned earlier, the Learning and Development departments may believe that they do not have the IT skills needed to produce an e-learning product, however one of the findings from this study was that it was relatively easy and more intuitive than expected.

As 25th May approached, most adults in Ireland became aware of GDPR because every organisation they were a customer of started seeking permission to retain their personal data. So everybody came to this training with some prior knowledge of GDPR. This created an additional problem which was the misperception of their knowledge around GDPR compliance. The training developed needed to focus on awareness of the topic and attitudinal change.

GDPR and the issues surrounding it didn't end when GDPR was implemented, it is now considered a compliance issue. A difficulty for a college or university which can arise is the start date for part-time lecturers and how their induction, including compliance training, is handled. Not all part-time lecturing staff start at the beginning of an academic year, they could start at any stage within the year, so formal induction days at the beginning of an academic year will not address the needs of all part-time lecturers. There could also be a continuation of this problem into the following academic year, as a part-time lecturer who started mid-way through the previous year, no longer considers themselves a new lecturer and may not attend the induction day at the beginning of the new academic year. Therefore, compliance training which might traditionally be done along with the induction might not be happening for some of the part-time lecturers.

The previous Data Protection Directive was in place since 1995, the growth of technology in these intervening years has been enormous. Technology is pervasive in both professional and personal lives and accessing information via smartphones has grown in the last five years (Statcounter Global Stats, 2018) as evidenced in figure 1.1

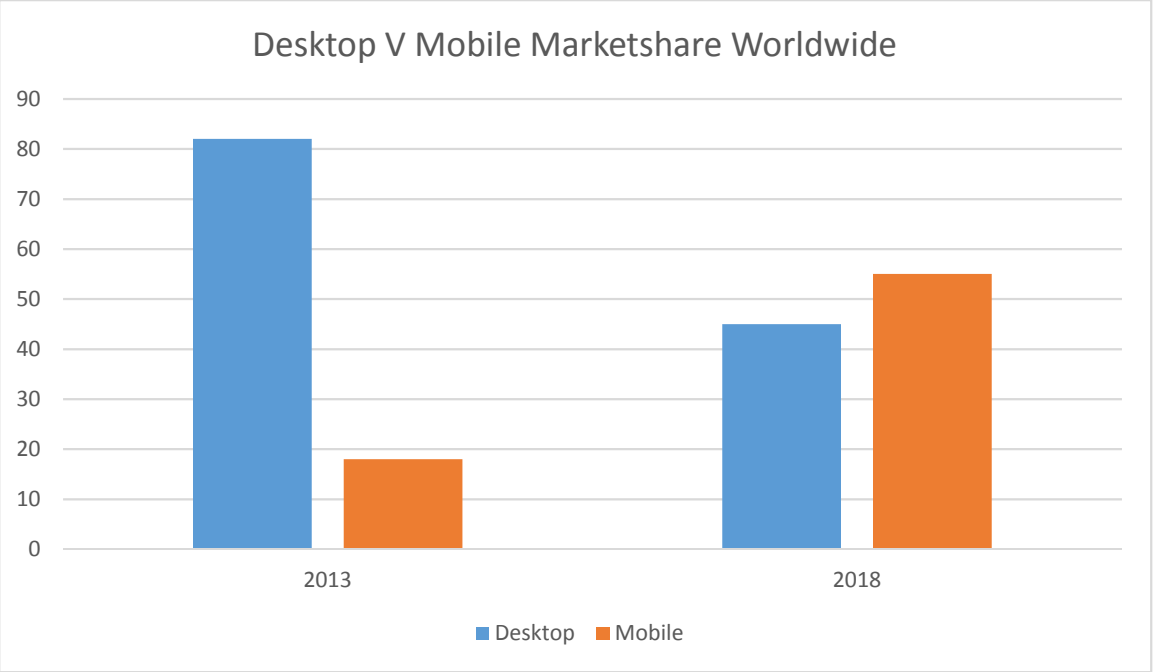

Figure 1-1 Desktop Verses Mobile Markeshare Worlwide (Statcounter.com 2018)

According to the Horizon Report ‘mobiles also have potential to foster learner independence and build habits for lifelong learning.’ (2017, p. 40) The use of personal devices in professional lives has potential GDPR implications for organisations; how staff access company information on personal devices and synchronising this information across multidevices.

When training teachers, it is important that it is continuous and that support is available to them at a time that suits them (National Forum, 2014, p. 59). This confirms the need for ongoing flexible staff training.

1.3 Research Proposal

Leading up to the implementation of GDPR it was occupying most organisations. The complexity of the topic, the different levels of compliance required within organisations for different staff, this presented a challenge.

The researcher looked to technology as a way of addressing this challenge, using e-learning as the solution also provided a move away from the traditional CPD or compliance training. With the advancements of technology came the multimedia options, however when developing e-learning products, there are as many pitfalls as there are solutions. Following a theory like CTML provided the guidelines to help create a better product. An e-learning product needs to be produced correctly. It is preferable that the person producing it is a subject matter expert as opposed to an IT expert.

When developing any training solution, it should adhere to Instructional Design principles which is a framework to ensure all stages are captured. The training must respond to the training need or problem which has been identified. This was an opportunity to respond to a problem using CTML, which wasn't adhering to old methods of delivery and would provide accessible training. Would it be possible to take something as complex as GDPR and create an e-learning product which would address compliance using specific practical examples for staff to implement?

The research objectives were:

- To design and produce an e-learning product for part-time lecturers or trainers in private industry on the topic of GDPR.
- Evaluate the effectiveness of an e-learning product which adheres to the Cognitive Theory of Multimedia Learning (CTML) by comparing it with another e-learning product which doesn't adhere to this theory.

1.4 The relevance of Practice

This dissertation is concerned with the training of part-time lecturers and trainers in private industry in the handling of student data in line with the new General Data Protection Regulation (GDPR).

The researcher is a trainer within private industry and therefore understands the issues faced by organisations ensuring GDPR compliance. She is also part-time lecturer with two third level institutions, therefore sees compliance on GDPR from both sides of the coin.

1.5 Structure of the Study

This chapter explains the purpose of the dissertation, it sets the context for the study, the research objectives and summarises the structure of the dissertation.

Chapter two discusses the literature on the topics GDPR, e-learning, Cognitive Theory of Multimedia Learning (CTML), and ending with microlearning.

Chapter three introduces the research strategy selected for this study, it includes the limitations, and ethical issues concerning the study. It reviews other GDPR e-learning products, selects, designs and produces the two e-learning products for this study.

Chapter four the presents the findings from the research. Five themes were discussed and recommendations for future iterations of the product are proposed.

In chapter five, this draws together the conclusions from the research, a reflection on the process and suggestions for future development.

1.6 Summary

This chapter set the context for this study. The next chapter will review the literature on GDPR, e-learning and Instructional Design. It introduces the Cognitive Theory of Multimedia Learning (CTML) which is the theory which underpins this study and finishes with microlearning.

Chapter 2

2.1 Introduction

The purpose of this chapter is to review existing literature in areas of GDPR and its implications on a third level institute of education or for a training provider. It also reviews e-Learning, Instructional Design (ID) Model, it introduces Cognitive Theory of Multimedia Learning (CTML) which supports the design of the e-learning product. Lastly, it presents the concept of microlearning and the benefits of this method of delivery.

2.2 GDPR

With the impending implementation of GDPR, the impact on organisations could not be underestimated. It required organisations to review how they did business and there was new terminology for GDPR and its implications to learn, see Appendix 1.

There were many comparisons between GDPR and the Millennium Bug (Stanek, 2017, Freeman, 2016, Van Renterghem, 2016, O'Connell, 2018), however, the Millennium Bug was a pure IT problem, GDPR is seen as a legal, operational and compliance issue. GDPR did not end on 25th May, this was the beginning of how businesses would and could handle personal data. Whilst the headlines of punitive fines where grabbing attention, it provided an opportunity for organisations to focus on compliance and responsibility when handling data privacy (Stanek, 2017).

The Data Protection Commissioner (DPC) of Ireland played a proactive role in raising the awareness of the Regulation. They offered practical advice for organisations, an example of this is a one recommendation related to Cloud Technology and staff training was;

> *Organisations should ensure that staff receive appropriate training on social engineering attacks, phishing attacks and security threat practices. Such training should be supported by refresher training/awareness programmes to mitigate the risk posed by an evolving threat landscape* (Data Protection Commissioner of Ireland, 2018b).

This highlights the importance of staff training and a reminder that the training needs to be repeated.

In the past, some organisation had gathered personal data for one reason and later used it for another. It was now no longer acceptable to adapt a cavalier attitude to data privacy (Newton, 2018), the new Regulation would ensure that misuse of personal data would not be tolerated. Individuals or customers realised that their personal data had a value, they also had a right to take legal action if

there was a breach in data security (EU Publications Office, 2016, Art.82, Data Protection Commissioner of Ireland, 2018a). The individual also has a right to be forgotten, (EU Publications Office, 2016, Art.17) where they could request their personal data be erased. In addition to the Data Protection Commissioner providing advice to organisations, they also provided similarly good advice to individuals. They simplified the processes for individuals to raise complaints and understand what their rights are (Data Protection Commissioner of Ireland, 2018a). With the implementation of GDPR, there was a genuine shift in the control of ownership of personal data.

The six principles which appear in Article 5 of the GDPR (2016) relate to the collection, storing and processing of personal data. Table 1.1 lists the GDPR principles:

All data shall be:
• Processed lawfully, fairly and in a transparent manner
• Collected for specified, explicit and legitimate purposes and not processed in a manner that is incompatible with these purposes
• Adequate, relevant and limited to what is necessary in relation to the purposes for which they are processed
• Accurate and kept up to date
• Stored in a form for no longer than is necessary
• Processed in a secure manner, protecting against unauthorised or unlawful processing and against accidental loss, destruction or damage

Table 1-1 GDPR Principles

These principles ensure that when an organisation collects personal data that they are responsible for how it is handled, where is it stored and retention period for holding this data.

Since the EU's previous Data Protection Directive was drafted in 1995, our connectiveness via technology has changed dramatically, between the development of new devices (smartphones, tablets etc) and the ubiquitous Internet in every aspect of our lives (Gabel and Hickman, 2016, chap. 1). These advances in technology have ensured ease of access to data, however, processes need to be put in place to ensure that that this ease of access does not contravene the principles of the GDPR in relation to storage, security and retention of records.

A college or university may have staff who are accessing personal data of students remotely. They could be storing, processing and synchronising this personal data on their own numerous devices and cloud applications. Whilst procedures were in place for the handling of personal data within a college or university infrastructure, remote access and storage on personal devices may not have been addressed.

2.3 The implications of GDPR for a training provider or part-time lecturers

So far, this chapter has focused on GDPR in general terms, the following section will discuss GDPR for a private training provider or part-time lecturer and how a student's data (including personal data) can be accessed and processed.

The researcher as a legal entity provides training services and is also part-time lecturing to two third level institutions and is therefore a data processor. The data controller whether it is a university, college or training provider, provide the data processor with student data. From the data controller's point of view, once they outsource any element of the training or teaching whereby a third party has access to student data, they must ensure that everybody involved in the supply chain are GDPR compliant. (Howe cited in Oesch, 2018, Reeve, 2017)

Colleges and universities needed to ensure that any staff member who collects student data or who processes student data became aware of their own personal responsibility in doing this.

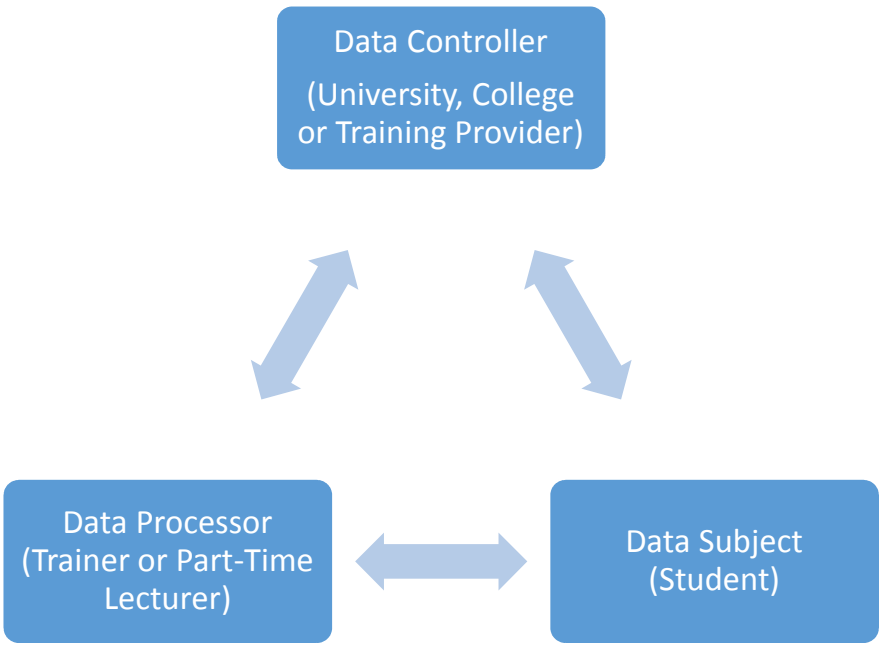

Figure 2-1 Relationship between different roles

2.4 e-Learning

Clarke and Mayer (2016) defined e-learning (2016) as instruction delivered on a digital device that is intended to support learning. e-Learning offers flexibility for the learner, they are no longer tied to a location and or date, it can be either asynchronous or synchronous. Asynchronous, is self- paced, self-study at any time completed by the learner from any geographical location. Synchronous learning is instructor led programmes which is delivered by a computer and designed to be used by learners at the same time from many locations, this is often referred to as a virtual classroom (Clarke, 2017, p. 844).

Zhang (2013) describes the evolution of e-learning over three generations.

- The First Generation; was a one-way transmission model, which was driven by technology
- The Second Generation; An interactive mode which was driven by learning pedagogy where role of technology was to support the learning
- The Third Generation; a comprehensive mode of e-learning, which include some of the following characteristics: (a) Adherence to a set of e-learning principles, (b) User-friendly and flexible functions and features, (c) Interactive and interesting content and (d) Student support of learning

As indicated in figure 2-2, the Association for Talent (ATD) State of the Industry Report (2017) The growth of e-learning in organisations in the US since 2011 has been from 38% to 45% in five years (Ho, 2017). Given the growth and acceptance of e-learning as a method for delivering training and identified by Ho, (2017) it became the obvious method for delivering this product.

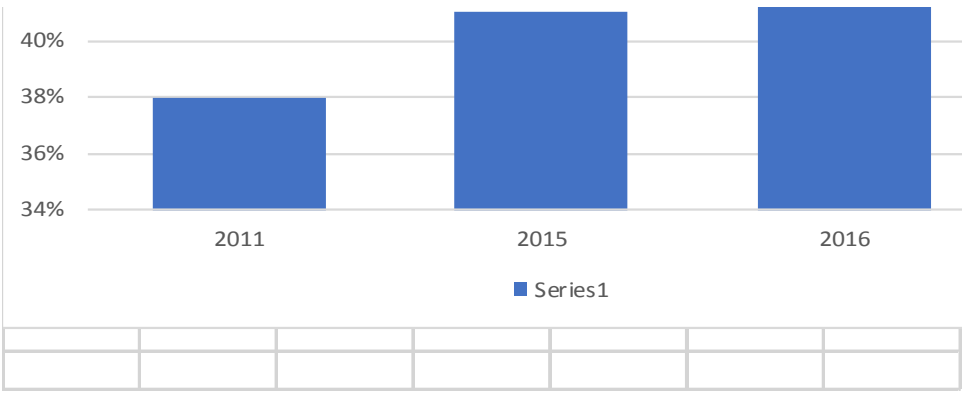

Figure 2-2 Increase in e-learning 2011-2016 ATD Sate of the Industry Report (2017)

2.5 Instructional Design (ID)

Instructional design is a system of procedures used to develop training and educational programmes in a reliable and consistent manner As described by Ilgaze and Gulbahar (2017) Instructional Design plays an important role when designing for e-learning.

The core elements of all instructional design models include, Analysis, Design, Development, Implementation and Evaluation (ADDIE). Included within the ADDIE model (Figure 2-3) there is a sub-step which is revision before moving onto the next stage.

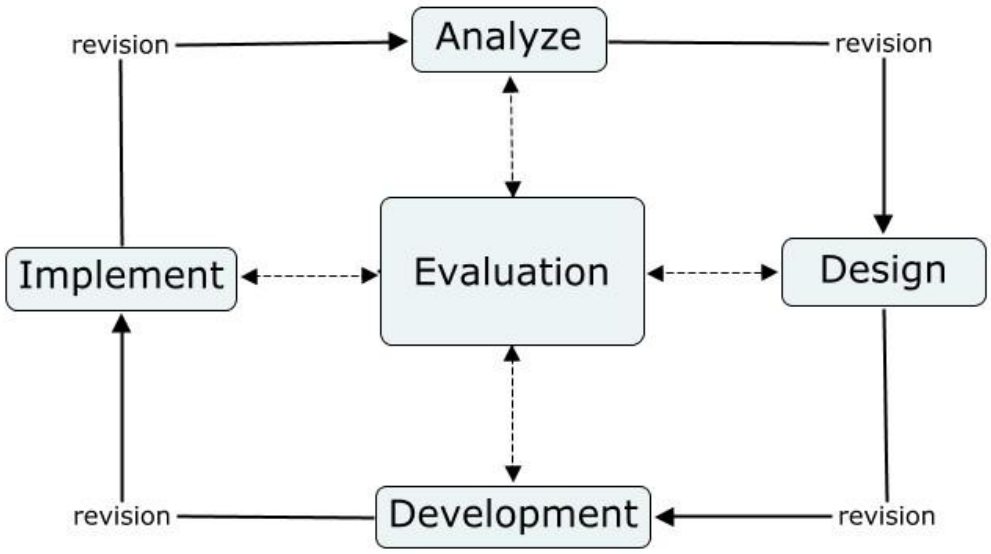

Figure 2-3 Core elements of Instructional Design (ADDIE Model)

The details of the work carried out by the researcher in both the Analysis and Design phases, is available in Appendix 3

2.6 Cognitive Theory of Multimedia Learning (CTML)

The technological advances in recent years and the introduction of multimedia into most aspects of our lives has created new opportunities for developing more engaging e-learning products. It is important to understand when to use multimedia and when it is appropriate not to use it. This section will start with Cognitive Load Theory, (CLT) (Sweller, van Merrienboer and Paas, 1998) the Cognitive Theory of Multimedia Learning (CTML) developed by Mayer (cited in Clarke and Mayer, 2016). It finishes by describing of Multimedia Principle (Clarke and Mayer, 2016).

The work on Cognitive Load Theory (CLT) by Sweller, van Merrienboer & Paas (1998) is the combination of the knowledge of human cognitive activities and instructional design principles. It focuses on the capacity of the brain to handle information from different sources, further information on this theory is available in Appendix 4

The learning principles described in Appendix 4 led Mayer (2009) to present the model Cognitive Theory of Multimedia Learning (figure 2-4) of how people learn during multimedia lessons.

- The *dual channel* principle is represented in the first column.
- The *limited capacity* principle is represented via the Working Memory
- And the *active processing* is represented by four elements within the working memory and the integrating of existing or prior knowledge.

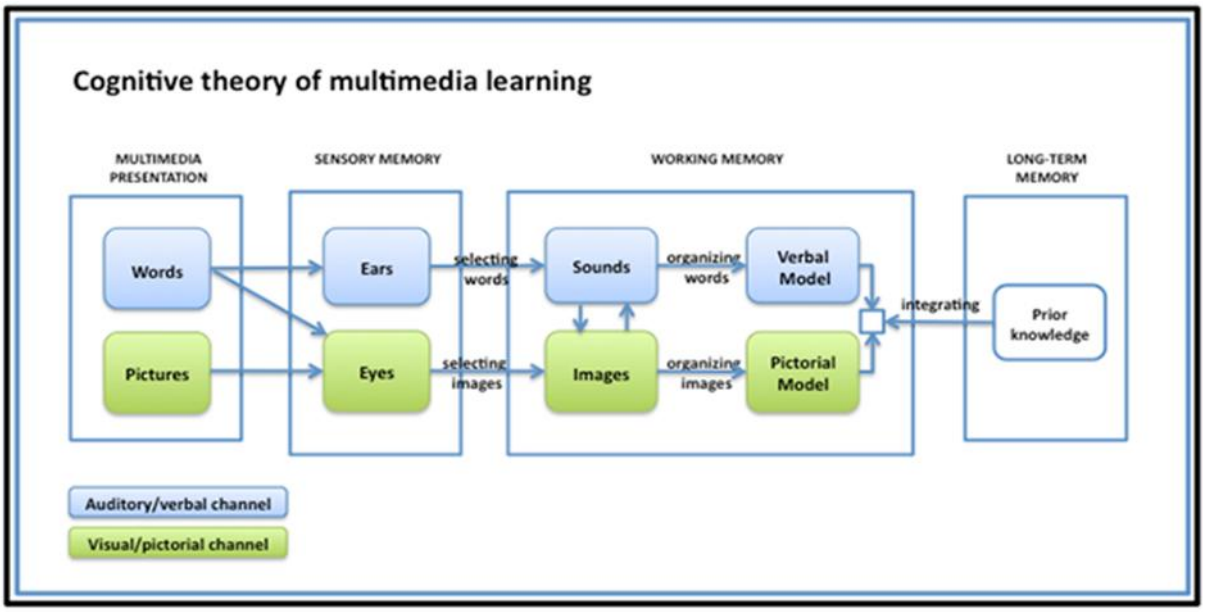

Figure 2-4 Cognitive Theory of Multimedia Learning (Adapted from Mayer, 2014)

The top row is concerned with the auditory or verbal channel.

The bottom row is concerned with the visual or pictorial channel.

For learning to take place, the learner must engage in the following three cognitive processes:

- *Selecting words and images*, paying attention to the appropriate images and words being presented.
- *Organising the words and images,* by mentally organising the selected words and images in a clear representation.
- *Integrating,* new words and image representations with existing or prior knowledge.

(Clarke and Mayer, 2016, p. 36)

2.7 Microlearning

The very nature of part-time employment means that these lecturers are not always on campus or available to attend traditional classroom CPD or compliance training. As explained earlier, e-Learning offers flexibility for the learner, they are no longer tied to a location and or date. Microlearning, is learning by using micro content (Bruck, Motiwalla and Foerster, 2012). The micro content is presented in learning units which can be highly engaging, learner centred and delivered as 'just in time' availability. The content can be consumed quickly, and in the order, that the learner requires. Bruck et al summarised by stating that microlearning uses mobile devices (smartphone or tablet) to access technology enhanced learning (2012).

The association of Talent Development (ATD) in a survey found that 38 percent of their members were already using microlearning and that a further 41 percent plan to start using it in the following year. Further, 92 percent of those organisations currently using it, plan to increase its usage in the in future (ATD, 2017). Markets and Markets (2015) forecasts the global mobile learning market to reach $37.60 billion by 2020 up from $7.98 billion in 2015.

Both the traditional e-learning and microlearning approach learning from different perspectives, they are seen to be complementary and addressing different learners. A comparison between traditional e-learning and microlearning was compiled by Buchem Hamelmann, (2010) is demonstrated in Table 2-1 Because of its multi-device capability microlearning ensures that one product can be viewed via computer, laptop, smartphone or tablet, therefore ensuring the mobility of learning.

Microlearning can suit the needs of the part-time lecturer. They are not always on campus and travelling to a campus to attend training is costly as well as time consuming. Having training content delivered on their smartphone allows them to access courses as and when they want.

Comparison between traditional e-learning (macrolearning) and microlearning

		Macrolearning	Microlearning
1	Learning context	formal learning	informal learning
2	Time spent	several hours	a few seconds up to about 15 minutes
3	Content type	learning modules, comprising and structuring a broader range of ideas or topics and combining learning objects	microcontent as small chunks of information, focusing on a single definable idea or topic
4	Content creation	content created by subject matter experts, usually with authoring tools	content co-created by learners with Web 2.0 and rapid e-learning tools
5	Content aggregation and fragmentation	learning objects usually need to be combined with other learning objects to enable full understanding; content can be easily split for re-use and restructuring	microcontent units are self-contained as they can be understood without any additional information; microcontent cannot be divided into smaller pieces without the loss of meaning
6	Content retrieval	courses or topics retrievable through a unique URL, however single learning objects are not addressable	microcontent has a unique URL (permalink), which make even small chunks of information retrievable
7	Structure of the learning cycle	hierarchic, sequential, pre-planned structures consisting of a number of units or lessons, each combining a number of learning objects, such as texts, images, audio, video	dynamic, flexible structures created by learners in the process of learning through syndication, aggregation and modification, based on such data as social tags and bookmarks
8	Target group	learners aiming at gaining an insight into topics defined by domain experts	learners aiming at exploring concepts or solving practical problems
9	Learner's role	learners as consumers of content, attempting to build mental structures similar to those of experts	learners as prosumers of content, building own mental structures through exploration and social interaction
10	Learner participation	focuses on learner-content interactions	focuses on social interactions between learners

Table 2-1 Macrolearning verses Microlearning (Buchem and Hammelmann, 2010)

2.8 Summary

This chapter began by explaining the terminology of GDPR. It identified the implications of GDPR and explored the option of using e-learning, it described Instructional Design (ID) leading onto Cognitive Theory of Multimedia Learning (CTML) and ended with microlearning. The following chapter will discuss the methodology used when developing the programme.

Chapter 3

3.1 Introduction

This chapter will describe the research philosophy and how this influenced the approach selected for the research.

3.2 Research Theme

The objectives of this research are to design an e-learning training programme for GDPR and to explore if by applying the CTML would this enhance the transfer of learning.

3.3 Research Methodology

A graphical representation of research known as The Research Onion (figure 3-1) was developed by Saunders, Lewis and Thornhill (2016, p. 124) to explain the process that researchers must work through in order to select the appropriate method. A description of the layers within the research onion is available in Appendix 5

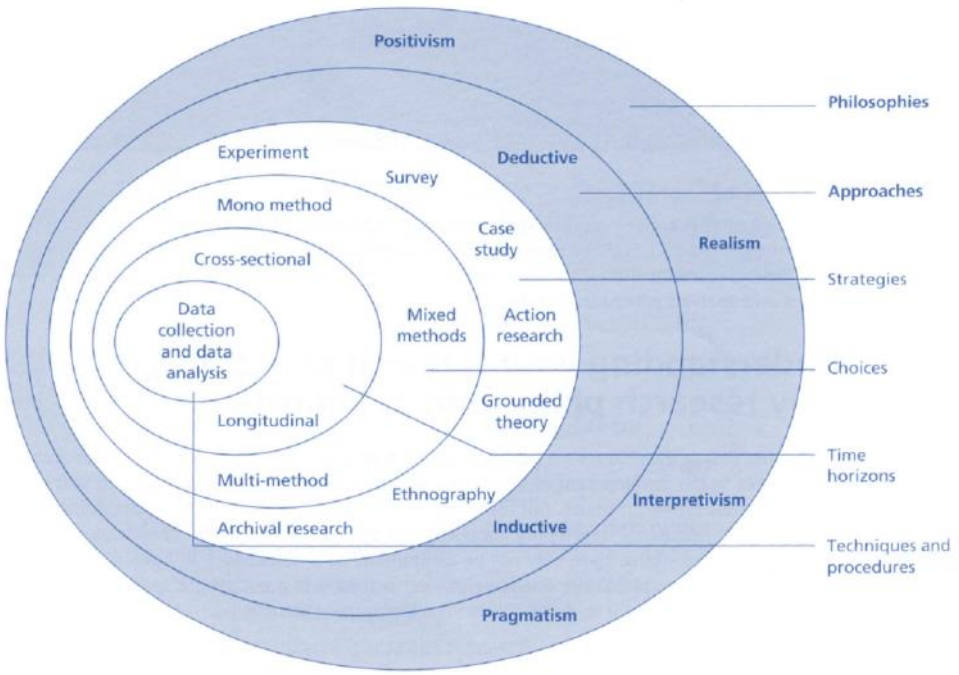

Figure 3-1 The Research Onion - 2015 Saunders, M Lewis P, Thornhill A.

The first selection made by the researcher was the research philosophy, Saunders et al (2016) identified interpretivism as focusing on creating new richer understandings on the basis that humans create meaning and therefore are different to physical phenomena. Interpretive has been selected for this research as there was an interactive link between the researcher and the participants. The researcher felt that it was important to be present when the product was delivered, there were a few reasons why:

- It allowed the researcher to be part of the interaction with the participants.
- When working with technology, things can go wrong, and it allowed her to assist if necessary.
- If a participant did not understand a technical term or if they were confused about any aspect, it allowed for the researcher to intervene or clarify.
- She wanted to get the immediate feedback on the usability of the product, in case there needed to be enhancements.
- It allowed her to pick up on nuances, body language such as ease or unease that participants displayed when using the products.

None of the above could have been possible if the researcher had sent a link to people and asked them to review the products and complete a questionnaire on same.

The next layer of the research onion is whether it is a deductive or an inductive approach. For the purposes of this research, the most appropriate approach is deductive because it begins by reviewing what is known about a given subject, in this case GDPR and the theory, in this case is CTML. The researcher then developed a hypothesis, she then designed a quantitative method of gathering the data to test the theory.

The hypothesis that was tested is that if the Cognitive Theory of Multimedia Learning (CTML) is applied to an e-learning course, would it achieve a better outcome for learning compared to an e-learning product which did not adhere to this theory?

Qualitative research focuses on the need to make sense of the meaning and the phenomenon being researched. Qualitative methods offer an effective way of gathering rich data (Saunders et al, 2016). As the emphasis is on making sense of the topic being explored, it was most appropriate to use qualitative methods.

The next decision to be made was the methodological choice. As the focus of this research is on the participants and their interpretation of the event, a mono-method qualitative was selected.

3.4 Research Strategy

There are eight research strategies which are identified in the research onion, the researcher has chosen a case study research strategy is 'it involves the empirical investigation of a particular contemporary phenomenon within its real-life context' (Saunders et al , 2016, p. 711), which reflects the context of this research.

3.6 Data Collection Method

There were two data collection methods used with this research; a focus group and individual interviews.

A focus group can be a group interview or a collective conversation (Kamerelis and Dimitriadis, 2015). The researcher determines the focus of the conversation, they can allow for a more natural interaction between the participants than an interview or observation would allow. The researcher picked a focus group as a method for collecting data as it facilitated collecting the impressions and feedback from a group of six people. It also allowed for an interaction between the group, and therefore encouraged richer feedback.

There was one focus group run, it was recorded using video. By recording the sessions, this freed up the researcher from the restriction of note taking and therefore allowed her to actively participate in the focus group. It also allowed for the researcher to watch body language or other cues which prompted further questioning.

The researcher conducted one to one interviews which have many advantages (Denscombe, 2014) as it is only necessary to co-ordinate two people's diaries, the opinions and views expressed are from one source and can easily attributed to one person. They also had the added advantages that they are easier for the researcher to control and to transcribe when only one other voice was represented. Bell (2014) asserts that interviews are beneficial for the researcher as recording and analysis are greatly simplified.

The researcher used semi-structured interviews (Drever, 1995, Elliot, 1991) for both the focus group and the interviews, as they facilitated focussed questioning. A semi-structured interview allowed a degree of flexibility for the researcher as the order of questions could be varied and it also allowed the interviewee to reflect and develop ideas before responding.

To encourage openness and honesty from the interviewees, the researcher was mindful to remain neutral and non-committal on the statements being made or when posing the questions. (Denscombe 2007).

3.7 Reliability and Validity

Reliability implies consistency, if the researcher or another researcher applied the same data collection method and analysis it should produce the same result for multiple participants. It also requires transparency on how logic was applied to the raw data (Saunders et al, 2016). The researcher ensured reliability by remaining neutral and adhering to the semi-structured questions.

There are two sections covering validity, the first relates to the extent that data collection methods precisely measure the data it was expecting to measure. The second relates to the extent that the findings reflect what they claim to be about (Saunders et al, 2016). The researcher ensured validity by adhering to the semi-structured questions, recording or videoing the interviews and focus group, and transcribing of same. She used descriptions phrased very closely to transcription and included direct quotes of interviewees.

3.8 Limitations of the Study

There are certain limitations associated with the use of qualitative methods, the main one being, the group size of participants is small and therefore it is important to get a good cross-section of participants (Saunders et al, 2016).

As the research was carried out over summer months, there was less availability of part-time lecturers on campus. Another limitation was that there was a possibility of bias by the researcher. The researcher was self-aware of this point and made every effort to stay neutral and subjective. She found the transcribing of the interviews and focus groups to be very insightful, as the written word clearly identified patterns that may not have otherwise been obvious.

3.9 Ethics

The researcher was cognisant of the ethical considerations when acting as a researcher. According to Cavan (2001, p. 45) 'Ethics say, while truth is good, respect for human dignity is better.' Bassey (1999, pp. 73–74) proposes that ethics in research encompasses the need for respect in three domains; respect for democracy, respect for truth and respect for persons.

In order to be ethical, Denscombe (2014) proposes that researchers should:

- Operate with integrity and honesty
- Avoid harm to participants
- Respect research participants

Prior to commencing the research, ethical clearance was sought, and approval granted from the Ethics Committee in Griffith College in June 2018. Participants were sent an email inviting them to participate, a copy of the invitation email is available in Appendix 6, included with the invitation email was the Participant Information which is also available in Appendix 6. At the beginning of either the interview or the focus group, each participant signed a Consent Form which is available in Appendix 6.

As part of the submission to the Ethics Committee, the researcher included the questions which would form the basis for the semi-structured interview and focus group, these are included in Appendix 6.

3.10 Other e-Learning Courses Which Are Available on GDPR

Research was carried out to review different GDPR training available as an e-learning option. The details contained in Appendix 7 helped to inform the researcher in relation to what worked well and what was lacking.

3.11 Different Software:

Taking onboard the Cognitive Theory of Multimedia Learning, the researcher reviewed and eliminated the following software packages:

- Videscribe
- PowerPoint Mix
- Elucidat
- Animaker

The software package selected was Articulate Rise, the benefits of this package are explained later in point 3.12.2

3.12 Developing the Product

The GDPR Regulation's official document contains 88 pages, so given the complexities of the regulation, the challenge for the researcher was to produce a meaningful training via e-learning products.

Having reviewed other e-learning products on the topic of GDPR most of them focused in on the 'why' of GDPR. The researcher wanted to create products which focused on the 'how' with specific topics being addressed and to prompt the participant to consider how they handle student data.

It was decided that to help keep the participants engaged, instead of repeating the same content in both e-learning products that there would be different content contained within both. The researcher was mindful that to make the product usable to a wide audience, it was important to get a balance between simplifying the content and keeping it relevant. Over simplification, might not get them to question how they currently handle student data, equally making it too complicated or technical could confuse or exclude some participants.

The two products were created using different approaches: a screencast and dynamic learning objects.

- **A screencast**, is a digital recording of data being displayed on a computer screen which is created into a video.
  For this research, the screencast will be a PowerPoint presentation with the content focusing on the storage of personal data, the screencast was captured using PowerPoint Mix. The length of the video is: approx 3 mins

- **Dynamic learning objects**, is a collection of visual learning aids including interactive 3D models, videos and clickable infographics.
  For this research, a mini course comprising two lessons and a quiz was created using Articulate Rise software. Approximate time to complete 3 mins.

3.12.1 Developing the Screencast Product

As the first e-learning product had no audio element, it was decided to keep it to below three minutes in duration, as any longer would be hard to keep the participants engaged. Although this product was not adhering to CTML , it did adhere to normal Presentation Guidelines (Maynooth University, 2017, p. 21) namely:

- Do not clutter slides
- Keep the number of bullet points to a maximum of six points
- Consistent font usage in size and colour (size between 28-34)

In normal guidelines, it is recommended to include only key points / phrases, however as there was no narration, it was necessary to include full sentences.

The screen recording was completed using PowerPoint Mix, as the researcher was familiar with the functionality within PowerPoint, it did not require learning a new application. The researcher was mindful to allow sufficient time for the participants to read each slide and allow an additional few seconds in the transition to the next slide to allow for reflection.

For distribution of the product, the options were www.slideshare.com or www.youtube.com the researcher decided to go with www.youtube.com as most of the participants would be familiar with this website.

Figure 3-2 Product One uploaded to YouTube

The link for this product is available in Appendix 1

3.12.2 Development of Dynamic learning objects

The difference between the first product and the second product is that it was designed by incorporating Cognitive Theory of Multimedia Learning (CTML), which proposes using words and graphics rather than words alone.

The second product was created using Articulate Rise because it allowed for creating a new course by using a template that gave flexibility along with different functionality and interactivity. The product which was produced allowed for automatic multidevice optimisation for displaying the course.

The different elements available within this package, allowed for:

- Introduction section, available with both text and audio options
- Creation of individual lessons allowing for uploading of images, photographs, videos and audio files. For interactivity, a lesson could contain a touch marker within a photograph. Behind the marker a video, or text, and/or audio could be added.
- Quiz section, allowing for multiple choice, multiple response, fill in the blank or matching. Confirmation if answer was correct / incorrect along with feedback.

The product can be distributed via a link and is viewable using multidevice formats i.e. smartphone, tablet, laptop or computer. It is also possible to export as a SCORM package which could be imported into a Virtual Learning Environment (VLE).

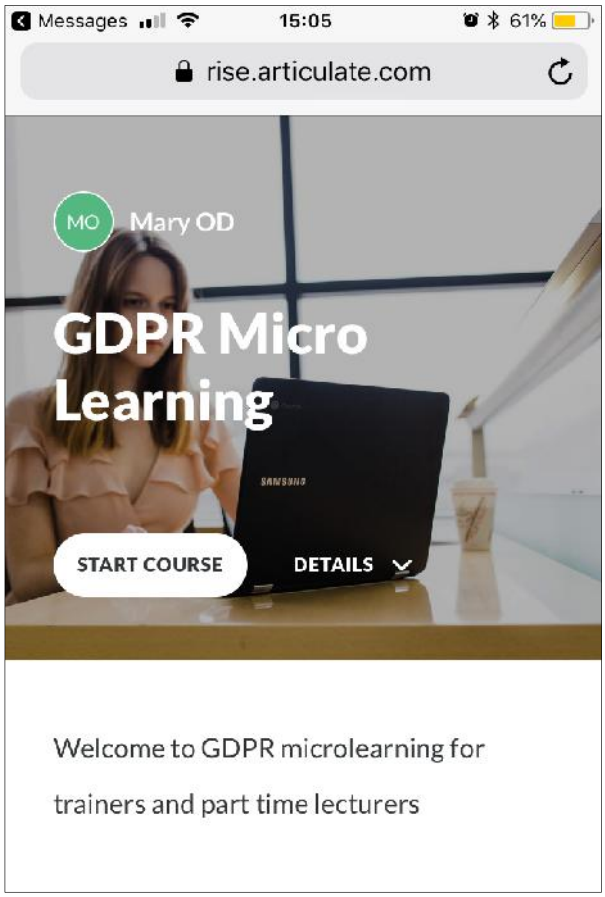

Figure 3-3 Screenshot of first page for the second e-learning product

3.13 Summary

This chapter addressed the research methodology selected, ethical issues, validity and limitations of this study. It then moved on to the decisions made when designing the products. The next chapter will focus on the findings from the research carried out via the interviews and the focus group.

Chapter 4

4.1 Introduction

In this chapter the researcher will describe the procedure followed in facilitating the interviews and the focus group. It will introduce data relating to the participants and will describe the main findings from the research carried out.

4.2 Procedures Followed

The interviews and the focus group were run over a period of ten days. The sample size was fourteen participants. There were eight interviews conducted, four were face to face and four took place online. There was one facilitated focus group with six participants. The interviews and the focus group were recorded.

Breakdown of the method of recording Interviews and Focus Group

Mode	How	Method of recording
Interview	Face to face	Audio recorded
Interview	Face to face	Audio visual recorded
Interview	Online	Audio visual recorded
Focus Group	Meeting	Audio visual recorded

Table 4-1 Method of recording data collection

Following the interviews and the facilitation of the focus group, all recordings were transcribed individually. As the researcher had used semi-structured questioning (Appendix 6) this allowed for the individual files to be combined into one document.

4.3 Participant Details

The researcher invited equal number of males and females to partake to have a balanced viewpoint, however, the final gender breakdown of the participants contained in figure 4-1, was eight males and six females.

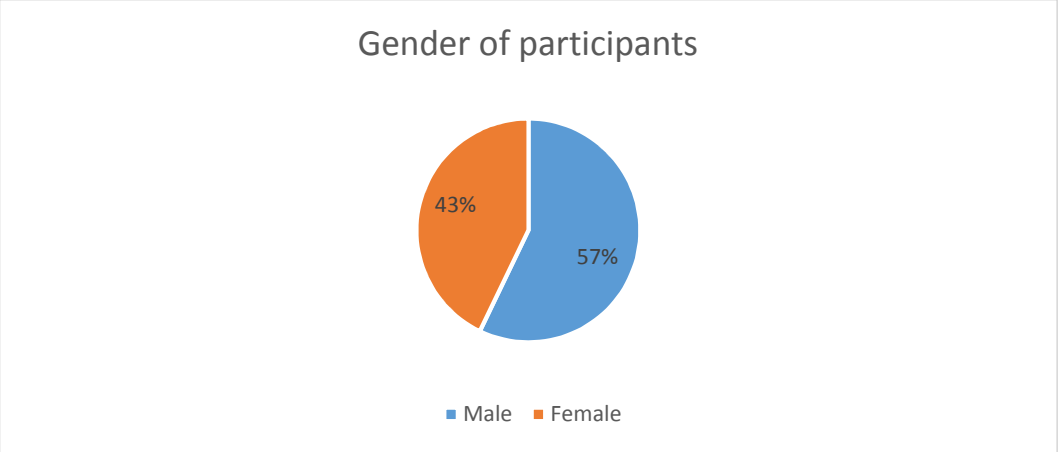

Figure 4-1 Breakdown of participants by gender

As this research was focused on the handing of student data on behalf of either third level institutions or training providers, the breakdown of occupations of the participants was either part-time lecturers in third level institutes or training in private industry and in the case of four participants, they were both trainers and part-time lecturers. The breakdown of the occupation of the participants is:

Part-time lecturers:	Eight
Trainers in private industry and part-time lecturers:	Four
Trainers in private industry:	Two

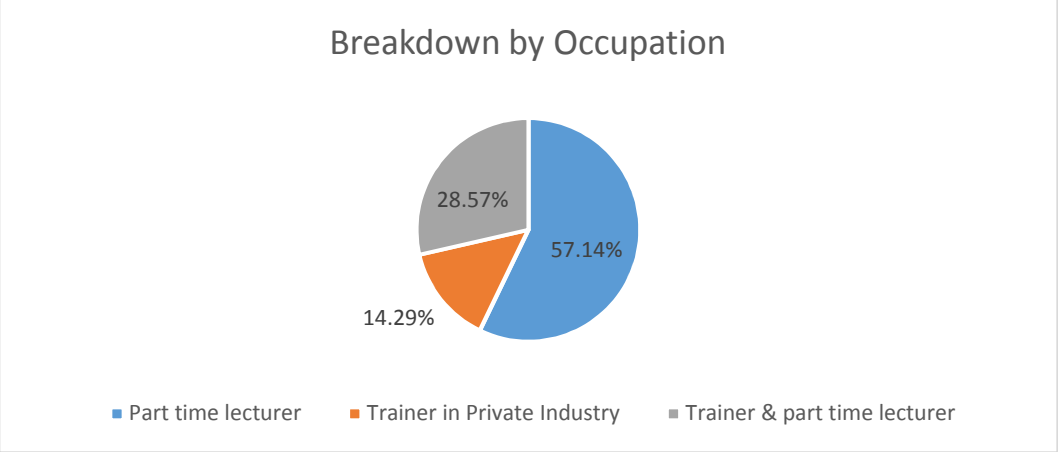

Figure 4-2 Breakdown of participants by occupation

As per the approval granted by the Ethics Committee of Griffith College (June 2018), all participants were anonymised, in table 4-2 it identifies the occupation of the participants to demonstrate the variety of occupations.

Coding of participants' profession:

	Employer	Role
Participant 1	University	Part-time lecturer
Participant 2	University	Part-time lecturer
Participant 3	University & Private Industry	Part-time lecturer & Trainer
Participant 4	University & Private Industry	Part-time lecturer & Trainer
Participant 5	University & Private Industry	Part-time lecturer & Trainer
Participant 6	Private college & Private Industry	Part-time lecturer & Trainer
Participant 7	Private Industry	Trainer
Participant 8	Private Industry	Trainer
Participant 9	Private college	Part-time lecturer
Participant 10	Private college	Part-time lecturer
Participant 11	Private college	Part-time lecturer
Participant 12	Private college	Part-time lecturer
Participant 13	Private college	Part-time lecturer
Participant 14	Private college	Part-time lecturer

Table 4-2 Details of participant breakdown

4.4 Key Findings from the Research

Research Themes

While transcribing the research, it became evident that five themes emerged. By grouping into these themes, it helped to address the research objectives, the themes identified are:

Theme 1 Attitudes to e-Learning Products

Theme 2 Learner Engagement

Theme 3 Assessment

Theme 4 Microlearning

Theme 5 GDPR

The researcher analysed these themes, which drew out findings and allowed the discussion to develop which in turn lead to the recommendations.

4.4.1 Theme 1: Attitudes to e-Learning Products

To ascertain the prior experience and the attitudes of the participants in using training videos, the researcher asked the participants if they were familiar with short training videos which are typically available on YouTube or training companies' websites.

The participants had all viewed these types of videos, with all of them confirming a positive attitude toward them and saw a role for them in a training or educational environment.

> Participant 3 said … *Short, brief and to the point, I think you can learn something very quickly and the benefits are... You can stop it and go back again if you get interrupted at some stage…. you can do them in the morning, in the evening, on your lunch break, whenever you want to.*

With Participant 13 adding 'If they are designed properly, …. when created by experts and condensed…. It really can be engaging.' Generally, people are positive about e-learning products, noting that they need to be created properly.

On the duration of the videos, most of the participants agreed that short and condensed is best with Participant 2 saying 'the shorter the better, just get to the point'

In relation to focused content, Participant 14 commented 'The short video would want to be targeted at exactly what I need to know.'

The last section on this theme is the usefulness of these short e-learning products as a training tool. Participant 7 was in favour of using videos as a training tool saying, 'I think learning through video is a very effective way to learn.' Participant 12 added, 'I love the little videos, especially for a class.' Most of the discussion throughout this research has been on the participants searching and using videos, however, the inclusion of them within the classroom, expands the effectiveness of them as a training or educational tool.

General positive disposition to this type of training with an acceptance that it is a viable and accessible method. People expect these products to be short and focused. Also, there is an acknowledgement that they should be designed 'correctly' by experts.

Recommendation: When designing e-learning products, ensure content is focused and keep the duration short. The product can be used in classroom environments, as support to same or as a standalone product.

4.4.2 Theme 2: Learner Engagement

When viewing the first product, the participants were passive as there was no opportunity to interact with the video. The interactivity and insertion of multimedia in the second product was described in Chapter 3.

Interaction and multimedia with the second product were cited as the most positive factors, with Participant 1 saying 'I like when you click on the screen, the fact that you can navigate around the screen.'

Participant 4 summed it up well by comparing the two products;

> *They are night and day, the second one is much better because of the way it is designed… the interactive nature of it. It is going to be more effective in my opinion.*

The interaction helped keep the participants engaged and there was an assumption that there would be a quiz which helped to focus the concentration.

The design of Product 2 allowed for the inclusion of multimedia, audio along with text and audio with video. The participants liked the multimedia element of the product with Participant 4 commenting,

> *I liked the multimedia aspect of it, you have somebody speaking to you, you have good imagery… we have the text there and it is read out and good images behind, so it is good fulsome communication.*

The value and positive response of the interactivity which the participants commented on links with the findings of Lajoie (2017, p. 627) 'that learners learn through their interactions; they construct knowledge by doing.' Also, the inclusion of the multimedia aspect, which adhered to the Cognitive Theory of Multimedia Learning (CTML) developed by Mayer (cited in Clarke and Mayer, 2016) this model explains how people learn during multimedia lessons. The positive feedback in relation to the multimedia elements validates this theory and the effectiveness of learning by using multimedia.

The strength of this product is that it contains multimedia aspects and it is interactive. However, the basics of keeping the content focused and the message simple with practical examples must also be adhered to.

Recommendation: Apply CTML when designing e-learning products. Use but do not overuse the multimedia and interactivity and keep the message focused with practical examples.

4.4.3 Theme 3: Assessment

The second product contained a quiz at the end, the participants engaged with it and got very competitive in both the interviews and the focus group. With Participant 6 saying, 'The quiz is very good, everybody loves a quiz and the extra bit of confidence comes from getting all the answers right.' All the participants enjoyed it and saw the benefit of it as it kept them engaged. There was even disappointment from Participant 1 that there weren't more questions in the quiz.

As everybody is coming to GDPR with varying levels of knowledge, the specific examples may be something that they already know. A suggestion from Participant 1 was, to have the quiz at the beginning so that you can establish what you already know, and you can then cover the lessons that you get wrong. The current product allows that the person can take the quiz at any stage. This further brought the researcher to the conclusion that for a topic like GDPR that from an employer's perspective, getting the assessment correct is more important than monitoring or tracking the lessons completed.

All the participants engaged with the quiz and saw the value of including one. The ability to take the quiz at the beginning would allow flexibility for the learner.

Recommendation: Include a quiz in future iterations of the product, ensure there are questions linked to each lesson, therefore if somebody does not get a question correct they know which lesson to go back to. The learner getting the assessment correct is more important than monitoring or tracking the completion of lessons.

4.4.4 Theme 4: Microlearning

When researching and creating the product, the researcher saw the benefit of microlearning as a way of refreshing or backing-up other learning whether it was e-learning, blended or classroom learning. However, the benefits of the microlearning became more evident during the research that the researcher is revising her thinking and now considers that microlearning can be used as for standalone training and a continuous training method. Boufford (2017) describes millennials as wanting to 'weed out superfluous information that surrounds them and focus on the key nugget of information they need to perform their next task or activity.' It challenges us to redesign our training programmes to provide learners with the information they need to know, it does not advocate long introductions with theory or background, just get straight to the point. The flexibility of the technologies available when designing a microlearning allows the creator to provide additional or back-up information that the learner can seek out if they want it. Epstein (2018) supports the concept that in order for microlearning to be successful it is ongoing and not just a once off with the content building and the learning being incremental.

We saw earlier under the attitudes to e-learning and in reviewing the two products for this research that the participants saw the value in short focused training. The second product was not only following the design principles of CTML, it also was a true microlearning product. It allows the flexibility of combining different lessons together so that short focused lessons can become a fuller product offering. Participant 5 said that the second product was 'very clear, very succinct, very structured and very useful.'

People want the training personalised and delivered to them in the way that they want it. This relates to aspects of multimedia preferences, content, availability and access to the microlearning product.

Different participants wanted the information presented to them in different ways, for example, one person might want the audio off whilst other person might want it activated immediately and others welcomed the control where they could turn it on or off if they wished.

The personalisation can be extended to what content is delivered. If you take the suggestion that it would be good to take the quiz first so that it would ascertain the level of knowledge before commencing the training. The feedback from the quiz could direct you to the lesson you got wrong. Remembering that people are coming with different levels of knowledge on a topic like GDPR, so this personalisation is important.

Another aspect of personalisation, is how you access the microlearning product. People will want it on a smart phone, tablet or laptop. It is important that the software package can deliver it effectively over multidevices.

During the research, the participants were shown both products on their phones. Some had previously viewed e-learning products on their phones whilst others had only viewed them on laptops, computers or tablets. Because microlearning is short and focused, it allows people to click into it anytime, anywhere and by using their phone. Participant 3 commented that,

> *A lot of the e-learning that you do… are more suitable for laptops, but I actually thought that [these two products] they were both very good for phone… you've got the phone with you, you could be on the bus, on a train and I thought that this was really handy*

The findings for this theme are that organisations should focus on what the learner needs as opposed to deciding what they need. Give flexibility which will allow personalisation. Microlearning can deliver training, when the learner wants it or just as importantly, when they need it

Recommendation: Design the training around the learners' needs. Give people short focused personalised training, with multidevice capability and access just in time and on time, with due respect to multimedia capability.

4.4.5 Theme 5: GDPR

GDPR came into effect on 25th May 2018 therefore, all participants in this research came with varying levels of knowledge and experience on the topic whether through company informative training videos or partaking in GDPR compliance training.

Participant 2 felt that there was a use for the second product elaborating by saying 'especially for GDPR, it was very simple it was presented simply, it wasn't cluttered, it was, these are the steps you need to take, these are the things you need to think about, it was good.'

Having reviewed these short products, all participants were asked if they had learnt anything in relation to the topic of GDPR, they were all pleased with the outcome, because they felt it heightened their awareness with practical examples. Additionally, six participants pointed out that there were specific actions that they would take to change how they handle student data.

The content of these short training products was designed to question how people handle student data and to evaluate if they are being compliant. What became evident was that some people had a misperception of how compliant they are, an example of this was that three of the participants claimed that they do not handle student data on their mobile phones, however, they went on to say that they answer emails on their phones which prompted two of them to realise that some student emails could contain student data. This meant that one of the participants hadn't realised that by answering student emails on a phone, they could potentially contain student data.

Having reviewed both products, it raised a discussion within the focus group concerning potential security issues for full-time lecturers compared to part-time lecturers. For full-time lecturers accessing student data, this is an internal security issue. For part-time lecturers, some of whom could work in other organisations, they could potentially be downloading student data onto computers within this other organisation. There wasn't a clear solution to this issue, however, it did raise the point of the importance of security with part-time lecturers accessing student data remotely on computers which belong to other organisations.

Additional learning which the researcher identified as a result of carrying out this research.

- A student requesting an extension on an assessment deadline might provide the lecturer with a doctor's certificate. Therefore, the lecturer is now handling 'sensitive personal data' i.e. details on health which under Article 8 no.1 of the GDPR requires additional security requirements.

- The implementation of GDPR training could also be extended to two other categories of staff:
    - As full-time lecturing staff could be accessing student data on their own personal devices
    - In certain circumstances, External Examiners could be accessing student data on either personal devices or possibly the devices of another organisation or institute.

    Both categories of staff should be aware of security issues relating to accessing student data remotely.

As everybody is coming to any GDPR training with some pre-existing knowledge of it, they may believe that they are compliant. However, when faced with specific scenarios they might realise that they are not compliant after all. Also, part-time lecturers might only interact with a college or university on a limited basis, they may belong to another organisation or institute, and they may follow the GDPR policies for their original organisation or institute. However, as they are acting as a Data Processor for the second college or university, the onus is on this college or university to ensure that all part-time lecturers are compliant with their GDPR policy and implementation of same. GDPR is a complex and detailed regulation, however, by giving focused practical scenarios it is possible to help heighten awareness, with a focus on change in attitude and increased responsibility towards handling of student data.

Recommendations: Compliance training is not a once-off training, especially if people are part-time and only interact on a limited annual basis, it is about the practical application of policies. Review retention policies to ensure that they have been designed to consider all external people who handle student data on behalf of a college, university or training provider.

4.5 Summary

This chapter began with an explanation of the process followed post the facilitation of the interviews and focus group. It described the breakdown of participants. It identified five themes, after analysis it identified findings and listed recommendations.

The next chapter will summarise the issues the researcher set out to address, the findings for this research summarising the recommendations. The researcher reflected on the process and and offered some suggestions for further development.

Chapter 5

5.1 Introduction

In this chapter the researcher will recap what she had set out achieve with this study. She will summarise the findings and recommendations, she will reflect on the process and finish with some suggestions for further development.

5.2 The Research Objectives

With the implementation of GDPR in May 2018, organisations throughout the EU became more aware of their responsibility on collecting, storing, and processing personal data. Training was identified as a key method to ensure compliancy with GPDR.

The two research objectives were:

- To design and produce an e-learning product for part-time lecturers or trainers in private industry on the topic of GDPR.
- Evaluate the effectiveness of an e-learning product which adheres to the Cognitive Theory of Multimedia Learning (CTML) by comparing it with another e-learning product which doesn't adhere to this theory.

5.4 Findings and Recommendations

The products which were developed answered the research objectives listed above. The feedback confirmed that the product designed adhering to the Cognitive Theory of Multimedia Learning was more effective than the product which did not adhere to this theory. The interactivity and multimedia led to greater engagement than the passive product.

The findings also proved that it was possible to take a topic as complicated as GDPR, break it into bite sized pieces, distribute it via multidevices and this this can be an efficient and impactful way to deliver training.

The following is a summary of the research themes and recommendations.

Theme 1 Attitudes to e-learning Products

Recommendation: When designing e-learning products, ensure content is focused and keep the duration short. The product can be used in classroom environments, as support to same or as a standalone product.

Theme 2 Learner Engagement

Recommendation: Apply CTML when designing e-learning products. Use but do not overuse the multimedia and interactivity and keep the message focused with practical examples.

Theme 3 Assessment

Recommendation: Include a quiz in future iterations of the product, ensure there are questions linked to each lesson and therefore if somebody does not get a question correct they know which lesson to go back to. The learner getting the assessment correct is more important than monitoring or tracking the completion of lessons.

Theme 4 Microlearning

Recommendation: Design the training around the learners' needs. Give people short focused personalised training, with multidevice capability and access just in time and on time, with due respect to multimedia capability.

Theme 5 GDPR

Recommendations: Compliance training is not a once-off training, especially if people are part-time and only interact on a limited annual basis, it is about the practical application of policies. Review retention policies to ensure that they have been designed to consider all external people who handle student data on behalf of a college, university or training provider.

Link to final iteration of Product and earlier Product links are available in Appendix 1

5.4 Reflection on the Process

Learning and evaluating the software packages was very insightful. The functionality of the software package Articulate Rise suited the needs for this research. Whilst developing the product, it became

evident that the package could deliver a better product than originally expected. This is because the software is very intuitive, it allowed for a non-technical person to develop a microlearning product which means it would be within the capabilities of Learning and Development Department staff member to produce similar quality.

At the beginning of this process, the researcher had some knowledge of microlearning and the benefits of it. What became obvious whilst carrying out the research was that it was more adaptable and effective than literature had highlighted. Within the literature and the online blogs, there was evidence that industry was supporting microlearning, they kept using the expression 'just in time' training, however, the researcher believes that there are more benefits to this adaptable and effective method of delivering training. The benefits of microlearning are in the ease of; developing it, updating it, distributing it, personalisation, accessing and interactivity. These benefits apply equally to those designing the training and the learners.

Continuing Professional Development (CPD) is an iterative process, with training needing to be delivered on an ongoing basis. People want to take control of their own personal development and how and where they learn. With the casualisation of some professions, where people are only paid for the hours they work, they no longer want to travel to a company or campus for training. Therefore, the classroom is no longer a viable option and e-learning needs to be more dynamic and adaptive.

As technology keeps developing and changing, so must staff training. New approaches must be explored, combining two different theories to produce a better product. Using multimedia with microlearning, this is moving away from the traditional way of delivering training. Microlearning is accepted by millennials as their preferred way of receiving information and training. This offers huge opportunities for Learning and Development Departments to deliver the training they want in bite size chunks. With the development of new intuitive software packages, the content creators can be subject matter experts and not technical staff.

5.5 Suggestions for Further Development

This research has proved that elements of GDPR can be taught, it didn't try to address all the issues within GDPR. With a topic like GDPR and other compliance issues, attitudinal change and personal responsibility also play a part. As attitudinal change can take weeks or months to become effective It is about creating new habits, so repeated touching base, feeding new examples will help to embed the learning.

In this research it only addressed GDPR training, however, it has a wider applicability, the flexibility of the microlearning product will allow Learning and Development Departments to explore other uses. There are at least three other areas where microlearning could have a role. One is onboarding or induction training, where a new employee must complete certain training before fully engaging in their role. The second is compliance training, as this research demonstrated complex compliance training for GDPR can be delivered via microlearning, so it could be extended to other compliance training. Lastly, for universities, colleges or training providers to develop a series of microlearning lessons which could form the basis of a Continuous Professional Development (CPD) for their full-time or part-time staff.

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Appendix 1

Links to the e-learning products

Link to e-learning Product One:

https://www.youtube.com/watch?v=-rhMCAk96d8&feature=youtu.be

Link to e-learning Product Two:

https://rise.articulate.com/share/wL7gCSZWHdc1e5wTDUQW5-xaeYxSU5vM#/?_k=fx9u5y

Link to final product:

https://rise.articulate.com/share/iYjCQWOvHz6eE_nhdDkdlbeuRpLNWXAG#/lessons/xAKJD7reVzYKcJvQCqCvkQusRN6VOSsi?_k=3ji3jq

Or available via Moodle on

http://www.arrivas.net/moodle/

(Guest login available – no password required)

Please see following pages, as it contains information which was given to participants in relation to navigation through the e-learning products.

Information for participants using the e-learning products

Thank you again for agreeing to participate in my research.

You will be shown two products.

++++++++++++++

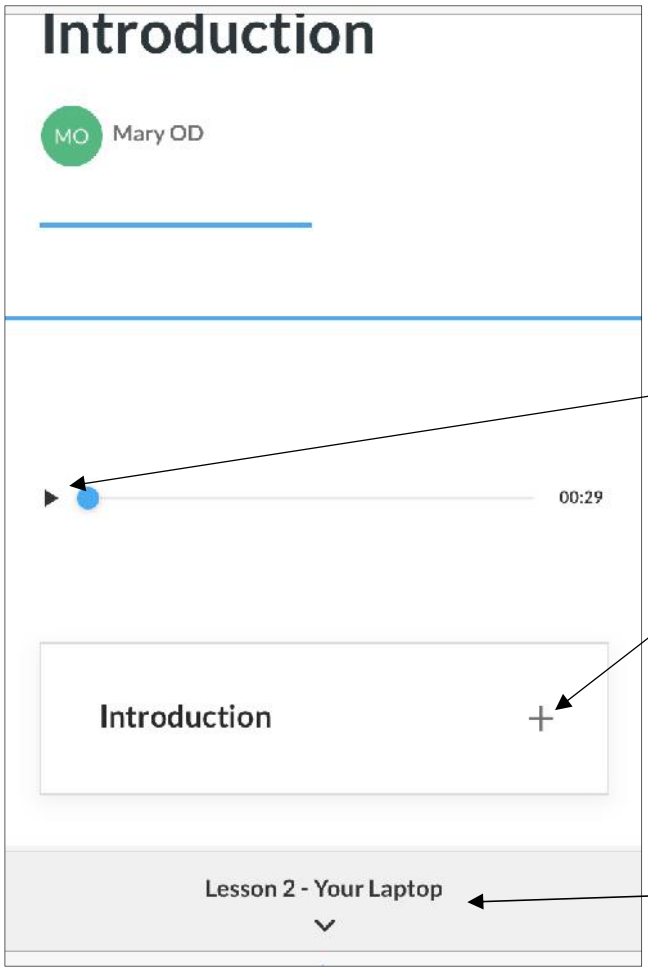
The first is a YouTube video using a screen recording of a PowerPoint Presentation, there is no audio with this video.

++++++++++++++

The second product includes text, audio, a video and a quiz.

To assist your navigation here are some tips:

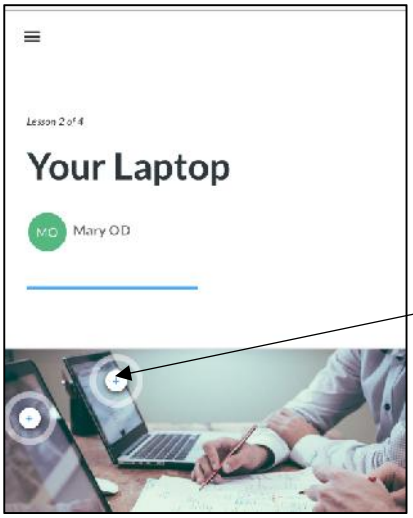
Welcome to GDPR microlearning for trainers and part time lecturers



Scroll up the screen so that you can see the content. Here you have a choice of listening to the content, reading the content or both

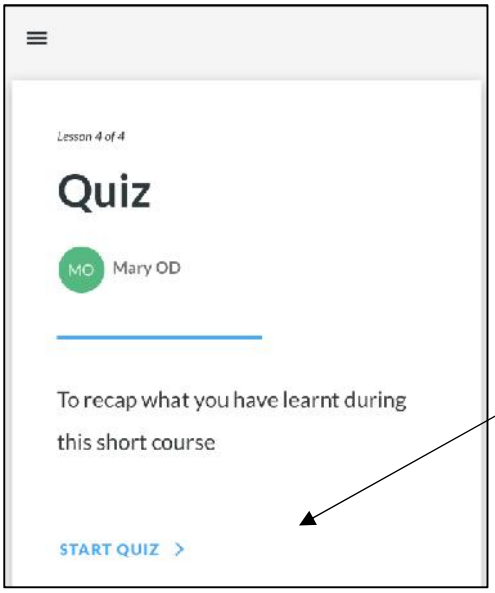
- Audio start
- Introduction text

To move onto the next lesson, click here



Click on the icon on the screen to open new content

When you are finished with audio or video, please click the X to close this section



When you are finished with audio or video, please click the X to close this section

Appendix 2

GDPR Terminology

Each Member State within the EU appoints an independent public authority to act as the Supervisory Authority (Art.4 No.21 GDPR). The Supervisory Authority is responsible for the implementation and monitoring of the GDPR within their state.

Private organisations who are systematically processing personal data are obliged to appoint a Data Protection Officer (DPO) who is responsible to monitor the GDPR compliance of the organisation (Voigt and Von dem Busshe, 2017, p. 61). In order to ensure the successful monitoring or the organisation's compliancy, the appointment of the DPO must be based on their expertise and professional qualities (Voigt and Von dem Busshe, 2017, p. 3). The DPO has a number of statutory obligations which include being the first point for the Supervisory Authority and the person whose data has been collected (Association of Colleges UK, 2017).

Data Controller, is an individual or entity that alone or jointly with others, determines the purposes and the way in which personal data will be processed (Art.4 No.7 GDPR).

Data Processor, is an individual or entity who processes the data on behalf of the controller, they do not make decisions on how data is processed (Art.4 No.8 GDPR).

Personal data, relates to an identified or identifiable individual (Art.4 No.1 GDPR). Data is personal if by using the available data a person can be identified. For example:

- A person's name
- Identification number such as Personal Public Service Number (PPSN), student number
- Address
- Online identifiers, such as IP addresses

(Voigt and Von dem Busshe, 2017, p. 11)

Data Subject, is a person whose personal data is being processed by a controller or processer (Art.3 No.2 GDPR 2016), for the remainder of this paper the data subject shall be referred to as a student.

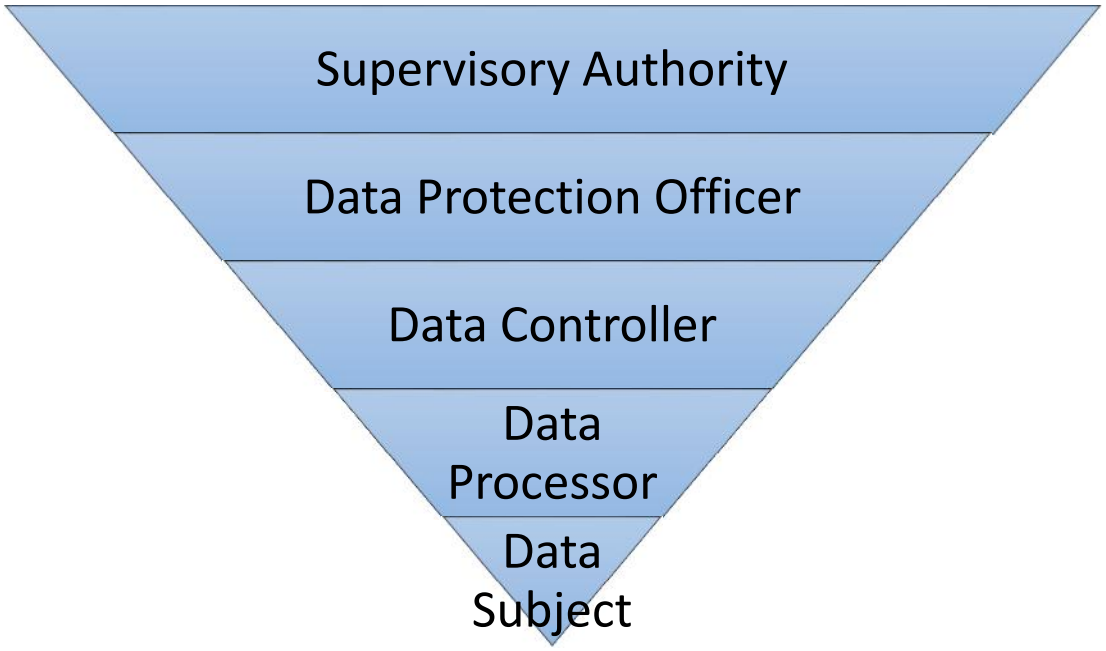


Figure A-1 Adaptation of the Hierarchy of Roles within GDPR

GDPR Consent

The process as to how consent is gathered from a student will not be covered within the scope of this research, however, the author is including the conditions as laid out in Article Seven (GDPR) as any data controller or data processor must be aware of the conditions in which personal data was collected;

- The data controller must be able to demonstrate that student has consented to the processing of their personal data
- If consent is sought in a written declaration which also contains other matters, the request for consent must be presented clearly distinguishable from other matters and explained in clear and plain language to avoid ambiguity
- The student shall have the right to withdraw their consent at any time. Prior to the student giving consent, they must be made aware that any processing of data prior to any request to withdraw consent is lawful. It shall be as easy to withdraw consent as it is to give consent
- Consent for processing the personal data must be freely given, it must clearly identify which data processing will take place. The consent for all data processing activities cannot be linked to for example, acceptance on to the course. The student should have the option to be

accepted onto the course and opt out of any processing which is not identified by the college as intrinsic to the life cycle of the programme. Any data processing which is outside of the intrinsic to the life cycle of the programme must be clearly identified and the student can have the option to not give consent to this processing and still be accepted on the course (Voigt and Von dem Busshe, 2017, pp. 96–97)

Appendix 3

Analysis and Development of product

In the ADDIE Instructional Design Model, the first step is Analysis. A Training Needs Analysis (TNA). Garavan, Hogan & Cahir-O'Donnell defined Training Needs Analysis as 'a need for human performance improvement arising from a deficit or an opportunity that can be met by an appropriate training intervention' (2003, p. 139).

In the Analysis Phase, the implementation of GDPR is the training opportunity being provided, the primary document required for the content of the training programme will be the General Data Protection Regulation (EU Publications Office, 2016). Secondly, the researcher carried out a Training Needs Analysis (TNA) to evaluate what data is accessed and processed. This identified the areas which need to be reviewed / new processes put in place,

Areas identified to be addressed in training programme:

1. Accessing data remotely (viewing online or downloading)
2. Security issues when storing data on personal laptop
3. Storage of data on mobile devices (either smartphone or tablet)
4. Synchronising data between devices
5. Password security
6. Deletion of data (folders, download files, recycling bin)

When designing a training product, the first decision to be made is whether it will be Learner Centred Verses Technology Centred. As described by Mayer (2017, pp. 13–15) the Technology Centred design is influenced by the starting off point of the capabilities of multimedia with a goal of providing access to information, by using cutting edge technology, this is similar to how Zhang (2013) described the second generation. Whereas with the Learner Centred approach, the starting off point is how the human mind works, with a goal of aiding human cognition, with a focus on how we can adapt the multimedia technology to design appropriate content, again this is in-line with Zhang's third generation of e-learning (2013).

Appendix 4

Cognitive Load Theory (CLT)

CLT has been linked with evolutionary theory, Pas & Sweller (2014) define the distinction between biologically primary and secondary knowledge. Biologically primary knowledge, we acquired naturally, e.g. learning a native language. Biologically secondary knowledge, we do not naturally acquire and therefore need assistance, e.g. reading and writing. Additionally, they introduce the two types of memory; long-term memory and working memory and their attributes. Capacity-wise, there is evidence for the long-term memory to be large. Functioning, the basic human cognitive activities are derived from information stored in the long-term memory. Whereas the capacity of the working memory is small with time limitations for processing new information. One of the functions of the working memory is to identify which new information could be used to change the information held in the long-term memory. For learning to take place, it requires altering to take place within the long-term memory, and this must be processed via the working memory.

Pas & Sweller (2014) identified the three categories of cognitive load which are included in the Cognitive Load Theory, they are: intrinsic, extraneous and germane cognitive load. All three of these categories are involved in acquiring, storing and using the biologically secondary knowledge.

Intrinsic category: involves different elements which interact, and which must be processed simultaneously. Alterations cannot be made other than by changing the nature of the task. However, it is possible to create mini-tasks and as learning is achieved on the mini tasks, bring them together to form a larger task.

Extraneous category: when instructional design involves introducing interacting elements, all of which may not be necessary, to reduce cognitive load, alter the instructional design.

Germane category: to overcome the limitations of the working memory, instructional design eliminates extraneous cognitive load, therefore only delivering intrinsic cognitive load which enables learning to take place (Pas and Sweller, 2014).

Principles and Processes of Learning

Research in the cognitive science has identified three principles of learning. (Clarke and Mayer, 2016, p. 35), they are:

- *Dual channels*; people have capacity to process via two channels both visual (pictures) and auditory (verbal)
- *Limited capacity*; people can only actively process limited information in each channel at any one time
- *Active processing*; there are few elements which must be evident to foster learning.
    - The learner must engage with the appropriate cognitive processes
    - Attending and organising the material in a clear structure
    - Linking the new learner with what they already know

Principles involved in designing Multimedia Learning

Clarke and Mayer (2016) have developed the following seven principles for multimedia learning.

- The Multimedia Principle: use words and graphics rather than words alone
- The Contiguity Principle: align words to corresponding graphics
- The Modality Principle: present words as audio narration rather than on-screen text
- The Redundancy Principle: explain visuals with words in audio or text but not both
- The Coherence Principle: adding extra material can hurt learning
- The Personalisation and Embodiment Principle: use conversational style, polite wording, human voice and virtual coaches
- The Segmenting and pertaining principles: managing complexity by breaking a lesson into Parts

The Multimedia Principle:

Use both words and graphics in all eLearning courses rather than words alone (Clarke and Mayer, 2016, pp. 67–87).

Words are printed text which appears on the screen and the learner reads or spoken words which the student listens to.

Graphics are either static images, drawings, photos, graphs & maps or dynamic graphics which are video or animation.

When using both words and graphics the learners are more likely to engage in active learning, as they mentally connect the words and pictures to make the connection with prior knowledge and therefore support their learning. Conversely, using words only can limit the learning to shallow learning and not connecting to other knowledge.

The Contiguity Principle:

Align words to corresponding graphics (Clarke and Mayer, 2016, pp. 89–111).

With this principle the things to avoid are:

- The explanation/words being spoken before the graphic is presented
- Too much content being provided on the screen, therefore the learner must scroll and may have a disconnect between the words and the graphic
- Giving feedback/answers to questions that appear on a separate screen to the learner's answers, requires the learner to switch between screens
- A detailed legend with numbers indicating parts of the diagram, as this requires the learner to keep switching from legend to diagram
- Spilt screen with text in one section and video/animation in the other, learner will be confused as to which to watch

When words and graphics are separated, learners must use their scarce cognitive resources to join them up. This creates a cognitive processing called extraneous process which is unconnected to the instructional lesson. By using their scarce cognitive resources on extraneous process impacts on their capacity organise and integrate the information.

The Modality Principle:

Present words as audio narration rather than on-screen text (Clarke and Mayer, 2016, pp. 113–130).

If words are presented as text along with a graphic or animation, the learner's visual/pictorial channel can become overloaded. If they must read the text with an explanation, they then must switch their eyes to the graphic, they lose time and requires them to keep switching between the graphic and the written word.

When eLearning is designed to deliver the words as auditory, the learner could look at the graphic simultaneously and follow the instruction, therefore avoiding the visual/pictorial channel overload.

By including a video in the second product, this adheres to the Modality Principle (Clarke and Mayer, 2016, pp. 113–130), when e-learning is designed to deliver the words as auditory, the learner can look

at the graphic simultaneously and follow the instruction, therefore avoiding the visual or pictorial channel overload.

The Redundancy Principle:

Explain visuals with words in audio or text but not both (Clarke and Mayer, 2016, pp. 131–150). When a programme is designed to include graphics and on-screen text along with audio narration where the audio is a repetition of the text, this technique is referred to as *redundant* on-screen text. According to CTML, adding redundant on-screen text can overload the visual/pictorial channel and like the Contiguity Principle can use up scarce cognitive resources.

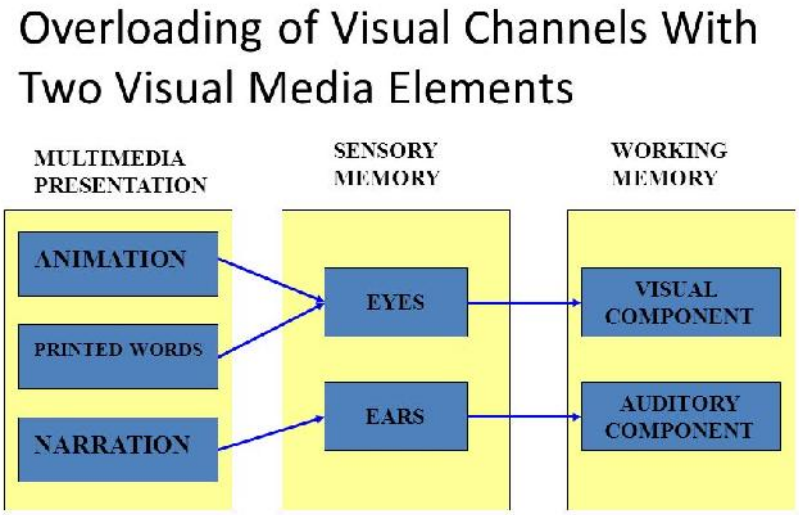


Figure A-2 Overloading of Visual Channel. Adapted from Mayer, 2009

The Coherence Principle:

Adding extra material can hurt learning (Clarke and Mayer, 2016, pp. 151–176). To keep learners engaged, some designers embellish the content by adding in extra pictures or background music and this can have the opposite effect. Avoid extraneous content, the lesson here is, less is more.

The Personalisation and Embodiment Principle:

Use conversational style, polite wording, human voice and virtual coaches (Clarke and Mayer, 2016, pp. 179–199). When preparing the scripts, use conversational language, 'you', 'your', 'our' and 'we'. Feedback should use polite wording, less formal. Always use a human voice and where possible include a virtual coach, whether animated or real.

The Segmenting and pretraining principles:

Managing complexity by breaking a lesson into parts (Clarke and Mayer, 2016, pp. 201–217). Even having applied the above principles, you could be faced with a complex training scenario which could still be overwhelming for the learner. The segmenting and pretraining principle is about breaking content into mini-lessons or bite size segments, allowing the learner to stop, reflect and maybe replay before continuing. The key concepts or technical terms should be explained before the lesson begins, therefore setting the context, this is the pretraining element of the principle.

Appendix 5

Research Methodology

The first layer of the research onion (see figure 3-1), is the research philosophies, they can be defined as 'the system of beliefs and assumptions about the development of knowledge' Saunders et al (2016, p. 124) the two main paradigms of research philosophies are positivism/postpositivism and phenomenological/interpretivist, they are more commonly known respectively as quantitative and qualitative approaches.

The term positivism refers to what is 'posited' i.e. 'given'. Saunders et al (2016) identify that the positivist focuses on research designed to produce pure data and facts which is not influenced by human interpretations or biases. Crotty (cited in Saunders et al 2016) further defined that epistemologically the focus is on discovering observable and measurable facts and only phenomena that can be observed and measured would lead to reliable and meaningful data. Conversely, Saunders et al (2016) identified the value of interpretivist research is in creating these rich insights which could otherwise be lost if rigorous generalisations were applied.

The next layer is the approach, whether it is deductive or inductive. The deductive approach begins by reviewing what is known about a given subject or theory, researchers then develop an hypothesis, they then design a quantitative method of gathering the data to test the theory (Saunders et al, 2016). On the other hand, the inductive approach starts by collecting data to explore a phenomenon in order to generate or build a theory (Saunders et al, 2016). The researcher has selected deductive.

Quantitative research focuses of the numerical data whilst qualitative focuses on making sense of the phenomenon being researched. The researcher selected qualitative method.

The next stage of the research onion explores the different methodological choice. Here the options are: Mono methods for both quantitative and qualitative, multi-method for both quantitative and qualitative and mixed method simple and mixed methods complex. The researcher selected mono method.

There are eight research strategies which are identified in the research onion, they are:

- Experiment
- Survey
- Archival research
- Case Study
- Ethnography
- Action research
- Grounded theory
- Narrative inquiry

The researcher selected case study.

Appendix 6

Invitation Letter / email to participate

x June 2018

Dear Colleague

I am a trainer and a part-time lecturer, the recent implementation of General Data Protection Regulation (GDPR) has raised my awareness about how I store personal data of students and the implications of this going forward.

I have created two short e-learning products on GDPR and want to consider the impact and effectiveness of both. I would greatly appreciate your participation in this research.

The results of this research will contribute to a dissertation by practice for the Master of Arts in Training and Education in Griffith College, Dublin.

Ethical permission to conduct this research has been granted by the Ethics Committee in Griffith College. The research will uphold the highest ethical standards. Confidentiality and anonymity are guaranteed; your name or the name of your organisation or any other identifying feature will not appear in any research report or publication. The data from this research will be stored on a password protected computer.

It is envisaged that this research will contribute to a growing body of knowledge on e-learning and GDPR. If you require any further information about the research, please contact me (mary.odriscoll@arrivas.net). If you would like a copy of the research or an executive summary of the research when it is completed, please let me know. Should you wish to withdraw from this study at any time you are free to do so.

My supervisor is Mary O'Toole (Learning Technologist and Lecturer).

I give my assurance that all information gathered as part of this research will be destroyed after graduation or in 24 months, whichever is sooner.

Sincere thanks for your participation.

Yours truly,

Mary O'Driscoll

Participation information:

Researcher: Mary O'Driscoll

Organisation: **Arrivas Training & Development**
Supervisor: Mary O'Toole

Title of Study: When creating a GDPR e-learning product, is the design and effectiveness of the product impacted when using Cognitive Load Theory (CLT)

What is the purpose of this research? The purpose of this research is to create a product and get feedback on the effectiveness of this product. By obtaining this feedback it will enhance the effectiveness for producing future training products and it will also contribute to a growing body of knowledge on e-learning. I am completing a dissertation by practice as part of the award of the Master of Arts in Training and Education in Griffith College.

Outline of research study:

This research considers the impact and effectiveness of courses designed by using different design methods.

Two short training products were created using different design technologies. You will be asked to compare and contrast these products and give feedback as to how effective and/or impactful either product is.

If you agree What would I need you to do?
Your participation in the study would be greatly appreciated. If you agree to participate, your involvement means taking part in a focus group or (and) a one-to-one interview with the researcher which could take up to an hour. You will be observed while interacting with the training products and you will be debriefed at the end of the focus group or interview.

Your name will not appear on any documents. Everything you say will be kept strictly **PRIVATE** and **CONFIDENTIAL**. The results of the study may be published but you will not be identified in any way.

The researcher will be happy to answer any questions you have. This research has received ethical approval from the Ethics Committees in Griffith College.

Should you wish to withdraw from the study at any time up to four weeks prior to the deadline for submission of the dissertation, you are free to do so. You are also free to withdraw your data, without giving a reason for withdrawing, and without your withdrawal having any adverse effect for you.

Consent Form

Researcher's Name: Mary O'Driscoll

Organisation: Arrivas Training & Development

Title of Study: When creating a GDPR e-learning product, is the design and effectiveness of the product impacted when using Cognitive Load Theory (CLT)

Consent (To be completed by the participant)

Do you understand what will take place in this study?	YES/NO
Have you had an opportunity to ask questions and discuss this study?	YES/NO
Have you received satisfactory answers to all your questions?	YES/NO
Has it been explained to you that you will be observed while interacting with the training products?	YES/NO
Has it been explained to you that you will be debriefed after the session?	YES/NO
Do you understand that you are free to withdraw from this study at any time without giving a reason for withdrawing and without your withdrawal having an adverse effect for you?	YES/NO
Do you agree to take part in this study the results of which are likely to be published?	YES/NO
Have you been informed that a copy of this consent form will be kept by the researcher?	YES/NO
Are you satisfied that any information you give to the researcher will be kept confidential? Your name or the name of your employer will not appear in the research report.	YES/NO

Name of Participant (printed) _____

(signature)_____ Date _____

Signature of Researcher _____ Date_____

Semi Structured Questions for Focus Group & Interviews:

The following are a list of questions which was used in both the focus group and the interviews. In order to get further feedback on these questions, the researcher asked the participants to elaborate more where appropriate.

1) Before watching these e-learning training products, on a scale of 1-3 how confident were you of General Data Protection Regulation (GDPR) and your responsibility in handling student data:
    1 Not very confident
    2 Relatively confident
    3 Very confident

2) Have you watched short e-learning products which are typically uploaded to YouTube, or are available on Training Providers' or Government websites?

    What is your attitude to these short videos?

    Positive

    Why

    Negative

    Why

3) Referring to the first video:

    What did you think about the way the information was presented?

    What did you like about this video?

    Can you give examples?

    What did you not like about the video?

    Can you give examples?

    What changes do you think could be made for future e-learning products?

    Can you give examples?

    Did you feel you learnt anything from it?

    If so what?

4) Having watched this video, on a scale of 1-3 how confident are you of General Data Protection Regulation (GDPR) and your responsibility in handling student data:

1 not very confident

2 Relatively confident

3 Very confident

5) Referring to the second e-learning product

What did you think about the way the information was presented?

What did you like about this training product?

Can you give examples?

What did you not like about the product?

Can you give examples?

What changes do you think could be made for future e-learning products?

Can you give examples?

Did you feel you learnt anything from it?

If so what?

6) Compare and contrast

7) Having watched the second training product, on a scale of 1-3 how confident are you of General Data Protection Regulation (GDPR) and your responsibility in handling student data:

1 not very confident

2 Relatively confident

3 Very confident

Appendix 7

Other e-learning products on GDPR which were reviewed

URL	What type of course	Length of video	Marks out of 5	Comments
https://www.youtube.com/watch?v=6fITStJ-4Es	Inform	3:25	4	Clean text Used more than one colours Good pace
https://www.youtube.com/watch?v=4yPxs4D9u_c	Inform	2:33	4	Clear message Related to a school (Neg – used stock photos Pace a bit fast)
https://phrism.com/gdpr/	Inform (sales pitch)	4:32	3	Clear text Good pace
https://legalisland.schoolvle.org/mod/scorm/view.php?id=484 and https://legalisland.schoolvle.org/mod/scorm/view.php?id=689	Perform	30 50	5 5	Good layout, clear text, Good pace Assessment at the end
https://www.futurelearn.com/courses/general-data-protection-regulation/3/todo/27816	MOOC / perform	4 weeks	4	Good content (negative: pace a bit slow)
https://www.youtube.com/watch?v=fGsltpMr8xA	Inform	1:39	2	Too much information in a short period of time, too much graphics Pace a bit fast
https://www.youtube.com/watch?v=T6uro05J8ZY and https://www.youtube.com/watch?v=dGqMXOKeujQ	Inform Inform	2:04 3:41	1 1	Only written text – no spoken
https://www.youtube.com/watch?v=HevII3zqc44 for schools	Inform	5:32	2	No spoken, only music (limited music on a loop)