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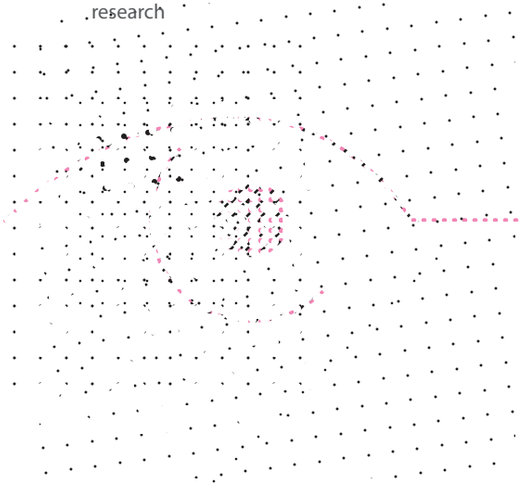

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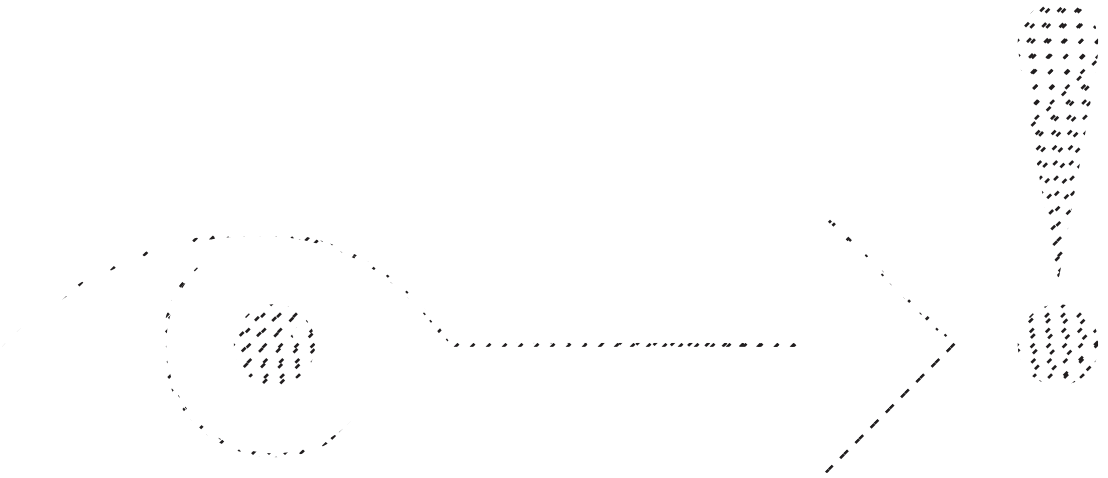

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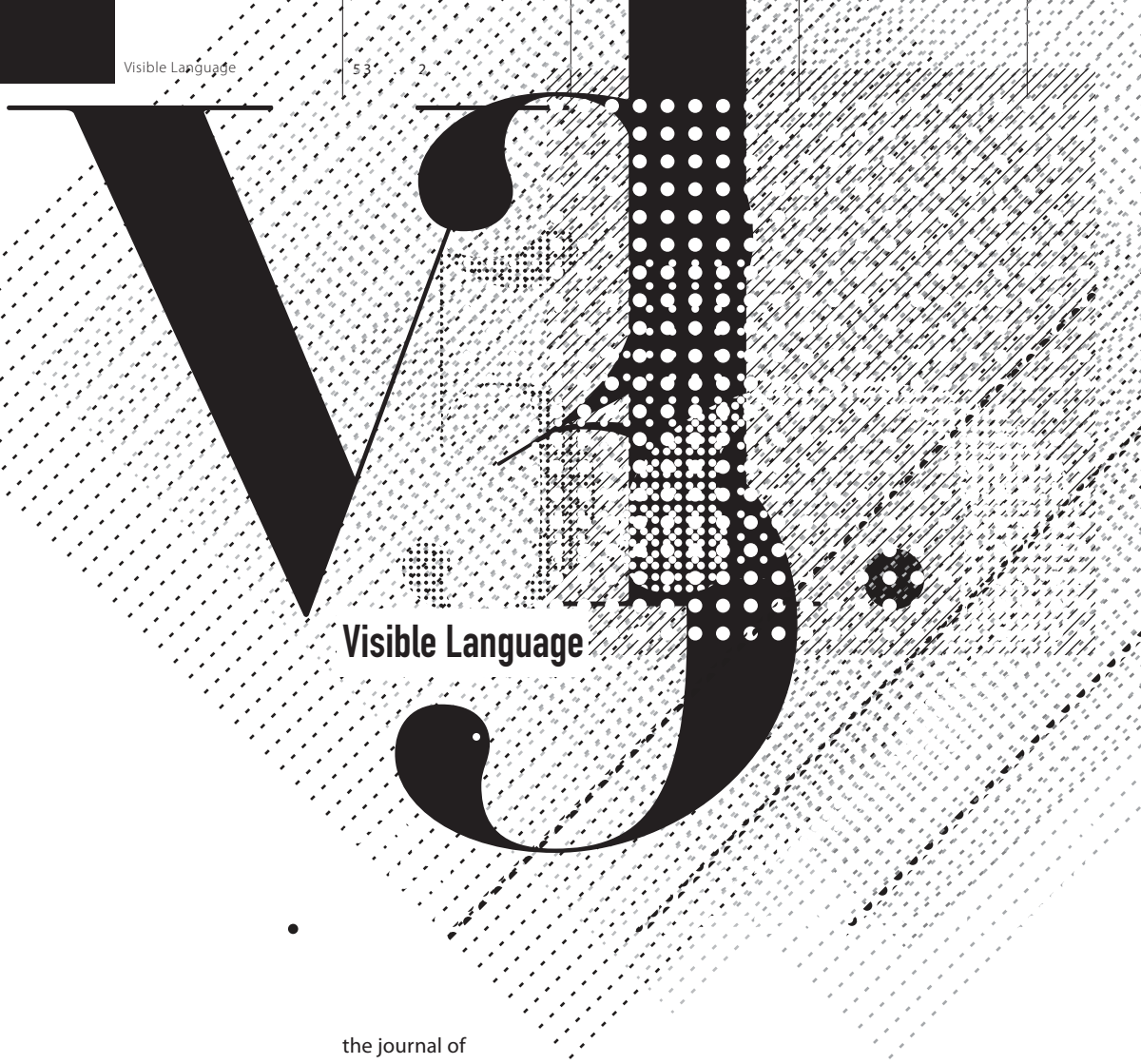

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Visualizing the terror threat: The impact of communicating security information to the general public using infographics and motion graphics.

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Terrorism represents one of the most pressing contemporary security threats. As a consequence, governments provide information to the public on threat levels and on how to respond to terror incidents. To effectively reassure the public, and to increase their vigilance, it is essential that the information communicated is accessible, clear, actionable and engaging. This is the first empirical study in the world to explore the impact of information design principles and visualization of information on the communication of security information related to terrorism. Two different but complementary strands were devised: Strand 1 – compared whether more visualized information was more effective than text dense information at communicating to the public; Strand 2 – compared whether a motion graphics was more effective than an infographic at communicating to the public. An initial usability test was conducted to identify existing problems and needs. Several other usability tests and iterations were then conducted to develop new design solutions. Empirical testing was then conducted for final evaluation and validation, collecting quantitative and qualitative data. Results show significant differences between pre- and post-knowledge of the Terror Threat Levels. Results also show significant differences between text dense information and more visualized information. Results further show no significant difference between communicating information via an infographic or motion graphics in situations where information needs to be assimilated as a crescendo (i.e. levels of severity) or as a series of steps to be followed (action in an emergency). This study provides important guidelines on how to effectively communicate security information to the public, with practical implications for security agencies.

Keywords

Information Design,
Visualization of Information,
Infographics,
Motion Graphics,
Terror Threat Levels,
Security Information

1. Background and context

This is the first empirical study in the world to address the visualization of public security information as a means to improve awareness, understanding and vigilance of existing public information on terrorism. With this in mind, this interdisciplinary research forges ground-breaking links between two disciplines that have not previously been brought together: Information Design and Security Studies.

1.1. The terror threat and how terrorism works

It is axiomatic to note that terrorism represents one of the most pressing security threats in the contemporary setting. Tragic events around the world, including the 2017 attacks in Manchester and London, testify to the continued use of terrorism by extremist groups. Although slightly down on the previous three years, in 2017 terrorism still accounted for 26,445 fatalities globally. (https://ourworldindata.org/terrorism, 2018).

In the face of such evidence, it is no surprise that, for example, the UK's *National Security Strategy and Strategic Defence and Security Review* highlighted terrorism as the most immediate and direct threat to national security (HM Government). Indeed, in response to the growing terror threat the UK government is making substantial investments in intelligence, security and counterterrorism.

These security measures are a response to a 'new' form of terrorism, one that seeks mass casualty events against vulnerable soft targets (Field, 2009). In this way, the modern terror threat places the public at ever-greater risk, and at the same time impacts more obviously upon daily life through enhanced security measures at transport hubs and large public events. Furthermore, the public is urged to play an important role in counterterrorism by being ever more vigilant of the threat. Our research study reflects this increased emphasis on the terror threat, but focusing on a neglected area, i.e. how to inform the public in a clear and accessible way.

Providing good information to the public is an essential component of an effective counterterror campaign. It is important that the public is informed of the nature of the terror threat, the necessary security measures they can expect to encounter, and information on how to act in the case of a terror attack. With such knowledge, the public is reassured, better understands the security context, and is empowered to participate in their own security, i.e. civil defence.

The public also plays an important role through vigilance. Intelligence is a central component of any counterterror campaign. Whilst much actionable intelligence is provided by the intelligence agencies, the public can provide key intelligence on attack preparation and suspicious behavior. However, for the public to play this important vigilance role, it is necessary that they know what to look for. The public must be informed in a manner that is concise, understandable and actionable. This truism is illustrated by the terror attack at Brussels Airport. A taxi driver who transported

the terrorists noted a strong chemical smell emanating from their suitcases. Unfortunately, he did not realise the significance of this from a counterterror perspective (Higgins and de Freytas-Tamura, 2016).

1.2. Rationale for choosing the UK as a case study

The UK, US, Australia and France have implemented a **Terror Threat Level system**, but they are significantly different from each other: visually, in the number of levels, in the narratives used, etc. Furthermore, these systems have drawn criticism for being: tired; unnecessarily complex; overly general; for contributing more to public anxiety than to effective counterterrorism (Shapiro and Cohen, 2007; Bergin and Murphy, 2015). This means that the primary objective of informing the public clearly and effectively is unfulfilled.

The UK system is particularly problematic and needs close attention, since all of the information is given in text with no visualization of any kind. This provides evidence of a clear gap between how the UK presents its Threat Level system using text only, and how other countries have progressed by presenting their Threat Level system as an infographic. Moreover, the British government is on-board with the general principle that its information and services should be "inclusive, legible and readable as possible" and should "design for the whole country" as "the people who most need the services are often the people who find them hardest to use." (Gov. UK, *Government Design Principles*).

In addition, in terms of an **Emergency Action Plan**, countries such as France and the Philippines have practical instructions for the public on 'How to react in a terror attack' and 'What to do in case of a blast' using visualization. France, for example, communicates such information to the public through an infographic design that can be seen on the streets of France and accessed on the national security webpage, along with a companion motion graphics video (Gouvernement France, 2018). As for the Philippines government, after a series of bombing incidents, an infographic was designed to demonstrate the actions that the public must follow (ABS-CBN NEWS, 2016). (In terms of legibility and clear communication of information, taking into consideration principles of information design, the Philippines infographic is less successful than the French).

In the UK, the National Counter Terrorism Security Office has available some guidance on how to react in the event of a firearms and weapons attack (GOV UK, 2017). However, no guidelines are available to the public on how to react in the event of a bombing terrorist attack, which represents a very different form of threat.

1.3. The role that Information Design can play in counterterrorism

When communicating terror threat levels, vigilance awareness, and how to act in the case of a terror attack, it is difficult to find a language (both written and visual) that emphasises the need to be alert, whilst avoiding ambiguity

and creating a sense of calm (as highlighted by ASPI – Australian Strategic Policy Institute, in their 2015 report *Sounding the Alarm – Terrorism Threat Communications with the Australian Public*).

Based on existing research in Information Design, it is apparent that visualization could be used successfully to inform the public about terror threats, security measures and vigilance. Research shows that human beings remember approximately 80% of what they see and do, and 30% of what they read (Lester, 2006; Bursi-Amba et al., 2016). Therefore, visual language has the potential to increase our capacity to take in, comprehend, and more efficiently synthesise new and complex information (e.g. Otten et al., 2015).

Countries like France, as discussed above, use infographics and motion graphics to communicate terrorism information to the public. Australia also uses infographics and motion graphics and applies color coding to distinguish the different levels. The USA has moved from a 5-level color coded system to a 2-level alert system. However, these design approaches to visualize the Terror Threat Level system show weaknesses, and have been further criticized (in addition to the criticisms referred to in section 1.2) for not having been tested with the users/public (Bergin and Murphy, 2015).

The benefits of using visualization to communicate information effectively are further supported by the work of Spiegelhalter et al. (2011) who advises: 1) the use of narratives and images that are sufficiently vivid to gain and retain attention, but which do not arouse undue emotion (such as fear, in the case of terror threats); 2) to assume a general low level of literacy, which leads to a less-is-more approach by reducing the need for inferences, making clear and explicit comparisons, and providing optional additional detail (according to the National Literacy Trust, around 5.2 million adults in England can be described as 'functionally illiterate'); 3) to assess the needs of the audience, experiment, test and iterate toward a final design (as also suggested by Bergin and Murphy, 2015, in relation to the Terror Threat Levels system).

This tier of evidence reinforces the need to use visualization in order to engage the public and communicate clearly the Terror Threat Level system. Moreover, it supports the need to involve the user. We would argue, however, that such involvement should be at various stages of the design and research process and not only at the final testing stage of the design. Only by involving the users in the various stages of design development, testing and iteration, is it possible to validate and achieve reliable design solutions with applicability to real-life contexts and that can achieve high and long-term impact.

1.4. The power of infographics and motion graphics in communicating information

The visualization of complex information through infographics and motion graphics can play a major role in communicating efficiently to the general public by providing information in a more concise, accessible and attractive form. Moreover, infographics tend to be more inclusive since they are accessible to a larger number of people, including people with varying levels of literacy. However, infographic and motion graphics design are in their infancy, creating an urgent need for more research.

1.4.1. Infographics

Infographics are concise graphic representations of information containing graphics/visuals and typography, which aim to present information quickly, clearly and in a way that can be easily accessed, digested and absorbed. According to Lankow et al, (2012), infographics are effective visual presentations that focus on three basic deliveries: comprehension, retention and appearance. When information is displayed in a clear and graphical format, it becomes visually engaging and exciting for the users to look at (Coates et al, 2014). Moreover, with adequately designed visuals, the brain will digest the information at first exposure, allowing the reader to understand the content before they even read a word (Bateman, 2014).

Infographics can also be used as an essential learning tool to instruct and educate people from different ages and literacy levels, as they make complex text-based information simpler and more accessible (Matrix et al., 2014 and Orland-Barak and Maskit, 2017). Studies have shown that using infographics improves learning, user experience, understanding and achievement (Baglama et al., 2017; Cific, 2016; Bailey et al., 2014). A particular study conducted by Pisarenko & Bondarev (2016) provides evidence that using infographics does not only create a positive impact on learning but also improves visual recognition, critical skills, and knowledge among non-native speakers.

A memorable and relatable visual design is therefore essential in notifying, instructing and persuading the user (Smiciklas, 2012). However, this does not mean that using text is considered less important. Instead, the combination of both visuals and text leads to greater results (O'Neil, 2011). This is exactly what infographics offer (i.e. a combination of text and visuals) and why they can be very effective at communicating terrorism information to the public.

1.4.2. Motion graphics

Motion graphics combine text, motion and graphics (Freeman, 2017) and are often complemented with sound or narration. As a result, they can complement the visual learning benefits of static infographics as they offer an additional and unique way of engaging users (Lankow et al., 2012).

In addition to their engaging nature, motion graphics can enhance understanding and learning (Lonsdale and Liao, 2018). Multimedia learning positively builds upon the cognitive load theory (Sweller, 1988; Sweller, 1989; Sweller, 1994), by allowing users to process information across auditory and visual channels (Mayer, 2012; Mayer and Moreno, 2003). As motion graphics uses both channels, they can facilitate better information integration by maximizing working memory capacity.

Literature also shows how animation has greater learning benefits than static graphics (Höffler and Leutner, 2007; Berney and Bétrancourt, 2016). However, whist animation has shown benefits over static graphics,

evidence exists that a combination of both may be even more beneficial. A study by Arguel and Jamet (2009) found learning scores were higher in participants when a combination of static and video media was used, in comparison to individually presented items.

Motion graphics are becoming increasingly popular educational tools through the accessibility of video sharing sites such as YouTube and Vimeo (Krum, 2013). Exploring this media as a design solution would also be familiar to many users worldwide.

1.5. Aims, objectives and hypotheses

This study proposes an integrated design approach between the fields of Information Design and Security Studies. The aim is to inform the public clearly and efficiently about the terror threat level; increase the public's understanding and compliance with the various security measures they might encounter in their daily lives; improve the public's understanding of vigilance; and educate the public on how to act in the case of a terror attack.

To help achieve this aim, the objectives are to:

- Conduct the first user-centred study on the visualization of the Terror Threat Levels, of associated security information, and of information to educate the public on how to react in the case of a bombing terrorist attack.
- Ascertain the level of knowledge about the Terror Threat Levels and security information amongst representatives of the British public.
- Compare user performance (speed and accuracy of finding information) between more visualized and text-dense information.
- Compare the effectiveness of communicating information to the general public between an infographic and motion graphics video.

Based on the literature and previous research, the researchers' hypotheses are:

- The level of knowledge about the Terror Threat Levels and security information amongst the British public is low.
- Communicating information to the general public via a motion graphics video is more effective and inclusive (reaching different levels of literacy) than via a static infographic.

2. Problem identification

An initial usability test was conducted using the existing MI5 Security Services website to understand how users access security information and to identify existing problems and possible design solutions.

Usability can be measured by how well a product/output can be used by a specific user to achieve the goals of: *Effectiveness* – completing a task accurately and completely to achieve specified objectives; *Efficiency* – completing a task with maximum accuracy (e.g. ability to find information, ability to understand information) and with minimum effort (e.g. finding and understanding information quickly); and *Satisfaction* – feeling positive and comfortable when using and after using a design output (ISO, 2013; Bevan et al., 2016; Lonsdale and Liao, 2018). In sum, in addition to assessing performance and identifying problems with a design, usability testing can also ascertain users' feelings about a design (Nielsen, 2012 and Ross, 2015). Usability testing ensures that a design functions as intended and iterating designs based on usability feedback can provide a marked increase in usability (Nielsen, 2011).

Quantitative data was collected through a questionnaire focusing on usability issues, and qualitative data was collected through an interview that took place after the questionnaire. Ten participants took part in the scoping usability test: six were female and four were male; the average age was 27.8; eight had postgraduate education, one had undergraduate education, and one had high school education.

2.1. Questionnaire

Participants were asked to access the current MI5 webpage and rate their opinion on aspects of the design such as understanding, ease of use and information organization. A 3-point Likert scale was used (disagree, neutral or agree). The questionnaire was spilt into 3 sections regarding: Threat Level system, webpage content and existing visualizations.

Results showed that in terms of Threat Levels, after accessing the webpage: 80% of participants indicated that they found it difficult to understand the current threat level after accessing the webpage; and 70% did not know how to react with the current UK threat level after accessing the webpage, with no participant saying that they knew how to react. In terms of website content: 100% of participants considered the current website to be time-consuming; 80% found that the amount of text on the existing website was too much; and 100% of participants did not consider the information to be memorable. In relation to existing visualizations (limited to one webpage – 'People and organization'): 70% of participants found it hard to understand them; and no one found the visualizations attractive.

Accessing the Terror Threat Levels page also elicited a negative emotional response from participants: 40% felt anxious after viewing the webpage; 30% felt stressed, and 20% felt confused and frightened.

2.2. Interview

The questionnaire was followed by an interview, where the same ten participants were asked a series of open-ended questions to look at problems with the existing website in more depth and in relation to: existing webpage information; and existing visualizations.

When asked about their first impression of the information on the website, comments included: "Very difficult to understand"; "Too much info that's hard to digest"; "Get bored reading it". Participants also felt that there was too much text on the MI5 website, with notable comments being: "Way too much text, it is not engaging"; "It's like an essay on every page." In addition, participants felt that the information on the website was difficult to understand, commenting: "The content is complex, not easy to find the information you need"; "People have a short attention span so will not read"; "The threat levels page doesn't tell you any specific details. It triggers unnecessary panic". Finally, participants felt that visualization of information could improve the clarity of the information stating: "Images would help the information to be more memorable"; "Infographics/images would be beneficial, or videos." In relation to the existing visualization, participants had a negative response saying that the colors were poor and the information confusing. Users found it unattractive with the background making the text hard to read. Some suggested using color more effectively to explain the structure of the information better.

2.3. Summary

The results from the scoping study confirm prior arguments that text heavy information is problematic for both user engagement and understanding. An area where this was particularly evident was the low understanding of the Threat Levels. Application of this initial research in the development of new design solutions (as described in the sections below), suggests that particular focus should be aimed at reducing the text heavy appearance of the existing website, and increasing understanding of both threat levels and visualizations.

3. Design development and iteration

3.1. Design guidelines

Literature on the design principles of Infographics is scarce and mostly relate to presenting numerical, medical or vast quantities of text-based information. Despite this, a few principles have been collected, that when used in conjunction with information design principles, can inform the visualization of the UK Terror Threat Levels as shown in Table 1.

Little empirical research has also been conducted into how motion graphics should be designed to improve comprehension and recall of information. Apart from a few studies (e.g. Lonsdale and Liao, 2018), design principles and theories of motion graphic design largely stem from creative practice. The design principles that informed the development of the design outputs for this research study are also presented in Table 1.

Principles on the design of online information were also collected to further inform the re-design of the information provided to the public on the MI5 website (also included in *Table 1*).

TABLE 1.

Design principles framework used to inform design solutions to the problem identified in this study.

	DESIGN PRINCIPLES	
Online Information	• The number of typefaces should be limited. No more than two, and different weights and sizes should be used instead. • Simple and clean typefaces designed for screen should be used. • Too short and too long lines should be avoided. 75-100 characters are best to enhance reading speed. • Headings should be larger than the body of text. • Bold text can be used to emphasize important information. • Text should be justified to the left. • Color should be used sparingly, with good contrast for text and images, and as an information tool (not as decoration). • Color can be used to influence user satisfaction and trust. Users seem to have a preference for the colors blue and orange on a website, with the presence of orange increasing information recall (probably due to increased attention). • The cultural influence of a color's perceived meaning should be considered. • Color coding should be used in a consistent and logical manner, and should be understood quickly. • Larger areas of white space should be used on a webpage to increase the clarity and prevent the appearance of cluttered information. • Webpages with lower visual complexity and uncluttered, should be considered, as users find them organized, clean, clear and appealing.	• Bonnardel et al. (2011) • Bringhurst (1992) • Carter et al. (2018) • Cyr et al. (2010) • Lonsdale (2014) • Lonsdale et al. (2019) • Michailidou et al. (2008) • Rehe (1979) • Reynolds (1978) • Saltz (2009) • Schriver (1997) • Seckler et al. (2015) • Tselentis (2012) • Tuch et al. (2012) • Wijnholds (1997) • Williams & Spyridakis (1992)
Infographics	• The use of text should be easy to read and kept to a minimum. • A maximum of three type fonts, ideally two, should be used. • Titles should be large in scale and have high contrast, as well as clearly distinct from subtitles and main text (size, features, etc.) • Colors must reflect the subject matter and fulfil specific needs and purposes. • A color palette should be on average between 3-5 colors. • Color can be used to help group chunks of information, to emphasize certain words, to show hierarchy and relationships between elements, to help navigate the information.	• Arslan and Toy (2015) • Conley (2017) • Krum (2013) • Menezes & Pereira (2017) • Murray et al. (2017) • Niebaum et al. (2015) • Stones & Gent (2015) • White (1991)

[continues]

DESIGN PRINCIPLES (cont.)

Infographics (cont.)

- Color coding can be used to show levels of severity.
- Design elements should be consistently aligned.
- Lines and arrows can be used to guide through the information.
- Simple and colorful shapes can be used to emphasize information and engage the user.
- Pictograms can be used for effective representation of populations, actions, etc.
- Distinctive layouts should be used.
- Online infographics should use a vertical layout in order to follow the scroll direction.
- User feedback should be sought when designing.

Motion graphics

- A storyboard should be used to plan the overall narrative.
- Motion graphics should employ hierarchy, balance and unity.
- Engaging motion graphics should possess a cohesive color palette, forms, characters and textures.
- Music and voice could be used to further the narrative and aid auditory learners.
- Fundamental motion design principles should be considered, such as: sequencing, timing, slow in slow out, and stretch and squash.
- Sans serif fonts should be used to secure legibility.
- Too much text should be avoided.
- Excess movement, motion effects for type, and high speed should be avoided.
- Colors should be chosen carefully to ensure sufficient contrast between elements and background.
- Avoid long sequences as these are tiring.
- Information can be emphasized by using color, size, manipulating speed (slow or fast), etc.

- Bellato (2013)
- Finke et al. (2012)
- Freeman (2017)
- Landa (2016)
- Lasseter (1987)
- Lodigiani (2014)
- Lonsdale and Liao (2018)
- Pannafino (2015)
- Stones & Gent (2015)
- Strizver (2014)
- Taylor (2013)
- Willenskomer (2017)

3.2. Design development

TABLE 2. (OPPOSITE) Stages of design development and testing for the Terror Threat Levels system and Online information available on the MI5 Security Services website

TABLE 3. (OPPOSITE) Stages of design development and testing for the Terror Threat system (as available on the MI5 Security Services website) and Emergency Action Plan (creation of a brand new emergency action plan in the event of a bombing terrorist attack)

With the new design outputs' aim of increasing learning, it was imperative that the new designs met the needs of the end user, while still appropriately representing the MI5 organization. Therefore, usability testing was conducted with representative users and an iterative design process was followed at various stages of design development. That is, new design solutions of information visualization for the MI5 website and Terror Threat Levels system, were developed, tested with representative users, and iterated at various stages of the design development in order to create reliable outputs of direct applicability to real-life contexts.

The steps of design development, usability testing and iteration conducted in this study are presented in Table 2 and Table 3, which describe the two ramifications of the study: Development 1) Terror Threat Levels and Online Information; Development 2) Terror Threat Levels and

DESIGN DEVELOPMENT 1 – Terror Threat and Online Information

	Design	Participants	Data collection	Results and imporvements needed
Iteration 1	• Initial infographic design • 2 initial webpages • Motion graphics storyboard	• 10 participants (6 F + 4 M) • 22- 52 years old • Average age: 27.8	• Interview (best and worst design features)	• *Infographic*: improve text alignment, color contrast and layout. • *Webpages*: use a more corporate color palette; using the existing blue from the MI5 website is most appealing; icons and color need refinement. • *Motion graphics*: more emphasis on why not to panic in the highest threat level; characters should be more mature in style; use blue color palette.
Iteration 2	• New Infographic layout • 5 webpages	• 23 participants (15 F + 8 M) • 18-54 years old • Average age: 27.1	• Questionnaire • Rating (5-point Likert scale) • Opinion (best and worst design features)	• *Infographic:* improve color contrast and use a larger font size. • *Webpages*: more coherent illustration style; larger typeface; alter some icons to better represent their meaning; further reduce block text on some pages.
Iteration 3	• Revised infographic placed on webpage • 5 webpages • Motion graphics demo	• 6 participants (3 F + 3 M) • 22- 48 years old • Average age: 32.5	• Pre-knowledge test • Performance recall test • User feedback • User opinion and satisfaction	Results (quantitative): • Knowledge was low and increased after looking at the infographic, motion graphics and webpages. • 100% participants agreed the new design improved knowledge of threat level and security measures. • Only 50% participants agreed that the new designs improved knowledge of the importance of being vigilant. Should be more prominent on motion graphics. • 100% participants agreed that the infographic made it easier to understand the threat levels. • 83% participants agreed that the infographic made the information more memorable. • 67% participants agreed that the companion motion graphics made the information both easier to understand and more memorable than just text or an infographic. • Infographic was considered 'Straightforward' by 100% of participants and 'Clear' by 83%; 100% of participants felt 'Informed' and 83% felt 'Aware' after viewing the infographic. • The motion graphics was described as 'Accessible' by 67% of participants and 'Relevant' and 'Effective' by 50%; 100% of participants felt 'Informed' and 83% felt 'Aware'. Results (qualitative): • *Infographic*: improve color contrast and type size. • *Motion graphics*: improve transitions (inconsistent / too quick), characters needed more movement, and more information is needed on the importance of vigilance. • *Webpages:* make visual icons and infographics clearer; use more color and text.

DESIGN DEVELOPMENT 2 – Terror Threat and Emergency Action Plan

	Design	Participants	Data collection	Results and imporvements needed
Iteration 1	• Existing design styles for infographics and motion graphics	• 28 participants (15 F + 13 M) • 21- 55 years old • Average age: 31.57	• Interview (advantages and disadvantages for 3 design styles – contemporary, realistic, and expressive)	• 61% of participants chose contemporary style (because it is straightforward, clear, simple and looks professional). • Suggestion to combine well-known symbols and figures in the illustration.
Iteration 2	• Infographic sketches • Motion graphics storyboard	• 5 participants (3 F + 2 M) • 17- 25 years old • Average age: 22	• Interview (best and worst design features)	• *Threat Levels Infographic*: preference for vertical style layout (straightforward and easy to read). • *Emergency Action Plan motion graphics*: remove harsh use of background color such as red (overpowering and can cause stress and worry); include more setting scenarios when escaping from an attack (directed to a wider public).
Iteration 3	• Further developed Infographics • Motion graphics – static frames	• 4 participants (3 F +1 M) • 17-33 years old • Average age: 29.25	• Interview (best and worst design features)	• *Threat Levels infographic*: new inverted order of threat levels, i.e. from top to bottom, was better and more logical. • *Threat Levels motion graphics*: delete the death numbers linked to previous terror attacks in the UK (it only causes alarm, raises fear and anxiety, brings back sad memories). • *Emergency Action Plan motion graphics*: change content for the 'Inform' section because it is not common practice nowadays for terrorists to call and warn of a bomb threat.
Iteration 4	• Further developed infographics • Motion graphics demos	• 10 participants (8 F + 2 M) • 23- 36 years old • Average age: 27.1	• Pre-knowledge test • User feedback • User opinion and satisfaction • Performance recall test	• *Threat Levels infographic*: the current threat level in the infographic is still difficult to understand; the motion graphics voice over is not engaging enough. • *Emergency Action Plan infographic*: text in the infographic is difficult to read in parts; too many details in a small space (remove unnecessary information). Still some problems with the motion graphics being too fast in places.
Iteration 5	• Fully developed infographic • Motion graphics demos	• 10 participants (6 F + 4 M). • 22- 41 years old • Average age: 29.5	• Same as Iteration 4	• *Threat Levels infographic*: characters should be of different races to make infographic more inclusive. • *Emergency Action Plan infographic*: it needs slight changes in wording; increase text size; improve color contrast.

Emergency Action Plan. Initial design solutions were informed by the literature and the findings from the questionnaire and interview conducted to identify the problems and needs. Any design issues that emerged from the various stages of the design development were resolved before moving on to the next design refinement and iteration.

4. Evaluation

4.1. Evaluation 1 – Terror Threat and Online Information

Evaluation 1 assessed whether communicating security information on the MI5 Security Services website, through a combination of text and visualization, enhances performance and is preferred by the public, in comparison to information communicated through text only.

4.1.1. Participants

A sample of 64 participants completed the experimental testing with participants being equally divided into two groups: Group 1) A control group of 32 participants, exposed to the existing design in order to test its effectiveness; Group 2) An experimental group of 32 participants, exposed to the new design to test its effectiveness.

Group 1 (existing design) consisted of 17 females and 15 males; between 22-57 years old (an average age of 30.3); 22 were British and 10 Non-British; 24 spoke English as a native language; 20 were educated to Postgraduate Level, 9 to Undergraduate level and 3 to Further Education level; 10 had an Advanced IT level, 18 Intermediate level and 4 Beginners level. Two participants reported having briefly seen the MI5 website before.

Group 2 (new design) consisted of 18 females and 14 males; between 18-65 years old (an average age of 32.25); 25 were British and 7 Non-British; 25 spoke English as a native language; 9 were educated to Postgraduate Level, 17 to Undergraduate level and 6 to Further Education level; 10 had an Advanced IT level, 21 Intermediate level and 3 Beginners level. Three participants reported having briefly seen the MI5 website before.

4.1.2. Procedure and materials

In Group 1 (existing design) all 32 participants were presented with the existing MI5 webpages, including the webpage containing information on the Terror Threat Levels. In Group 2 (new design) all 32 participants were presented with the redesigned webpages, as well as a motion graphics video designed to further explain the UK Terror Threat Levels (meaning and impact on the public).

All 64 participants were tested individually and completed an experimental study that was divided into 5 sections. In Section 1 participants were asked to write and explain their current knowledge of the existing UK Terror Threat Levels. In Section 2 participants were asked to view the

current 'Threat levels' page on the MI5 website to learn the information that fully answered the questions in section 1. Participants were allowed to take as long as they needed. Group 2, using the new design, also had a motion graphics to watch. Figure 1.1 shows the new infographic design and inserted in the newly designed webpage, and Figure 1.2. shows static frames of the new motion graphics design. The existing design encompassed text only.

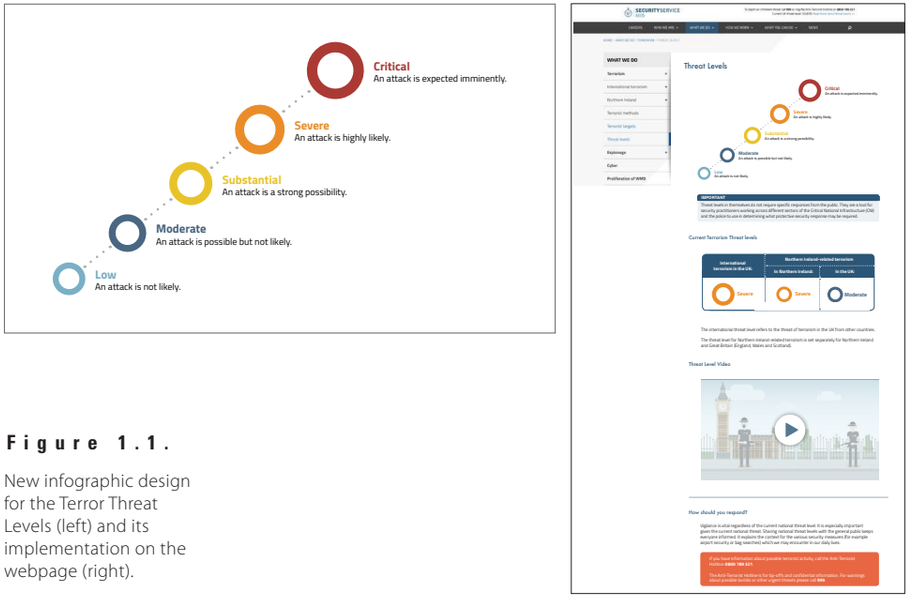


Figure 1.1.
New infographic design for the Terror Threat Levels (left) and its implementation on the webpage (right).

Figure 1.2.
New Terror Threat Levels motion graphics – static frames.

In Section 3 participants were asked to navigate 7 webpages and find information that answered a series of questions relating to information on those pages. Performance was measured by time and accuracy (as described below). Figure 2 shows two examples of the newly designed

webpages. The existing designs encompassed text only. All newly designed pages follow the same approach in combining text and graphics to make information more accessible, easy to understand and memorize and engaging.

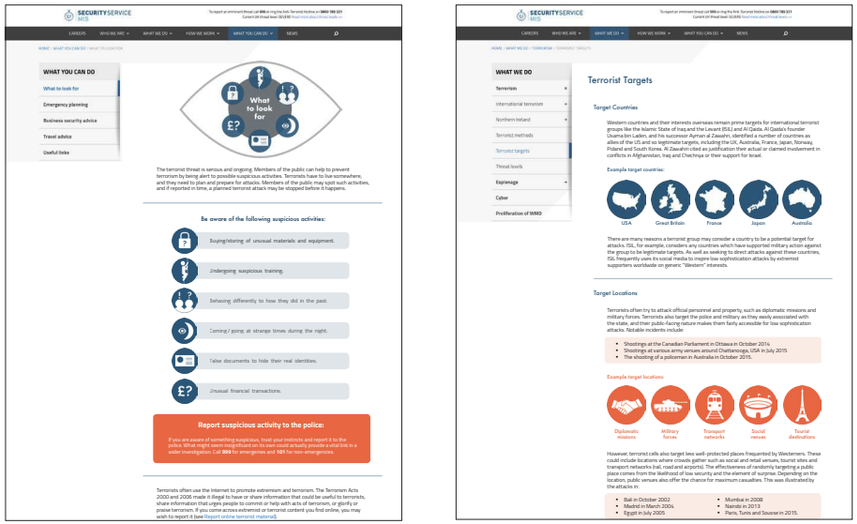


Figure 2.

Newly designed webpages: 'Suspicious Behavior' (left) and 'Terrorist Targets (right).

In Section 4 participants were asked to answer the questions in section 1 again. Post-knowledge was measured by accuracy of the answers. In all sections, participants were always asked not to guess any answers but only to write what they knew (Section 1) or were able to find on the webpages (Section 2-4).

After the performance test, a recorded interview was conducted where participants were asked their opinion on the design of two webpages only – 'Threat Levels' and 'What to look for' (in terms of suspicious behavior)– by comparing existing and redesigned versions. Statements were read out and participants were asked to agree or disagree based on a 5-point Likert scale from 'Strongly disagree' to 'Strongly agree', and then explain their option. Further opinions on the existing designs were gathered using an Appraisal Word Chart and Emotional Word Chart (each presented as a table with 10 positive and 10 negative words) where participants described: 1) their opinion on the design of the webpages; and 2) their feelings after using the webpages. Group 2 was further asked about: 3) their opinion regarding the companion motion graphics.

4.1.3. Results

4.1.3.1. Pre-knowledge vs post-knowledge

A paired samples t-test was used to compare pre-knowledge and post-knowledge of the UK Terror Threat Levels. Results show that there was a significant difference between pre-knowledge and post-knowledge when measured by accuracy, i.e. the number of correct answers, for both Group 1 and Group 2. In Group 1 (existing), knowledge before seeing the information (M=0.34, SD=0.83) was significantly lower than knowledge after looking at the webpages (M=2.38, SD=0.91); t(31) = - 8.961, p<0.001. In Group 2 (new), knowledge before seeing the information was also significantly lower before (M=0.06, SD=0.25) than after seeing the information (M=3.25, SD=1.83); t(31) = -10.096, p<0.001 (*Figure 3*). This supports our hypothesis that the UK public has very little knowledge of the Terror Threat Levels and of the current Threat Level that is in place.

When comparing the beneficial effects of the existing webpages design (M = 2.38, SD = 0.91) and the new design (M = 3.25, SD = 1.83) upon post-knowledge, a significant difference was also found, $t(45.34) = -2.422$, $p < 0.05$ (*Figure 3*). That is, the increase in knowledge after learning the information was significantly higher with the new design than with the existing design.

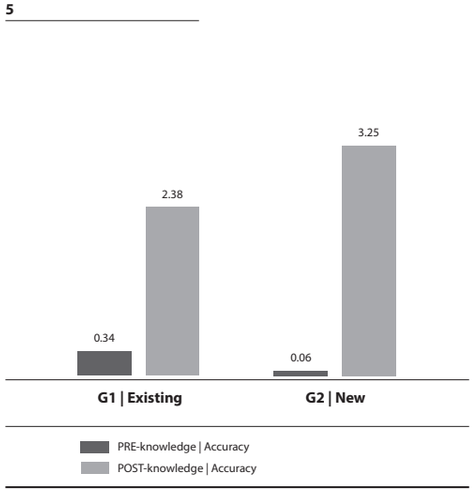


Figure 3.

Mean accuracy (number of correct answers): comparison between 'Existing' and 'New' design, as well as 'Pre-knowledge' and 'Post-knowledge'.

4.1.3.2. Performance – Time and accuracy

An Independent Two Samples t-test was used to compare performance for completing the given tasks between Group 1 (existing design) and Group 2 (new design). Performance was measured by time (i.e. the time to find the information on the webpages and answer the questions) and accuracy (i.e. the number of correct answers).

Results show that there were significant differences between the two groups. In Group 2 (new design), participants took significantly less time (M=630.03, SD=156.4) than Group 1 (existing design) (M=908.06, SD=265.0) to complete the performance test; t(62) = 5.112, p<0.001. Results further show that accuracy was also significantly higher with Group 2 (new design) (M=40.38, SD=2.11) than with Group 1 (existing design) (M=37.19, SD=3.72); t(62) = -4.218, p<0.001 (*Figure 4*). Therefore, participants performed significantly better with the new, rather than with the existing, design.

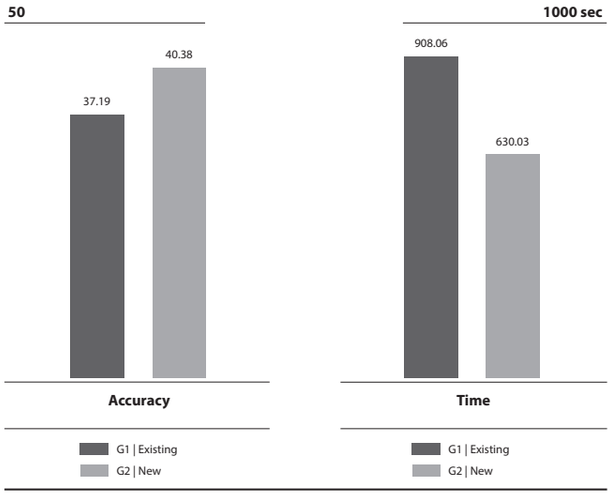


Figure 4.

Mean accuracy (number of correct answers) between 'Existing' and 'New' design, as well as mean time (time in seconds taken to find and write the information down) between 'Existing' and 'New' design.

4.1.3. Opinion

WEBPAGE AND INFOGRAPHIC

For the interview and to gather participant feedback, only two webpages were shown: 'Threat Levels' and 'What to look for'. Participants' impression of the webpages design was not positive for the existing design, but was very positive for the new design. In Group 1, very few (or no) participants agreed that the existing design made the information: easier to find (3%); easier to understand (0%); more memorable (0%); more engaging (0%); and more professional (19%) than the new design (*Figure 5*). In contrast, the majority of participants in Group 2 agreed that the new design made the information:

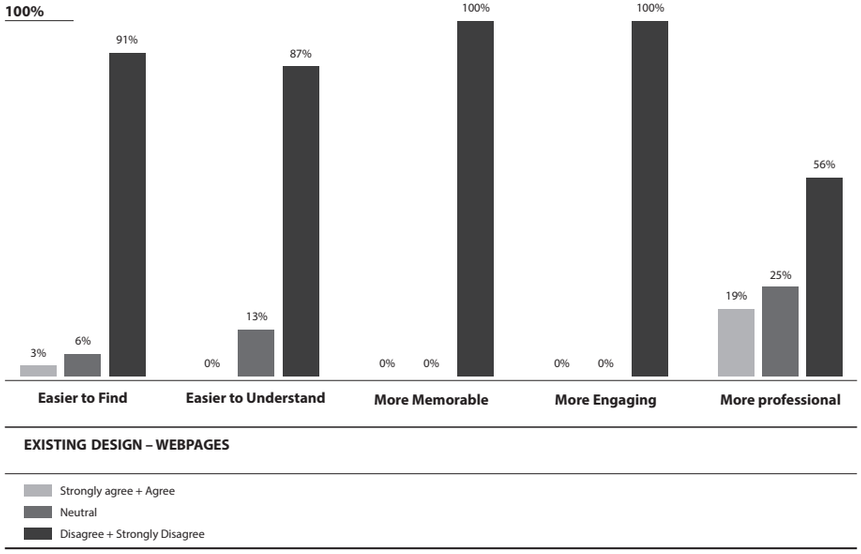


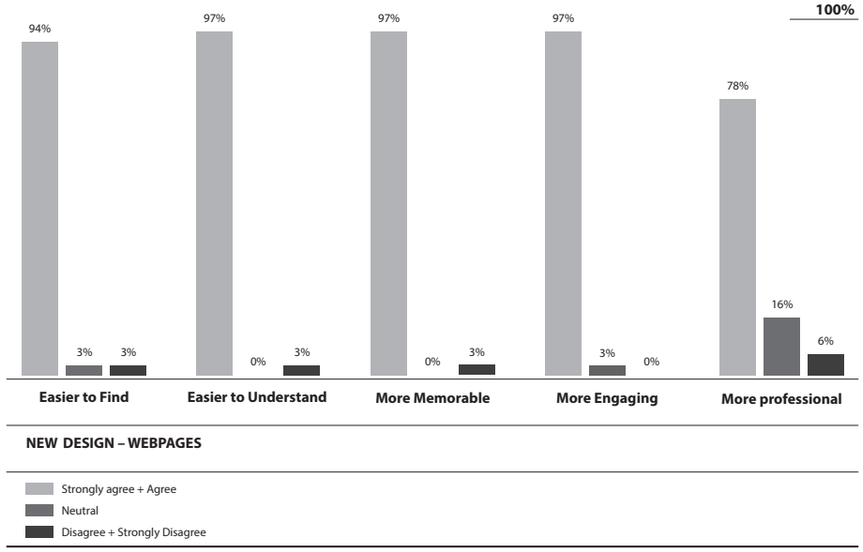
Figure 5.

Participant opinion regarding the 'Existing' Terror Threat Levels system and two webpages (all text dense).

Figure 6.

Participant opinion regarding the 'New' Terror Threat Levels system infographic and two redesigned webpages (to include a balance between text and visualized information).

easier to find (94%); easier to understand (97%); more memorable (97%); more engaging (97%); and more professional (78%) than the existing design (*Figure 6*). Specific comments mentioned the fact that the infographic makes it easier to understand the 5 different levels, and that it is much better than just having text. Participants also mentioned that having different colors for each threat level, as well as increasing the size of the circle as the level increases, helps to understand the severity of each level better.



When participants were asked to choose three words to describe both their opinion and feelings after using the webpages design, the results were as follows. In Group 1 (existing design) the majority of participants chose negative words to describe both their opinion and feelings: 66% described the existing design as time consuming and 50% of participants felt overwhelmed. But, on a more positive note, 50% also felt informed. In Group 2 (new design) the majority of participants chose positive words: 98% felt informed, 78% felt engaged and 72% thought the new design was clear (top five most chosen words are shown in *Figure 7* below). Further comments highlighted the fact that the existing design was too text heavy and required the user to read entire paragraphs to find important information; it was also thought to appear dated with little consideration of how the user would interact with it. The new design, on the other hand, had a more positive response with participants describing the use of color and images both as appealing and useful, especially in the visualization of the threat levels; and the division and reorganization of information on the webpages as being useful in finding the required information.

WEBPAGES				MOTION GRAPHICS	
G1 | Existing design		G2 | New design		G2 | New Design	
Opinion on design		Opinion on design		Opinion on design	
Time consuming	21	Clear	23	Effective	21
Complex	11	Effective	14	Clear	16
Ordinary	10	Accessible	12	Helpful	15
Relevant	9	Helpful	12	Straightforward	15
Hard to use	7	Easy to use	12	Accessible	9
Feelings about design		Feelings about design		Feelings about design	
Informed	16	Informed	30	Informed	29
Overwhelmed	16	Engaged	25	Engaged	22
Bored	13	Clear	13	Reassured	10
Unimpressed	13	Satisfied	5	Calm	8
Discouraged	10	Reassured	5	Clear	6

Positive words
Negative words

Figure 7.

Participant choice of three words to describe their opinion and feelings about the design of the webpages and motion graphics – top five chosen words and number of times chosen.

MOTION GRAPHICS

Participants agreed that the Terror Threat Levels motion graphics helped: to understand the information better (97%); to make the information more engaging (97%); make the information more memorable (91%) (*Figure 8*). Participant comments emphasized that a motion graphics is easy and accessible to everyone, and that the combination of visuals and voiceover makes the information clearer and easier to remember. Moreover, a lot more information can be communicated in a short space of time.

Participants' opinion regarding the design of the motion graphics, when asked to select three words, was positive: 65% described the design as effective, and 50% as clear. Participants' feelings during, and after viewing the motion graphics, were also positive: 91% felt informed and 69% felt engaged (top five most chosen words are shown in *Figure 7* above).

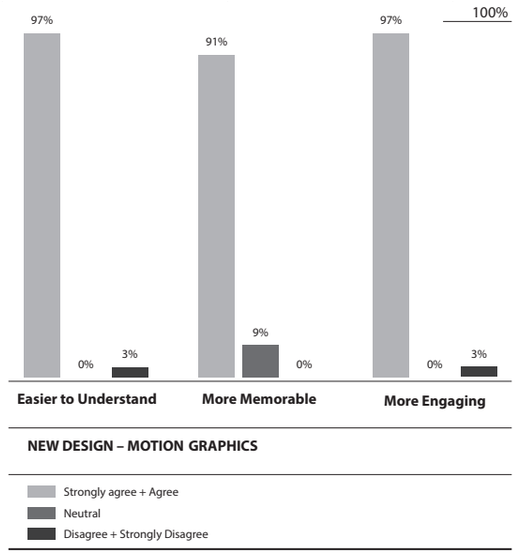


Figure 8.

Participant opinion regarding the 'New' Terror Threat Levels system motion graphics.

4.1.4. Summary and discussion

Overall, participants had very little knowledge about the Terror Threat Levels prior to the test, which increased significantly after exposure to the information. Moreover, this increase was significantly higher with the new design that presented information combining good text layout with infographics and with a companion motion graphics. A significant improvement was also found in performance, i.e. the time and accuracy of finding information and answering the questions, when participants searched for information on the webpages displaying a combination of text and visualization. These results therefore provide evidence to suggest that design following research-based principles of information design and visualization, optimize user knowledge and performance.

4.2. Evaluation 2 – Terror Threat and Emergency Action Plan

Evaluation 1 provided evidence on the superiority of communicating security information through a combination of text, visuals and motion graphics. Evaluation 2 went a step further to also identify whether (based on previous research) communicating security information in a more visualized approach is superior when using a motion graphics than it is via an infographic.

4.2.1. Participants

A total number of 64 participants (a different group from Evaluation 2) completed the performance test, with participants being divided into two groups: Group 1) A group of 32 participants to test the effectiveness of infographics as a tool to communicate security information; Group 2) A group

of 32 participants to test the effectiveness of motion graphics as a tool to communicate security information.

Group 1 (infographics) consisted of 17 females and 15 males; between 18-65 years old (an average age of 37.3); 16 were British and English native speakers and 16 were Non-British; 12 were educated to Postgraduate level, 15 to Undergraduate level and 5 to Further Education level.

Group 2 (motion graphics) consisted of 18 females and 14 males; between 18-72 years old (an average age of 40.2); 16 were British and English native speakers and 16 Non-British; 19 were educated to Postgraduate Level, 6 to Undergraduate level and 7 to Further Education level.

4.2.2. Procedure and materials

In Group 1 (Infographics) all 32 participants were presented with two infographics: one for the UK Terror Threat Level system, and another one for the Emergency Action Plan (i.e. how to react in the event of a bombing terrorist attack). In Group 2 (motion graphics) all 32 participants were exposed to the same information as Group 1, but presented via a motion graphics video.

All 64 participants were tested individually and completed an experimental study that was divided into 5 sections. In Section 1 participants were asked to write and explain their current knowledge of the existing UK Terror Threat levels. In Section 2 participants were then asked to look at the infographics (Group 1) and motion graphics (Group 2) to learn the information that fully answered the questions in Section 1. Figure 9.1 shows the infographics and Figure 9.2 shows static frames of the motion graphics for the Terror Threat Levels. Figure 10.1 shows the infographics and Figure 10.2 shows static frames of the motion graphics for the Emergency Action Plan. In Section 3 participants were asked to answer the questions in section 1 again, but this time based on the information that they saw on the infographics (Group 1) or motion graphics (Group 2).

After the performance test, a recorded interview was conducted where participants were asked their opinion on the design of the infographics (Group 1) and motion graphics (Group 2) in comparison to similar information provided on the MI5 website. Statements were read out and participants were asked to agree or disagree based on a 5-point Likert scale, as well as explain their choice.

Figure 9.1.

New infographic design for the Terror Threat Levels.

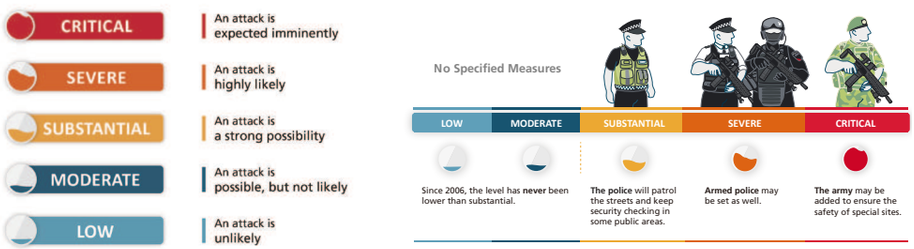


Figure 9.2.

New motion graphics for the Terror Threat Levels – static frames

Figure 10.1.

New infographic design for the Emergency Action Plan.

Figure 10.2.

New motion graphics for the Emergency Action Plan – static frames.

4.2.3. Results

4.2.3.1. Pre-knowledge vs post-knowledge

A paired samples t-test was used to compare pre-knowledge and post-knowledge of the UK Terror Threat Levels and Emergency Action Plan in the event of a bombing terrorist attack. Results show that there was a significant difference between pre-knowledge and post-knowledge when measured by accuracy, i.e. the number of correct answers, for both Group 1 and Group 2.

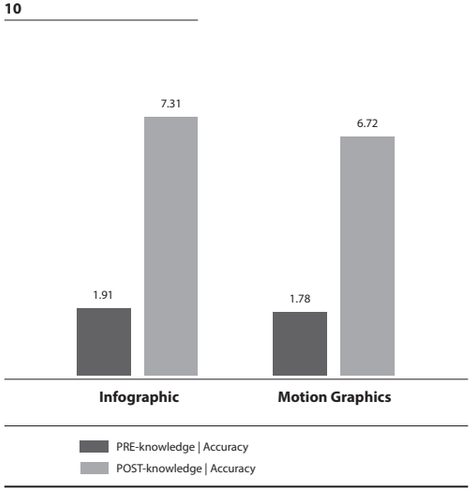
In Group 1, knowledge before seeing the Terror Threat Levels infographic was significantly lower (M=0.5, SD=0.91) than knowledge after looking at the infographic (M=5.66, SD=2.1); t(31) = - 13.430, p<0.001. Knowledge before seeing the Emergency Action Plan infographic was also significantly lower (M=1.91, SD=1.77) than knowledge after looking at the infographic (M=7.31, SD=1.7); t(31) = - 14.010, p<0.001 (*Figure 11*).

In Group 2, knowledge before watching the Terror Threat Levels motion graphics was significantly lower (M=0.47, SD=0.80) than knowledge after looking at the motion graphics (M=5.47, SD=2.36); t(31) = - 11.673, p<0.001. Knowledge before watching the Emergency Action Plan motion graphics was also significantly lower (M=1.78, SD=2.03) than knowledge after watching the motion graphics (M=6.72, SD=1.6); t(31) = - 11.407, p<0.001 (*Figure 11*).

This evidence further supports our hypothesis that the UK public has very little knowledge of the Terror Threat Levels and of the current Threat Level that is in place.

Figure 11.

Mean accuracy (number of correct answers): comparison between 'Infographic' and 'Motion Graphics', as well as 'Pre-knowledge' and 'Post-knowledge'.



4.2.3.2. Infographic vs Motion Graphics

An Independent two samples t-test was used to compare performance between Group 1 (infographic) and Group 2 (motion graphics). Performance was measured by accuracy (i.e. the number of correct answers).

Results show that there were no significant differences between the two groups. For the Terror Threat Levels information, accuracy was not significantly different between Group 1 (infographic) (M=5.66, SD=2.1) and Group 2 (motion graphics) (M=5.47, SD=2.36); t(62) = 0.338, p=0.736. Results further show that for the Emergency Action Plan, accuracy was not significantly different either between Group 1 (infographic) (M=7.31, SD=1.7) and Group 2 (motion graphics) (M=6.72, SD=1.6); t(62) = 1.437, p=0.156 (*Figure 11*). That is, a motion graphics video was not superior to an infographic when communicating security information to the public. They were both equally beneficial.

4.2.3.3. Opinion

INFOGRAPHIC

After the performance test, participants were asked whether, when comparing the information on the existing website, the new and visualized information was more efficient at communicating to the public, i.e. easier to understand, clearer, more legible and more attractive than the information on the MI5 website.

For the new Terror Threat levels infographic, the majority of participants gave a positive response: Participants agreed that the Terror Threat Levels were easy to understand (100%); were clear and legible (97%); and were attractive (97%) (*Figure 12*). Further comments emphasized that the existing design is very bland, boring, text dense and does not convey the importance of the information, while visuals and color help to enhance that importance. Moreover, it was also noted that simplified information aids understanding of said information at the time of looking at it, but it also helps to remember the information at a later stage.

For the Emergency Action Plan Infographic, the majority of participants also gave a positive response. Participants agreed that the three main actions the public must follow in the event of a bombing terrorist attack were easy to understand (100%). The majority of participants also agreed that the importance of informing the police (84%), how to escape (91%) and how to help others (84%) were also easy to understand. Moreover, participants agreed that the infographics was clear and legible (100%); and attractive (100%) (*Figure 13*). Further comments highlighted that relying on pictures is easier than relying on text, that visuals are very self-explanatory and easy to understand, and that it is easy to follow information when it is broken down into steps.

MOTION GRAPHICS

The same opinion questions were asked in relation to the motion graphics. For the new Terror Threat Levels motion graphics, again, the majority of participants gave a positive response. Participants agreed that the Threat levels were easy to understand (94%); the security measures were also easy to understand (97%); the infographics was clear and legible (100%); and was attractive (97%) (*Figure 14*). Further comments pointed out that the motion graphics was interesting, short and easy to follow. Moreover, that the correlation/progression between each level was clear.

Figure 12.

Participant opinion regarding the 'New' Terror Threat Levels system infographic.

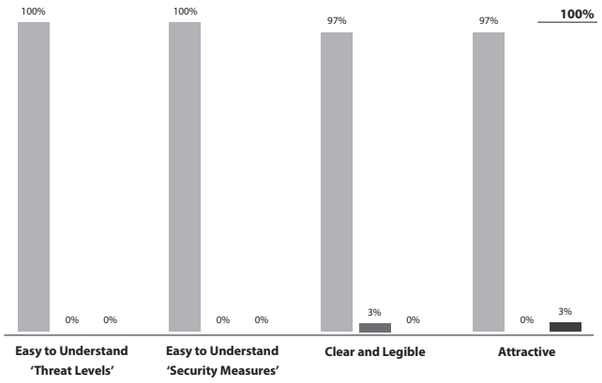
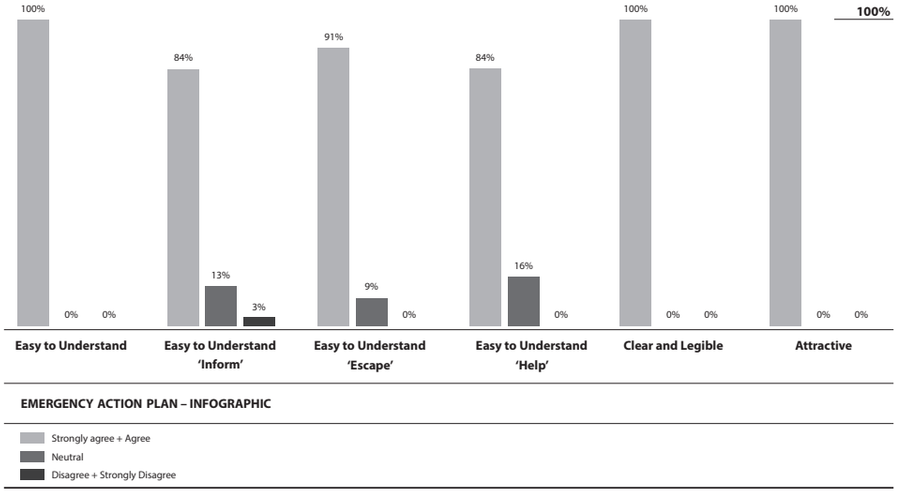


Figure 13.

Participant opinion regarding the 'New' Emergency Action Plan infographic.



For the Emergency Action Plan motion graphics, again, the majority of participants also gave a positive response. Participants agreed that the three main actions the public must follow in the event of a bombing terrorist attack were easy to understand (100%). The majority of participants also agreed that the importance of informing the police (88%), how to escape (91%) and how to help others (88%) were also easy to understand. Furthermore, participants also agreed that the infographics was clear and legible (100%); and attractive (100%) (*Figure 15*). Further comments highlighted that visuals enable them to see what to do in an actual/real situation, which is better.

Figure 14.

Participant opinion regarding the 'New' Terror Threat Levels system motion graphics.

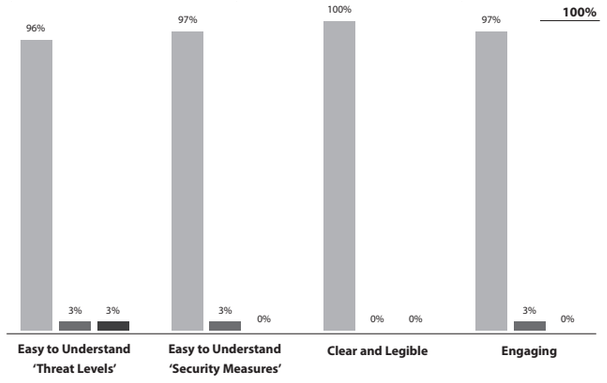
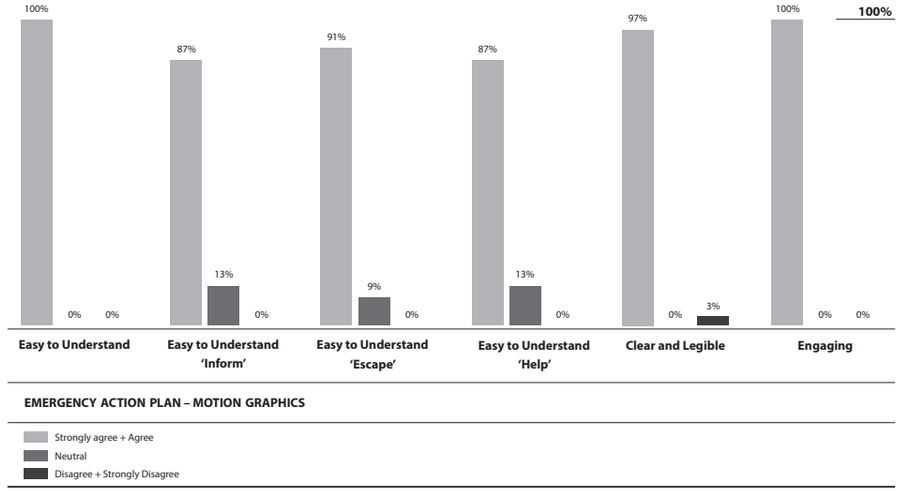


Figure 15.

Participant opinion regarding the 'New' Emergency Action Plan motion graphics.



4.2.4. Summary and discussion

Once again, these results provide evidence that the new design following research-based principles of information design and visualization of information, has a significantly more positive impact in accessing and understanding information, than the existing text-dense design.

However, it was interesting to discover that, contrary to previous studies and the researchers' hypothesis, infographics and motion graphics are equally efficient at communicating security information, i.e. one form of visualized information is not superior to the other. In fact, if we look closely at the mean values, participants performed slightly better with the infographic than with the motion graphics.

5. Overall discussion and conclusion

The present empirical study is the first in the world to examine the impact of an information design approach on the public's knowledge and access to information on national security related to terrorism. Specifically, the study identified whether static infographics and motion graphics have a positive impact on the UK public's ability to find information on, and their knowledge of: a) the UK Terror Threat Level system; b) other additional national security information such as how to be vigilant regarding terror threat; and c) how to react in the event of a bombing terror attack. In addition, this study is an example of the importance of following a user-centered design approach during the research and design process by: 1) defining the design problem and user needs through literature review that is complemented by observation, interviews and testing of existing designs; 2) identifying innovative information design solutions and design principles through literature review, that are user-centered and research-based, to ensure their success; 3) conducting several usability tests and iterations during the design development, to ensure the design's quality and suitability for the user; 4) conducting experimental performance tests and comparison (to the original) tests with statistical analysis to validate the final design solutions. All these steps ensure that representative users (in this case members of the UK public) are the ones involved throughout the research and design process.

In Part 1 of the study – Terror Threat Level system and Online Information – the results were clear in showing that performance in accessing and finding the information (measured by time and accuracy) was significantly better using the new design (a combination of visuals and text, plus a motion graphics) than with the old design (text dense information). Participant comments were also strongly in support of the positive impact of the new design. Results also showed that knowledge on Terror Threat levels is very low among the UK public, and that being exposed to the information significantly increased their post-knowledge. Moreover, when comparing post-knowledge between the existing design and the new design, an increase in post-knowledge was significantly higher with the new design than with the existing design. (This is true in both Part 1 and Part 2 of the study, discussed next). Such findings support previous research showing that learning scores are higher when participants are exposed to a combination of static and motion visuals (Arguel and Jamet, 2009).

However, literature also shows that motion graphics might have greater learning benefits and engage users more than static graphics (Höffler and Leutner, 2007; Berney and Bétrancourt, 2016; Siricharoen and Vinh, 2017). Therefore, Part 2 of the study – Terror Threat Level system and Emergency Action Plan – was designed to test whether a motion graphics is superior in delivering the same information than a static infographic. Contrary to existing research, our study shows no superiority of a motion graphics over a static infographic, which also dismisses one of our initial hypotheses. In the particular case of Terror Threat Levels and how to react in the event of a terrorist attack, perhaps seeing information that displays different levels (Terror Threat) and different steps to take (Emergency Action Plan) is easier to make sense of if the information is presented all together, in a chunk.

According to the chunking principle, as addressed by various authors (Bettman et al., 1986; Sweller, 1994; Few, 2004 and 2012; Le et al., 2013; Patterson et al., 2014; Lyra et al., 2016; Tetlan and Marschalek, 2016; Coyle et al., 2017; Majooni, 2017; Lonsdale and Lonsdale, 2019) cognitive load can be reduced if visualizations are presented in chunks. Although each chunk can contain a good amount of information, there is a limit to how many chunks of information can be stored at any one time in our working memory. As the working memory is temporary and has limited storage capacity, three to four chunks are suggested as the optimum number. Any new information or chunk of information to be included in our working memory will require pre-existing information to be forgotten or sent to the long-term memory. Therefore, when acquiring new information, if presented in more than three or four chunks, learning will be affected and cognitive processing will be ineffective. For example, as illustrated by Few (2012) in terms of information visualization, a legend for a chart that contains a color or symbol for ten different sets of data will force users to go back and forth between the chart, because the user's working memory will not be able to take in more than three or four chunks of information at a time.

If we consider the Terror Threat levels, and Emergency Action Plan, the same theory applies. In the **Terror Threat levels infographic** and **Emergency Action Plan infographic** all levels are presented as one chunk. In contrast, for the **Terror Threat level motion graphics** each individual level is presented as a chunk of information (Chunk 1 –Low; Chunk 2 – Moderate; Chunk 3 –Substantial; Chunk 4 –Severe; Chunk 5 –Critical). The same applies to the **Emergency Action Plan motion graphics**, where each individual step is also presented as a separate chunk of information (Chunk 1 –Inform; Chunk 2 – Escape, Chunk 3 – Help), with additional sub-steps in each one of them, increasing the cognitive load further. If we apply the chunking theory, chunking all levels together and all steps together in a single infographic is a superior method, because it supports the user in understanding and assimilating them effectively. This is because all of the information is gathered together in meaningful chunks in the working memory, and thus the user can make comparisons, establish a crescendo in severity (Terror Threat Levels) and a sequence of actions (Emergency Action Plan) in a more logical and connected way. Moreover, communicating threat levels and action steps separately may have diminished the advantage that **motion graphics** have over **static infographics.** Normally, communicating information across auditory and visual channels (as is the case in motion graphics) will reduce cognitive load (Mayer, 2012; Mayer and Moreno, 2003).

Thus, from this study the following theory emerges. When communicating levels of risk or several steps to follow in a situation of emergency, static infographics (if designed according to information visualisation research-based principles) can reduce cognitive load and support understanding of information.

In reference to motion graphics, and based on existing evidence that a combination of infographics and motion graphics may be

even more beneficial than each item presented individually (Arguel and Jamet, 2009), in these same situations motion graphics could be used as a companion output to infographics. This is because, if designed according to information visualisation research-based principles, they are more inclusive in that they communicate through various channels (visuals, music/sound and narration) and provide a more detailed explanation of the content. However, this is yet to be tested.

Therefore, based on this hypothesis, the following research question is suggested for future research: Is the communication of information via a combination of infographics and motion graphics superior to either presenting the information only via an infographic or only via a motion graphics? Our suggestion is that combining infographics and motion graphics allow for a more efficient, effective, accessible, comprehensive and inclusive approach. This suggestion is also based on participant comments stating that infographic and motion graphics together contributed to the information being easier to find and understand, as well as being more memorable and more engaging. Moreover, that a combination of visuals and sound maximize understanding (also argued by Baer, 2010) and that motion graphics are more inclusive of people with low literacy and some kinds of visual impairment. Prior literature also states that multimedia can improve engagement with online information (Garett et al., 2016).

Another question for future research is: Does communicating security information via the combination of infographics and motion graphics have a positive impact on long-term memory? As shown by previous studies (e.g. Brady et al., 2008) long-term memory is extremely important to visual perception because it is where our ability to recognize visuals is held. Therefore, the inclusion of visualized information may increase long-term recall of security information, which is very important to empower the public to remember what to do in the face of suspicious behavior and in the event of a terrorist attack.

This pioneering study, which brings together Information Design and Security Studies, provides evidence that motion graphics and infographics can be of great benefit to the public in the contemporary security environment. By extolling the virtues of enhanced communication of important security information, this study would ensure that the public are better informed, reassured, and hence have a greater sense of control over their response to the terror threat. Additionally, by empowering them in this way, the public could be more vigilant and thereby able to better contribute to the security of their communities and nation. Furthermore, the findings of the study have direct practical implications for security agencies in the UK, as well as those in countries around the world.

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