INTRODUCTION

In accordance with the information provided at http://www.internationaljournal.org/london.html, three workshop proposals are supplied in this document. One or more of these workshops can be delivered, as required by the Multidisciplinary Conference committee. Additionally, as discussed below, the workshops can be tailored to meet specific types of audience needs.

These proposed workshops are:

- **Workshop Proposal #1.** This workshop can deliver detailed insights into the best way to develop visual aids for teaching, developing eLearning systems, or simply creating visual aids for any form of presentation. The practical insights provided in this workshop apply detailed research in psychophysics, biopsychology, cognitive science, educational design and visual design, which were integrated through the multidisciplinary research discussed in Research ID U6K264.

- **Workshop Proposal #2.** This workshop is similar to the one proposed at Option 1, but it is focussed on providing the insights in a way that makes the content highly useful for anyone developing Human Computer Interfaces (HCI), Graphic User Interfaces (GUI), web pages, and other computer-based display systems. Consequently, whereas Option 1 is useful for teachers/lecturers, people in business, and a wide range of professions, the second option is focussed on IT professionals, to help them align their designs to the way people process visual information.

- **Workshop Proposal #3.** The final option also draws from content related to the research discussed in the Research ID U6K264 outline and associated paper. However, this workshop is focussed on the content development process. This workshop therefore provides innovative insights into the implementation of an optimised method for developing content for presentations, teaching/lecturing, and all forms of communication. In particular, the practical exercises explain the application of Cognitive Templates (CT). These CT are easy-to-use frameworks for developing any form of message, so it is more readily understandable and memorable. This works because the CT allow users to align their message directly to the fundamental way humans process information. Just as importantly, the application of this approach reduces content development time by up to half. The system covered in this workshop is the result of integrating detailed research in the field of cognitive science, and the integration of definitive logic models, to identify universal techniques that are readily applicable to a wide range of fields.

The related U6K264 paper will be provided shortly, as it is just going through the final review process at the moment.

**WORKSHOP PROPOSAL #1**

<table>
<thead>
<tr>
<th>Workshop title:</th>
<th>Creating brain-focussed visual aids - for optimisation of teaching and all forms of presentations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration:</td>
<td>The content listed below provides a rough outline of the type of material that can be covered in the workshop. As the available duration for the workshop is currently unclear, the outline cannot be finalised. However, very useful coverage can be achieved in a two to four-hour session.</td>
</tr>
</tbody>
</table>
Abstract and Keywords
A great deal has been written about optimising the design of visual aids for all types of presentations, or computer based communications, such as web pages, or eLearning systems. However, detailed research and analysis of the available advice indicated that much of the existing information is based on design paradigms that do not take into account how the brain actually handles visual information.

Consequently, Dr. Hilliard embarked on a detailed and extensive research program to separate the design myths from the facts, by starting with the fundamentals of visual processing. This research culminated in the development of a Unified Design Model (UDM), and a set of clear design guidelines that are based on sound science and rigorous experimentation.

This workshop explains the UDM, key aspects of the underlying science, and the practical methods that can be applied to improve all aspects of visual design for computer-based systems.

Keywords: presentations, web-pages, learning design, eLearning, visual design, psychophysics, cognitive science

Workshop presenters’ information

<table>
<thead>
<tr>
<th>Name</th>
<th>Dr. Bruce Hilliard</th>
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<tbody>
<tr>
<td>Affiliation</td>
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<tr>
<td>e-mail</td>
<td><a href="mailto:bruce.hilliard@seahorses-consulting.com">bruce.hilliard@seahorses-consulting.com</a>; or <a href="mailto:b.hilliard@murdoch.edu.au">b.hilliard@murdoch.edu.au</a></td>
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Dr. Hilliard commenced research into the optimisation of visual design in 1994. This investigation was based on extensive exploration in the fields of psychophysics, cognitive science, psychology, neuroscience and biopsychology. In other words, the research was founded on identifying the mechanics of how the human brain handles information, and particularly visual information. Many years of practical application of this research in industry and government led him to eventually embark on a consolidated experimental program, which was conducted through Murdoch University. The results of this research were published as a comprehensive PhD thesis.

Dr. Hilliard continues to work with industry and government to apply the concepts, and his research is ongoing.

Specific Requirements for conducting the workshop
- Data projector and screen
- Computer (I would prefer to utilise my own computer if possible)
- A whiteboard that can be used at the same time as the data projector, and a minimum of four colours of markers
- Printing of the handouts
**Target Audience**

This session will be useful for anyone who wishes to optimise visual aids, such as PowerPoint presentations, web pages, or eLearning systems. In particular, the content can be tailored to general presenting and/or teaching as required.

Participants will not need any prior knowledge of psychophysics (or any of the related sciences), as the session will explain the pertinent information they need, so they can understand the design imperatives to optimise design.

Maximum number of participants: 50 (the groupwork practical exercises can still be achieved with this size of audience, as discussed below).

**Description of workshop, and envisioned activities during the workshop:**

**Objectives of the Workshop**

This workshop will explain a set of science-based design guidelines, which can be applied to optimise the development of all types of presentation aids, web pages, and eLearning environments. Although the workshop describes key aspects of the science to lay a foundation, the main focus of the session is on explaining the implications and practical application issues. Consequently, the concepts are rationalised and explained in ways that make the holistic and specific methods easy to understand.

**Importance/Currency**

This workshop is based on extensive contemporary research, which was published in Hilliard (2016) *(which is discussed below)*. This document provides unique insights into the application of visual design through computer displays or data projectors. The uniqueness of the insights is based on the fact that the methodology leverages extensive and rigorous research into the way the human brain processes information, and particularly visual information. Additionally, this thesis coalesced information from more than 1600 research and design publications to create a rational Unified Design Model (UDM), which provides a coherent scaffolding for managing all aspects of visual design.

The overview diagram for the UDM is shown to the right, which illustrates the categories of attributes that affect the way our brains process visual material. Supporting this holistic framework is an extensive set of science-based guidelines that make optimal methods readily understandable.

To demonstrate the breadth and depth of the content that provides the foundation for these techniques, I have enclosed a link to my thesis in the Murdoch University repository:


The quickest way to get a feel for the breadth and depth of the content is to take the following steps:

- Firstly, have a look at the beginning of Chapter 3 (in Volume 1), which illustrates the visual elements of the UDM concept. If you want to see the full model, have a look at Section A3.1 (in Volume 2).
• You can then browse through Section A3.2 (in Volume 2). This gives you access to the simplified tentative design principles (which were used to develop the experiments), and also lets you drill down into the underlying material used to create the principles. The drill down is facilitated by the provision of a set of reference locations, which point to the various parts within the thesis. The underlying reasons for each principle are explained in those sections (Note: Section numbers beginning with A are in the Appendices (Volume 2) whereas the others are in Volume 1). You will notice that this approach validates the design concepts by linking to detailed research in the fields related to psychology, cognitive science and psychophysics (as listed in the right hand columns). The tables in Section A3.2 therefore allow you to drill down right through the psychology and psychophysics (experiment outcomes) to the underlying neural mechanisms that cause the particular effects related to different visualisations.

• The principles were then rigorously tested (see Chapters 4, 5 and 6 in Volume 1, and Appendices 4, 5 and 6 in Volume 2). As a result of this testing the universal design guidelines were developed and listed in Section A6.1. The reasoning for the changes from the initial design principles is explained in Chapter 6 (in Volume 1).

Need
One of the more interesting aspects of this research relates to finding out that many of the existing design recommendations are not based on sound science, and in fact many of the existing publications give advice that is actually counter-productive. This workshop will help participants understand what really works and what does not.

Additionally, although the thesis was scoped down to just use PowerPoint, the visual design and psychophysics/neuroscience related issues are universal. Consequently, the findings are applicable to all computer-based representations. This workshop will therefore give participants unique insights that will help them separate the facts from the myths, and use a set of practical techniques to significantly improve the effectiveness of their visual aids for teaching and all forms of presenting (e.g. business, marketing, sales, etc.).

Format of the Session
The session will be delivered in the form of a lecture, which is interspersed with a range of practical exercises that help the participants to understand and apply the concepts. The practical exercises are small group activities that get the participants to apply the guidelines to rationalise common design techniques and identify steps that they can apply to enhance the visualisation of their material.

Presentation Format
The detailed format of the presentation will be dependent on the actual duration of the session. However, for a longer session the content structure could include the following:
(1) Introduction
(2) Design Science: This part of the session outlines a set of key concepts related to the way the human visual system processes visual information. This is an important element of the session, because it allows participants to then understand the effects of key design decisions.
(3) Complexity: This module element explains the concept of visual complexity, so designers can understand the ramifications of differing visualisations on the mental processing of their content.
Colours & Backgrounds. The content in this part of the session helps individuals understand the importance of managing colours and background elements to manage perception most effectively.

Layout & Array. The layout and array part of the workshop explains how two stage processing in the human brain should be taken into account to optimise web pages, eLearning systems and all visual aids.

Text. This part of the session discusses font choices, and introduces key factors that need to be taken into account in optimised design.

Graphics. The content in this part of the session describes a set of methods for applying presentation graphics in the most effective manner.

Animation. A wide range of animation issues can be discussed in this part of the session; so optimal techniques can be applied to shape viewer perception.

Conclusion.

Audience Participation

For each of the sessions discussed in the preceding section, the audience can participate in small groupwork (2-3 participants per group) exercises that will help them consolidate the concepts through practical application. Because of this small group format for the practical exercises, large audiences can participate in the workshop.

Outcome Measures

The following are the measurable outcomes applicable to this workshop:

1. participants will have a better understanding of how the brain processes visual information;
2. they will understand how to shape their presentations, web pages, and eLearning environments to optimise the communication of information; and
3. participants can gain enough information to take positive steps to improve their designs immediately.

WORKSHOP PROPOSAL #2

<table>
<thead>
<tr>
<th>Workshop title:</th>
<th>Creating brain-focussed interface designs and web-pages</th>
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<tbody>
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Abstract and Keywords

A great deal has been written about optimising visual design for Human Computer Interfaces (HCI), Graphic User Interfaces (GUI), web pages, and other computer-based display systems. However, detailed research and analysis of the available advice indicated that much of the existing information is based on design paradigms that do not take into account how the brain actually handles visual information.

Consequently, Dr. Hilliard embarked on a detailed and extensive research program to separate the design myths from the facts, by starting with the fundamentals of visual processing. This research culminated in the development of a Unified Design Model (UDM), and a set of clear design guidelines that are based on sound science and rigorous experimentation.

This workshop explains the UDM, key aspects of the underlying science, and the practical methods that can be applied to improve all aspects of visual design for computer based systems.

Keywords: Human Computer Interfaces (HCI), Graphic User Interfaces (GUI), web-page design, psychophysics

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Dr. Hilliard commenced research into the optimisation of visual design in 1994. This investigation was based on extensive exploration in the fields of psychophysics, cognitive science, psychology, neuroscience and biopsychology. In other words, the research was founded on identifying the mechanics of how the brain handles information, and particularly visual information. Many years of practical application of this research in the ICT industry led him to eventually embark on a consolidated experimental program, which was conducted through Murdoch University. The results of this research were published as a PhD thesis.

Dr. Hilliard continues to work with the ICT industry to apply the concepts, and his research is ongoing.

Specific Requirements for conducting the workshop

• Data projector and screen
• Computer (I would prefer to utilise my own computer if possible)
• A whiteboard that can be used at the same time as the data projector, and a minimum of four colours of markers
• Printing of the handouts.
**Target Audience**

This session will be useful for anyone who wishes to optimise visual design. Consequently, it will be very helpful for designers of HClIs, GUIs, web pages, a range of other interfaces, and even presentation software such as PowerPoint.

Participants will not need any prior knowledge of psychophysics (or any of the related sciences), as the session will explain the pertinent information they need, so they can understand the design imperatives to optimise design.

Maximum number of participants: 50 (the groupwork practical exercises can still be achieved with this size of audience, as discussed below).

**Description of workshop, and envisioned activities during the workshop:**

**Objectives of the Workshop**

This workshop will explain a set of science-based design guidelines, which can be applied for all types of computer-based visualisation and interfaces. Although the workshop describes key aspects of the science to lay a foundation, the main focus of the session is to explain the implications and practical application issues. Consequently, the concepts are rationalised and explained in ways that make the holistic and specific methods easy to understand.

**Importance/Currency**

This workshop is based on extensive contemporary research, which was published in Hilliard (2016) *(which is discussed below)*. This document provides unique insights into the application of visual design through computer displays or data projectors. The uniqueness of the insights is based on the fact that the methodology leverages extensive and rigorous research into the way the human brain processes information, and particularly visual information. Additionally, this thesis coalesced information from more than 1600 research and design publications to create a rational Unified Design Model (UDM), which provides a coherent scaffolding for managing all aspects of visual design.

The overview diagram for the UDM is shown to the right, which illustrates the categories of attributes that affect the way our brains process visual material. Supporting this holistic framework is an extensive set of science-based guidelines that make optimal methods readily understandable.

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down is facilitated by the provision of a set of reference locations, which point to the various parts within the thesis. The underlying reasons for each principle are explained in those sections (Note: Section numbers beginning with A are in the Appendices (Volume 2) whereas the others are in Volume 1). You will notice that this approach validates the design concepts by linking to detailed research in the fields related to psychology, cognitive science and psychophysics (as listed in the right hand columns). The tables in Section A3.2 therefore allow you to drill down right through the psychology and psychophysics (experiment outcomes) to the underlying neural mechanisms that cause the particular effects related to different visualisations.

• The principles were then rigorously tested (see Chapters 4, 5 and 6 in Volume 1, and Appendices 4, 5 and 6 in Volume 2). As a result of this testing the universal design guidelines were developed and listed in Section A6.1. The reasoning for the changes from the initial design principles is explained in Chapter 6 (in Volume 1).

**Need**

One of the more interesting aspects of this research was to find out that many of the existing design recommendations are not based on sound science, and in fact many of the existing publications give advice that is actually counter-productive. This workshop will help participants understand what really works and what does not.

Additionally, although the thesis was scoped down to just use PowerPoint, the visual design and psychophysics/neuroscience related issues are universal. Consequently, the findings are applicable to all computer based representations (including HCI, GUI, web pages, etc.). This workshop will therefore give participants unique insights that will help them separate the facts from the myths, and use a set of practical techniques to significantly improve the effectiveness of their designs.

**Format of the Session**

The session will be delivered in the form of a lecture, which is interspersed with a range of practical exercises that help the participants to understand and apply the concepts. The practical exercises are small group activities that get the participants to apply the guidelines to rationalise common design techniques and identify steps that they can apply to enhance the visualisation of the material.

**Presentation Format**

The detailed format of the presentation will be dependent on the actual duration of the session. However, the content structure can include the following:

1. **Introduction**
2. **Design Science:** This part of the session outlines a set of key concepts related to the way the human visual system processes visual information. This is an important element of the session, because it allows participants to then understand the implications of key design decisions.
3. **Complexity:** This module element explains the concept of visual complexity, so designers can understand the ramifications of differing visualisations on the mental processing of their content.
4. **Colours & Backgrounds.** The content in this part of the session helps individuals understand the importance of managing colours and background elements to manage perception most effectively.
5. **Layout & Array.** The layout and array part of the presentation explains how two stage processing in the human brain should be taken into account to optimise HCIs, GUIs or the representation of information on the screen.
(6) Text. This part of the session discusses font choices, and introduces key factors that need to be taken into account in optimised design.

(7) Graphics. The content in this part of the session describes a set of methods for applying graphical screen elements in the most effective manner.

(8) Animation. A wide range of animation issues can be discussed in this part of the session; so optimal techniques can be applied to shape viewer perception.

(9) Conclusion.

**Audience Participation**

For each of the sessions discussed in the preceding section, the audience can participate in small groupwork (2-3 participants per group) exercises that will help them consolidate the concepts through practical application. Because of this small group format for the practical exercises, large audiences can participate in the workshop.

**Outcome Measures**

The following are the measurable outcomes applicable to this workshop:

1. Participants will have a better understanding of how the brain processes visual information;
2. They will understand how to shape their HCI, GUI, web page or other screen design, so it best aligns to the way the human brain processes the information; and
3. Participants can gain enough information to take positive steps to improve their designs immediately.

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**WORKSHOP PROPOSAL #3**

<table>
<thead>
<tr>
<th>Workshop title:</th>
<th>Developing message content to match the way we think – to optimise comprehension, impressions and learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration:</td>
<td>The content listed below provides a rough outline of the material that can be covered in the workshop. Finalised content will be dependent on the workshop duration. Useful outcomes can be achieved in a two to four hour workshop.</td>
</tr>
</tbody>
</table>

**Abstract and Keywords**

Detailed research in the field of cognitive science identified that universal logics can be used to optimise the way we communicate with other people. For example, a set of easy-to-use Cognitive Templates can be applied to improve learning outcomes, enhance marketing and sales, or optimise any form of presentation.

This workshop explains these Cognitive Templates, and many other aspects that will help participants develop content more effectively, so it is readily understandable and also highly persuasive.

**Keywords:** learning development, presentations, business, sales, marketing, cognitive science

**Workshop presenters’ information**
Dr. Bruce Hilliard commenced research into the field of teaching in 1983. His objective was to develop an integrated approach that would fundamentally enhance teaching methods. To achieve this aim, he implemented multidisciplinary research that leveraged a range of psychology related fields (e.g. cognitive science, psychophysics, biopsychology, neuroscience, educational and developmental psychology, etc.). The methods that he defined from this research were then trialled and fine-tuned over many years, to create a practical approach that can be readily applied to improve learning outcomes.

Until recently these results were not shared with the academic community, because it became apparent that aspects such as the Cognitive Templates were universally applicable, and their relevance to business had important commercial implications. The methodology was therefore treated as being commercial-in-confidence. However, while recovering from cancer, Bruce decided that he would share the information and techniques openly.

He is therefore in the process of developing and distributing a set of insightful journal articles, and is also offering to share these easy-to-apply techniques in a range of interesting and very useful workshops. Additionally, he is continuing his research through Murdoch University in Western Australia.

### Specific Requirements for conducting the workshop
- Data projector and screen
- Computer (I would prefer to utilise my own computer if possible)
- A whiteboard that can be used at the same time as the data projector, and a minimum of four colours of markers
- Print the handouts

### Target Audience
This session will be useful for anyone who wishes to develop learning materials, any form of presentation, or communication that is readily understandable and memorable.

Maximum number of participants: 50 (the groupwork practical exercises can still be achieved with this size of audience, as discussed below).

### Description of workshop, and envisioned activities during the workshop:

#### Objectives of the Workshop
This workshop will explain a set of psychology-based methods, which can be applied to enhance all forms of communication. However, in this case the content would be shaped to reflect the Interdisciplinary Conference committee’s requirements for either learning focussed material, or for more generalised application (e.g. applicable to all forms of presentations/communication).

#### Importance/Currency
This workshop is based on extensive contemporary research, which was published in Hilliard (2016) (see Section A3.1 in Volume 2 of the thesis discussed above for an overview) and Hilliard (2010). These documents provide unique insights into the application of cognitive science to...
improve the quality and effectiveness of communication, by shaping the content to the way people think.

**Need**
This approach helps to overcome shortfalls in other guidance on this topic, by applying extensive research in cognitive science and other psychology related subjects. The content that can be delivered in the workshop therefore provides a framework that is applicable to a wide range of pursuits. For example, independent research conducted by Rio Tinto and the University of Western Australia identified that these techniques improved comprehension of complex material by around 40%, and enhanced longer term retention of the content by up to 200%.

The content is therefore widely applicable, and can immediately support a range of needs.

**Format of the Session**
The session will be delivered in the form of a lecture, which is interspersed with a range of practical exercises that help the participants to understand and apply the concepts. The practical exercises are small group activities that get the participants to apply the related techniques.

**Presentation Format**
The detailed format of the presentation will be dependent on the actual duration of the session. However, the content structure can include the following:

1. **Introduction**
2. **Bounding**: This module introduces a set of proven techniques that allow the content for a presentation, lesson, or any form of message to be scoped quickly and effectively. In particular, it allows the participants to understand their students/audience more effectively, and scale their message before wasting time developing extraneous content.
3. **Focussing**: This part of the process explains how the content identified in the bounding process can be quickly refined, so the message is properly focussed.
4. **Laying Out**: This is the most important part of the session, because it explains the application of the Cognitive Templates and provides practical insights into their use.
5. **Conclusion**.

**Audience Participation**
For each of the sessions discussed in the preceding section, the audience can participate in small groupwork (2-3 participants per group) exercises that will help them consolidate the concepts through practical application. Because of this small group format for the practical exercises, large audiences can participate in the workshop.

**Outcome Measures**
The following are the measurable outcomes applicable to this workshop:

1. participants will have a better understanding of how to structure information, so it conforms to universal processing logics;
2. the participants will be able to follow a process that methodically develops the content, so it is readily understandable, highly memorable, and persuasive; and
3. participants can gain enough information to take positive steps to improve their content development immediately.