THE FRAMEWORK FOR UNDERSTANDING LAYOUT PRINCIPLES

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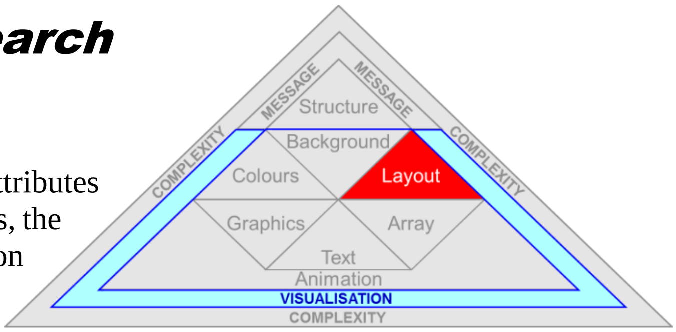
WHAT'S THE POINT?

This handout:

- ✓ is an excerpt from Chapter 2 of my thesis *(hence why it refers to other parts of the thesis in the text)*;
- ✓ helps you to understand some key approaches for establishing the right layout for slides and other material*)*; and
- ✓ provides an effective foundation for developing all forms of visual and presentation material.

1.1. What the Research Indicates



Although layout is influenced by other attributes listed in preceding and following handouts, the basic arrangement of the key elements on the screen can significantly impact on the efficacy of visual communication (Wu, Hu, & Shi, 2013). For example, Roberts (2007) identified that layout aspects related to the organisation and symmetry of the visual elements on a screen is responsible for nearly half of the perceived complexity of the material. Additionally, the layout can directly affect the comprehension of the visual information (Seymour, Clifford, Logothetis, & Bartels, 2010; Wheildon, 1990), the readability of any text (Leykin & Tuceryan, 2004; Pathiavadi, 2009; Ramadan, 2011; Wästlund, Norlander, & Archer, 2008), the impressions generated by the material on the screen (Egger, 2001; Mackiewicz, 2008; McGinley, 2009; Surenda, Nikunj, & Spears, 2005; Um, 2008), and the application of attention (Conci & von Mühlenen, 2009; Jiang & Chun, 2001; Rothkopf, Ballard, & Hayhoe, 2007).

The importance of layout is best understood by analysing how it is utilised for perception and cognition. Firstly, the entire gist of a scene (e.g. the entire slide) is typically analysed initially as a whole entity by viewers[(1)] (Henderson & Hollingworth, 1999; Henderson, Williams,

1. This appears to take place in a network of regions within the brain, which include the Parahippocampal Cortex (particularly the Parahippocampal Place Area (PPA)), the Retrosplenial Cortex (RSC) (Bar, 2004; Dickinson & Intraub, 2009), the Transverse Occipital Sulcus (TOS) (Ward, MacEvoy, & Epstein, 2010) (see Section 1.4.1.3.1in Appendix 1), and the Perirhinal cortex (Murray, Bussey, & Saksida, 2007) (See Section 1.4.1.3.7 in Appendix 1). This content

Catstelhano, & Falk, 2003). This assessment appears to generally align to the application of the Gestalt principles (Wolfe, 2006), but this process may be better explained by a more recent concept known as Fuzzy-Trace Theory[(2)] (Reyna, 2012). In either case, significant meaning is generated through the initial gist analysis of the layout (Tileagă, 2011; Wolfe, Võ, Evans, & Greene, 2011). For instance, object recognition within a scene is greatly influenced by the context generated by the gist analysis (Jiang, Sigstad, & Swallow, 2013; Wolfe et al., 2011). A good example of this is cited in the research by Wolfe et al. (2011), who found that viewers take significantly longer to locate objects in a scene that are positioned out of context (e.g. when looking at a kitchen scene, the viewers typically found it more difficult to find bread positioned in the sink, because this positioning did not align to their semantic knowledge).

To further explain this concept, Sanocki et al. (2006) identified that the processing of the entire layout appears to be managed at two levels. Firstly, very rapid automatic perceptual processes (Intraub, Daniels, Horowitz, & Wolfe, 2008) are driven by bottom-up attention, which may be predominantly processed rapidly through the dorsal stream (Sanocki et al., 2006; Tatler, 2009). In this initial process up to about 13 visual objects can be assimilated (Sanocki, Sellers, Mittelstadt, & Sulman, 2010), and these groups of visual elements (arrays/objects) are then prioritised for top-down attention (Betz, Kietzmann, Wilming, & König, 2010) through overt or covert shifts (Matsukura, Luck, & Vecera, 2007). Detailed analysis, and the development of more comprehensive representations is then implemented as a part of a top-down attention driven approach (Sanocki et al., 2006). Therefore, as cited by Noiwan and Norcio (2006) layout is a highly important feature in shaping attention, because it helps to define how viewers assess individual elements on the screen.

Good layout should therefore facilitate perception, cognition (Cavanagh, 2011), and the generation of attention (Pettersson, 2010; Wolfe et al., 2011). Additionally, the layout should also be designed to be rich and appealing, so the gist can help to generate positve attitudes (Agarwal & Karahanna, 2000). The following sections describe STEP based findings that can be applied to support these objectives.

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is also mixed with semantic information from the hippocampi within the frontal cortex to finalise the contextual analysis of the gist (Bar, 2004) (see Section 1.4.3.3 in Appendix 1). Therefore gist affects both the application of bottom-up and top-down attention, and cognitive analysis (Sanocki, Michelet, Sellers, & Reynolds, 2006).
Appendix 1 is provided at the following web location:
http://www.seahorses-consulting.com/DownloadableFiles/Appendix1.pdf
Bottom-up and top-down attention processes are explained in:
http://www.seahorses-consulting.com/DownloadableFiles/ShapingAttentionHandout.pdf

2. *Fuzzy-Trace Theory* (F-TT) posits that gist is utilised early in the visual analysis process to facilitate the creation of representations, which then 'support fuzzy (yet advanced) intuition, and superficial verbatim representations of information, which support precise analysis' (Reyna, 2012, p. 332). F-TT is therefore closely related to object recognition (which is described in Section 1.2.2.2 in Attachment 1) at the gist level. A more detailed description of F-TT is beyond the scope of this paper. However Reyna (2012) provides a useful review of the key concepts, should the reader wish to investigate this topic further.

1.2. The Importance of Scan Types

According to (Mohler & Duff, 2000), good screen layout should take into account the flow of the eye across the screen. For example, they identified that poor visual design forces greater saccadic eye movement(3), which in turn reduces the amount of information that can be processed by the viewer (Mohler & Duff, 2000).

The need to implement design that aligns to standard scanning techniques is espoused in numerous PowerPoint® publications (e.g. Duarte (2008) and Gabrielle (2010)). These respectively refer to 'Z' and 'F' shaped standard viewing paths for slides. Additionally, other design publications (e.g. Wheildon (2005), Hanington (2006), and Bradley (2013)) also refer to variations such as the Gutenberg diagram. Each of these three visual scan pathways can be characterised as discussed in the following subsections.

1.2.1. Gutenberg Diagram

The Gutenberg Diagram aims to demonstrate the flow of the eye across homogenous material, such as a full screen of text (Hanington, 2006). Figure 1 illustrates the key elements of the Gutenberg Diagram(4), and Arnold (1978) indicated that design should respect and apply this concept, to optimise the communication of information to people from western cultures.

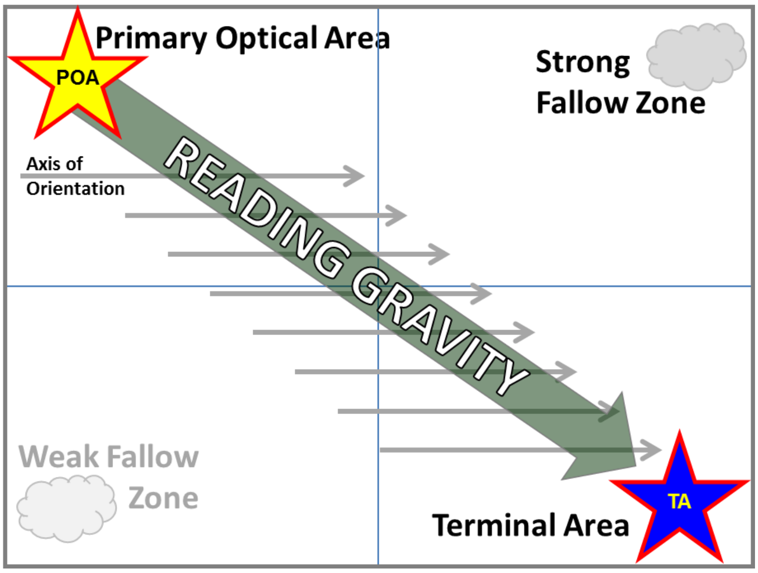

Figure 1: The Gutenberg Diagram

The premise of the Gutenberg diagram is that readers from western cultures will typically scan from the top left (the Primary Optical Area (POA)) and gravitate toward the bottom right (the

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3. *Saccades* are used to move the fovea within the visual field (Leigh & Zee, 1999), so the eye can fixate on specific objects (Liversedge & Findlay, 2000). These saccadic eye movements are therefore rapid position shifts of the eye, which are happening most of the time, to generate awareness of the environment and focus attention on specific objects (Casey, 2004; VanRullen & Koch, 2001) . Saccadic eye movements are explained in more detail in Section 1.6.1 in Appendix 1.

4. The Gutenberg Diagram was developed by the famous newspaper publisher Edward Arnold, to demonstrate how viewers are likely to scan pages of text content (Arnold, 1978).

Terminal Area (TA)), by reading the content through a series of horizontal movements along the axis of orientation (e.g. reading lines of text from left to right and from top to bottom) (Bradley, 2013). Although the axis of orientation supports horizontal movement of the eye, the general reading gravity is from the top left to the bottom right. The Gutenberg diagram also splits the readable area into four quadrants, and indicates that the viewer is likely to pay less attention to the fallow areas (Arnold, 1978). However, the viewer is likely to pay more attention to the strong fallow area (top right corner) and very little attention to the weak fallow area (bottom left corner) (Bradley, 2013).

The key assertions of the Gutenberg diagram are that important information should be placed toward the top left, and the layout should facilitate the movement of the eye from the POA to the TA (Wheildon, 2005) (e.g. from top left to bottom right).

1.2.2. Z-Pattern

The Z-Pattern indicates that viewers will begin in the top left, move horizontally to the top right, and then diagonally to the bottom left, before gravitating horizontally to the bottom right of the screen (Bradley, 2013). The left hand diagram in Figure 2 illustrates this concept.

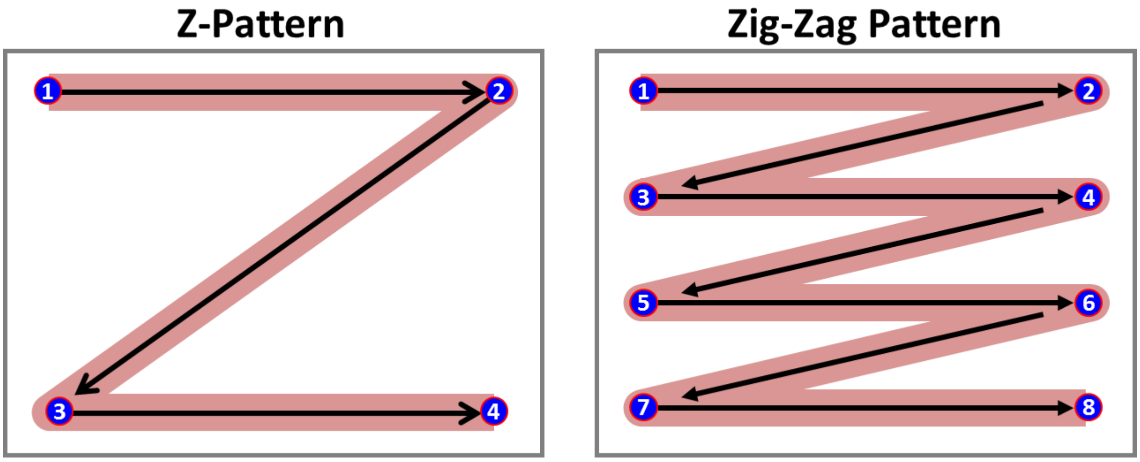


Figure 2: The Z-Pattern Diagrams

Advertising and web designers (e.g. Jones (2010) and Nunn (2012)) recommend organising the visual content within these regions of the layout, to support the ordered communication of information (e.g. first and most important point at position 1, the next most important information at position 2, and so on), as they believe this helps to reinforce the flow of information.

According to Bradley (2013) the Z-Pattern is a useful representation of standard eye scanning paths for simple designs, but for more complex content the Zig-Zag pattern (shown to the right in Figure 2) may provide a better representation. This second visual search model has many similarities with the Gutenberg diagram, because each horizontal path represents the axis of orientation, and the general reading gravity is from the top left to the bottom right.

1.2.3. F-Pattern

Nielson (2006) conducted research into the standard methods for visually scanning text based web pages, and used these experiments to identify the so-called F-Pattern. As detailed by Bradley (2013) the F-Pattern indicates that the eye will typically:

- begin in the top left hand corner;
- move horizontally to the top right before returning to the left edge;
- then make a second sweep to the right, but not as far as the first saccade; and
- whilst the eye moves further down the page the horizontal sweeps will typically remain progressively closer to the left hand margin.

A stylised representation of this F-shaped pattern is provided in Figure 3.

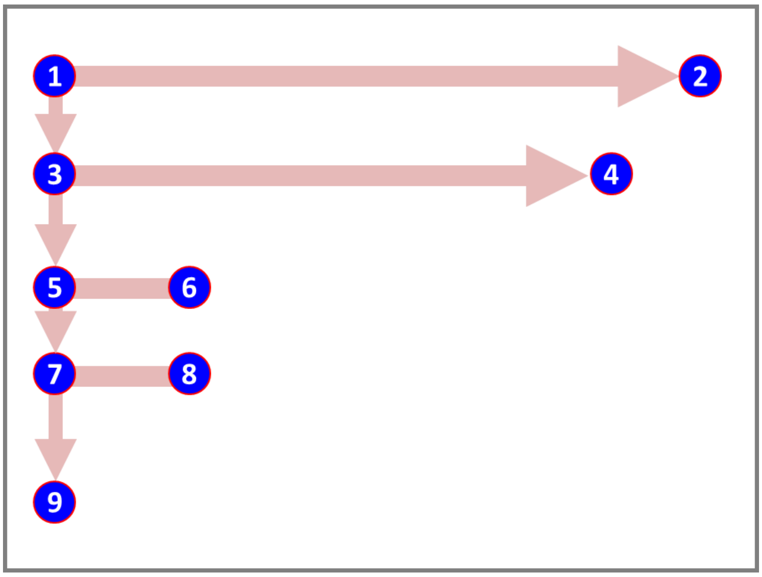


Figure 3: The F-Pattern Diagram

This Nielson (2006) model indicates that important information should be positioned across the top of the design, and other key content should be biased toward the left of the screen to support information scanning.

1.2.4. Practical Implications and Limitations of these Scan Paths

As specified by Bradley (2011), each of these patterns are predicated on viewing homogenous information, such as a full page of text. However, these patterns appear to be applied almost universally to layouts without the designers understanding their limitations (Bradley, 2011). This is in spite of the fact that even relatively old research results, such as those cited in Noton and Stark (1971), Stark and Ellis (1981) and Groner, Walder, and Groner (1984), identified that different scanning techniques are applied when viewing different types of visual material (e.g. the way a viewer scans text is different from the way in which they scan a picture). Suvorov (2013) reinforced these findings, by identifying that the type of content and the context of the visual material significantly affected the scanning and processing of information.

Therefore, because the Gutenberg Diagram, Z-Pattern, and F-Pattern are all predicated on text scanning, they may be sensible in terms of the cognitive processes identified for reading. However, this may also be limited to languages like English (Schuett, Heywood, Kentridge, & Zihl, 2008), where the viewer has learned to scan from left to right and move line by line from the top to the bottom (Schuett et al., 2008). Different cultures learn other standard scanning techniques (Abed, 1991; Brockman, 1991). For example:

- Chang, Chu, and Chen (2005) identified that when a Chinese reader identifies vertical Chinese characters they will start reading in the top right corner and scan vertically through the column and then move to the left for successive lines (this can be defined as a reverse N-Pattern). On the other hand Chang et al. (2005) also identified that when a Chinese reader finds horizontal lines of text characters (e.g. headings) these will be scanned automatically from left to right.
- Abed (1991) identified that Hebrew readers tend to focus initially on the top right when reading text. Similar scan paths define the standard technique for reading Arabic script (George, Anwar, & Jeyasekhar, 2011). This text scanning is defined as a reverse-Z-Pattern, because it is the mirror image of the Z-Pattern (starting in the top right corner, moving across the top, then diagonally toward the bottom right corner, and then horizontally to the bottom left corner (George et al., 2011).

These standard patterns are also only valid where top-down processes drive the visual scanning (Schuett et al., 2008)[(5)] (e.g. text is identified and goal driven behaviours are applied to read the writing). However, these top-down scanning strategies can also affect the order of processing for non-text material (e.g. when showing shapes in a row, the standard reading order can determine the order of processing) (Abed, 1991).

Additionally, these scan patterns can be significantly disrupted by the presence of recognisable visual patterns (Noton & Stark, 1971), direction invoking content[(6)], salient colours (e.g. coloured text (Brockman, 1991)), or the presence of pictures in the vicinity of the text (Navalpakkam, Rao, & Slaney, 2011). Therefore, bottom-up processes can significantly impact on the standard scanning techniques that will be applied, even in text rich visual material (Navalpakkam et al., 2011).

Alternatively, when viewing graphical scenes (e.g. showing a picture over the full extent of the PowerPoint® slide), other types of visual scanning techniques are applied (Myers, 2007; Noton & Stark, 1971; Rayner, 1998). For instance:

- Bindemann (2010) identified that there is a strong bias toward beginning the scan around the centre of the screen; and
- Engmann et al. (2009) showed that scanning was typically biased to begin just to the left of the screen centre, and the scanning was then predisposed toward regions of high luminance and colour contrasts.

In other words in an unstructured (e.g. non-text) scene the scanning will begin around the middle of the graphical content or screen (Bindemann, 2010), and then the following scan path is likely to be driven significantly by bottom-up attention factors (Engmann et al., 2009).

5. These scan paths appear to be controlled through top-down attention systems within the Posterior Parietal Cortex (see Section 1.4.2 in Appendix 1) and the Frontal Eye Fields (see Section 1.4.3.2.1 in Appendix 1) (Leff, Scott, Rothwell, & Wise, 2001).

6 ‘Viewers scan a display with their attention moving from one part to another. The underlying pattern of the display will be the main determinant of the eye movement pattern. But if you want viewers to “read” the display in a particular sequence or focus on some particular element then you can use various other devices called directionals’ (Smaldino, Lowther, & Russell, 2008, p. 62) These *directionals* can include graphical elements (e.g. arrows that shape the direction of eye movement), icons (e.g. graphical bullets that highlight content and direct the eye), or even text highlighting (e.g. bold text) (Smaldino et al., 2008).

Therefore, the Gutenberg Diagram, Z-Pattern and F-Pattern scan paths are not applicable in these cases. Additionally, they may also not be applicable for text based scanning by other cultures. The recommended standard scan paths cited in the design publications may consequently not be the most efficient approach for defining layouts in all cases.

For instance, Djonov and Van Leeuwen (2013) states that in tools like PowerPoint®, the key to controlling the order of perception rests on:

- the application of grids, and the composition of the visual elements; while
- keeping some aspects of the standard visual scanning techniques in mind (e.g. appropriate reading paths and salience).

Hence, grids and composition aspects may be more important for defining the layout than relying solely on standard scan patterns. The following sections therefore explain important concepts related to grids and composition.

1.3. Grids

A grid is a pattern of lines that is used as a foundation for implementing effective visual composition, by providing a framework for organising the visual elements coherently (Djonov & Van Leeuwen, 2013). However, the grid structure should be implicit, and should not normally be seen by the viewer in the final visual content (Djonov & Van Leeuwen, 2013). According to Pettersson (2010), these implicit grids should then be applied to set standardised visual hierarchies. This objective is achieved by using the selected grid to provide consistent regions and intersection points, which helps to create aesthetically pleasing and comprehensible layouts (e.g. putting information into standard positions on the grid) (Pralle, 2007).

As viewers rapidly learn where to expect information within the grid, this can significantly improve the shaping of attention to the correct visual content (Jiang & Song, 2005; Kunar, Flusberg, & Wolfe, 2006; Waller & Richardson, 2008)[(7)]. Additionally, the utilisation of appropriate grid layouts can reduce cognitive load (Cheon & Grant, 2009), and decrease search time for new material (Myers, 2007; Sanocki & Epstein, 1997).

However, as with various design publications, the research based findings recommend a range of different grid patterns. For instance:

- Djonov and Van Leeuwen (2013) identified what they called Renaissance grids (single-point perspective converging grids), and Graphic Design girds. This latter form of gridding involves the pragmatic selection of implicit shapes and areas within the screen to provide balance, consistency, efficient use of the space available, and visual clarity (Djonov & Van Leeuwen, 2013). Djonov and Van Leeuwen (2013) utilised a wide range of different grid configurations that were defined specifically to meet their objectives. This pragmatic selection approach is also supported by Pralle (2007), who recommended a range of different grid patterns, which utilise the aggregation of squares, rectangles and triangles of various ratios and sizes, to cover the entire slide and provide the framework

7. This may be due to the creation of *configural learning* (Jiang & Song, 2005), in which the viewer's mind is primed (Olds & Degani, 2003) to view specific areas through contextual cueing (Kunar et al., 2006), which can then speed attentional targeting (Jiang et al., 2013).

for positioning content. Interestingly, many of Djonov and Van Leeuwen's (2013) and Pralle's (2007) grid models are extraordinarily complex.

- Ch'ng and Ngo (2003) and Ngo and Ch'ng (2005) applied a similar, but more formal approach, which identified that grids based on unreal number ratios can be used to provide harmonic subdivisions of the screen (e.g. with adjacent grid ratios based on one to the square roots of two, three, five, and/or the golden ratio[8]). According to Ch'ng and Ngo (2003) the application of these ratios to the grid pattern improves the aesthetic properties of the display. However, the associated approach they detailed in Ch'ng and Ngo (2003) and Ngo, Teo, and Byrne (2003) is much too complex for general use in PowerPoint® design[9].
- Alternatively, Marion and Crowder (2013) recommend a standard three (columns) by three (rows) grid. This approach is also cited as a simple method for gridding the screen, in many other publications, such as Reilly and Roach (1984), Thompson (2008) (who applied this to PowerPoint® design directly) and Smaldino et al. (2008). These authors describe this approach as the 'Rule of Thirds'.

Therefore, a range of different grid approaches can be applied. However, many of the recommended grid patterns are very complex and may not be appropriate for normal usage in PowerPoint® design. For this reason the 'Rule of Thirds' may be the most appropriate for utilisation in PowerPoint®, as discussed in Thompson (2008)[10].

1.4. Composition

According to Djonov and Van Leeuwen (2013), good composition utilises the implicit grid, but positions the visual content to take into account framing (array)[11], salience, and the positioning of the information based on its importance. This last point can take into account the scanning paths discussed earlier. For example, where the layout of the visual content is likely to induce reading patterns for scanning, then this scan path can be utilised in positioning the required content (e.g. for western cultures placing the most important information toward the top and left of the screen) (Djonov & Van Leeuwen, 2013). However, Djonov and Van

8. These proportions are discussed in more detail below in Section 1.4.2.
9. Ch'ng and Ngo (2003) explain a complex system of segmentation of the screen based on a set of mathematical ratios that rely on unreal numbers, and they also introduces a complex mathematical formula for determining the best ratios. Ngo et al. (2003) explain this complex mathematical formula in significantly greater detail. After analysing both papers in detail the author believes that it would only be feasible to apply this for most design if an associated computer program was applied. As such a program was not available at the time of drafting this thesis, it was considered that this approach would be beyond the capabilities of most designers to apply. For this reason, it was not utilised in this project.
10. The practical application of this 'Rule of Thirds' technique is explained in more detail in Section 3.7 (which will be covered in a later handout).
11. 'Framing is the degree of connectedness or disconnectedness between layout elements, which may be signalled by contrast or similarity in colour, font type or size, brightness, shape, spatial orientation, distance, movement, and the grouping of elements within a given area, apart from elements occupying other areas' (Djonov & Van Leeuwen, 2013, p. 11). The term framing in this context is therefore a synonym for *Array* within this model.

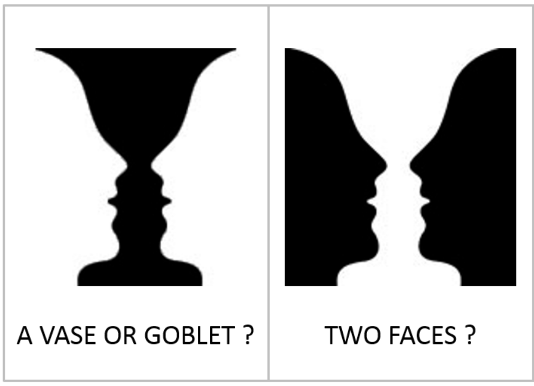
Leeuwen's (2013) approach does not provide guidance on universal principles to facilitate the optimisation of the layout within the grid.

Therefore, for this thesis, two research based models were analysed. The first applies Gestalt theory, because as specified by Chang, Dooley, and Tuovinen (2002), the application of these principles can significantly improve viewer impressions, and their comprehension of the visual material. The second model investigates aesthetic qualities, because these aspects of the layout of visual information can directly affect the acceptability, learnability and comprehensibility of the content (Ngo, Teo, & Byrne, 2000).

1.4.1. Gestalt Principles,

The term Gestalt refers to the human mind's[(12)] propensity to assess material within the field of view as 'a perceptual whole that is more than the sum of its parts and cannot be completely described in terms of its parts' (Matsumoto, 2009, p. 221). Chang et al. (2002) identified 11 important Gestalt laws[(13)], which can be characterised as follows[(14)]:

- ***Figure-Ground.*** This principle states that when viewing content, some elements will seem prominent and therefore in the foreground, and other parts of the visual field will recede into the background (Sternberg, 1998; Yang, 2006). This is a critical element of design, because the ability to identify the foreground is essential in determining the most important material (Graham, 2008)[(15)]. The concept of Figure-Ground differentials is demonstrated in Figure 4.



EXPLANATION

Humans distinguish foreground from background, based on aspects such as colour salience, contrast, and visual weight (Yang, 2006). Therefore, the example on the left may be identified first as a vase or goblet, because the black stands out in contrast with the normal page background. The same effect highlights two faces in the second example (just to the left). Both show the same visual elements, but the assessment of the content is very different, dependent on what the viewer assesses as foreground or background.

Figure 4: Figure-Ground

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12. This processing appears to take place predominantly within the higher order regions of the occipital lobes, adjacent areas of the parietal lobes, and within the ventral stream (Snyder, Shpaner, Molholm, & Foxe, 2012), and in particular within the Perirhinal cortex (O'Neil, Barkley, & Köhler, 2013). The occipital lobe processing is explained in Section 1.3.5 in Appendix 1, and the ventral stream is described in Section 1.4.1 in Appendix 1.

13. This thesis utilises the term 'principles' rather than laws to avoid creating confusion.

14. This section contains short descriptions of each Gestalt principle. The associated diagrams (Figure 5 to Figure 14 are rationalised versions of diagrams provided in (Sternberg, 1998, pp. 178-179), or Figures 1 to 11 in (Chang et al., 2002).

15. Background concepts are discussed in more detail in the handout provided at: http://www.seahorses-consulting.com/DownloadableFiles/ColourPsychology-Backgrounds.pdf

- ***Balance/Symmetry.*** The Gestalt concept of balance states that 'a psychological sense of equilibrium or balance is usually achieved when visual "weight"[(16)] is placed evenly on each side of an axis' (Chang et al., 2002, p. 1). Symmetry is closely aligned to Balance and it relates to the fact that viewers group elements together if they are perceived as being mirror images (Sternberg, 1998, pp. 178-179). Figure 5 illustrates the concepts of Balance and Symmetry.

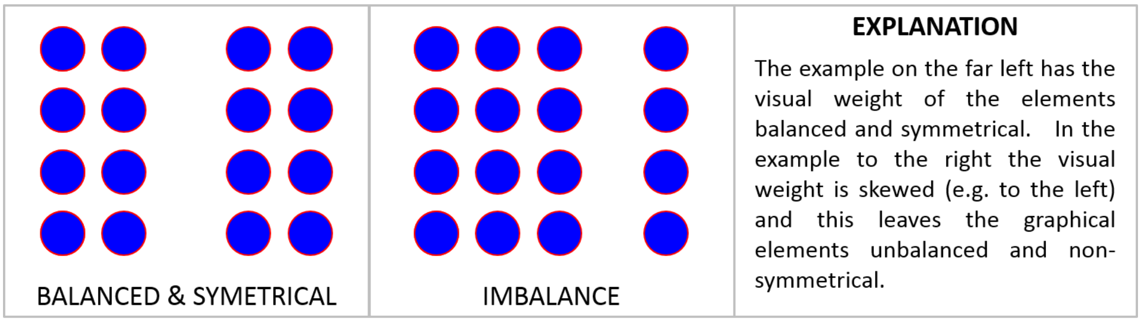

Figure 5: Balance/Symmetry

- ***Closure.*** *Closure* states that viewers 'tend perceptually to close up or complete objects that are not, in fact, complete', because the open/unfinished aspects are ignored in Gestalt perception and cognition (Sternberg, 1998, pp. 178-179). Figure 6 demonstrates the effect of closure.

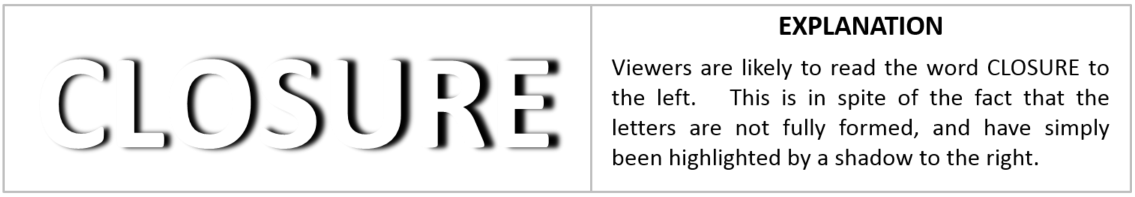

Figure 6: Closure

- ***Continuation***. Good continuation (sometimes called continuity (Wertheimer, 1923)) reflects the concept that viewers will 'tend to perceive smoothly flowing or continuous forms rather than disrupted or discontinuous forms' (Sternberg, 1998, p. 179). This principle is explained in more detail in Figure 7 (overleaf).

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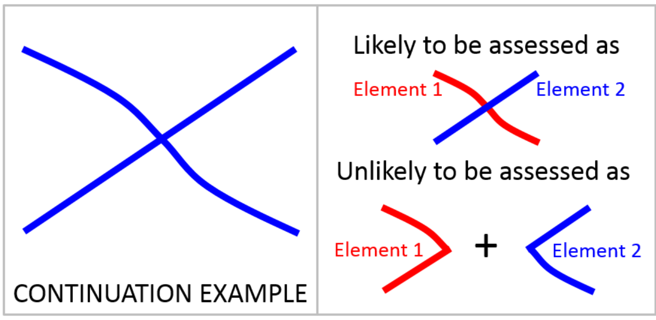
16. 'All objects in a design have a visual weight based on size, colour, form, surrounding space, etc. Our eyes are drawn to elements with the greatest visual weight' (Bradley, 2013, p. 26). For example, the colours identified in the research by Ou, et al. (2004a, 2004b) (see 1.4 on Page 11 of http://www.seahorses-consulting.com/DownloadableFiles/ColourPsychology.pdf), create impressions of visual weight. Alternatively, aspects such as location can also affect the impression of visual weight for an object (e.g. objects closer to the centre of the screen are typically assessed as having more weight than objects on the periphery) (Lok, Feiner, & Ngai, 2004).

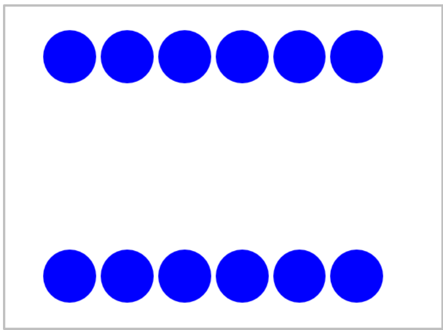


EXPLANATION

Humans are more likely to assess that the two lines at the far left are continuous. Therefore, the curved line and the straight line are likely to be determined as separate entities *(as shown at the top to the left)*. Individuals are much less likely to disaggregate the visual elements by disrupting continuity (as shown in the bottom example to the left).

Figure 7: Continuation

- ***Proximity.*** The proximity principle states that objects near each other tend to be grouped together (Sternberg, 1998), whereas objects positioned further apart will be seen as separate (Graham, 2008)[17]. Figure 8 discusses the concept of proximity, and this principle is explained in more detail in a following handout.



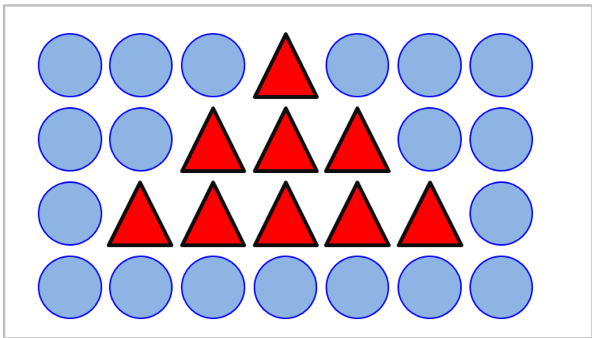
EXPLANATION

A viewer is likely to see the configuration to the left as two horizontal lines of dots. This assessment is likely to arise, because the dots are close together horizontally, and therefore they are more likely to be cognitively linked. Because each of these lines is separated vertically by a larger amount of white space, they are more likely to be seen as separate.

These separation and grouping aspects are discussed in more detail in the section on Array (see Section 2.7 (below)).

Figure 8: Proximity

- ***Similarity.*** This principle posits that items that are analogous (e.g. look similar) will tend to be grouped together (Sternberg, 1998). Therefore, 'visual elements that are similar in shape, size, colour, … and direction are perceived as part of a group' (Graham, 2008, p. 9). Figure 9 discusses similarity in more detail.



EXPLANATION

As illustrated in the example to the left, similar objects are likely to be grouped cognitively. For example, the red triangles aggregate to a pyramid surrounded by light blue circles.

Such aggregation based on similarity is an important element for the generation of distinctiveness of content (as discussed in Section 1.2.2.1.2 in Appendix 1).

Figure 9: Similarity

- ***Isomorphic Correspondence.*** This principle states that viewers will utilise their knowledge to make sense of visual information (through the application of object recognition), and this means that viewers may cognitively process visual content

17. This concept is discussed in more detail in Section 2.7 (Array), which will be covered in a following newsletter.

differently based on their experience (Chang et al., 2002). The effect of isomorphic correspondence is illustrated in Figure 10.

	EXPLANATION
WHAT DOES THIS MEAN?	A viewer who has no experience of recycling is likely to see the figure to the left as just three interlinking arrows. However, a person who has experience with recycling is likely to assess this diagram as the standard Recycling symbol. A viewer's knowledge can therefore shape their cognitive processing of this visual information. Such object recognition can play an important part in the analysis of the visual content, as discussed in Section 1.2.2.2 in Appendix 1.

Figure 10: Isomorphic Correspondence

- ***Prägnanz.*** The concept of Prägnanz (German for 'good form') states that individuals will tend to order their experiences, so they are simplified, regular and orderly (Sternberg & Mio, 2006). Therefore, in terms of visual information, individuals will apply their experience to make sense of the visual content (Chang et al., 2002). This principle is therefore closely related to the concept of Isomorphic Correspondence. Some of the key implications of Prägnanz are demonstrated in Figure 11.

	EXPLANATION
IBM	In its own right, this IBM logo is just a series of lines. Viewers develop a good form view of the content, to read the IBM logo. This subconscious desire to create good form from the visual information is the key to understanding Prägnanz.

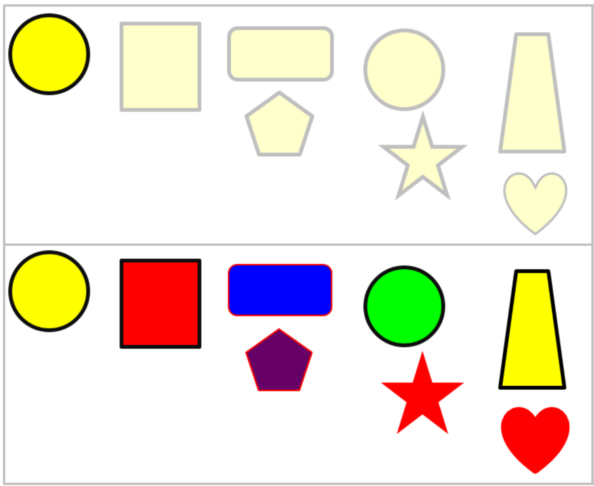
Figure 11: Prägnanz

- ***Simplicity.*** This Gestalt rule cites that viewers will try to simplify what is seen into what they can understand, and this may lead to invalid communication if the content is too complex (Chang et al., 2002; Smith-Gratto & Fisher, 1999). Figure 12 demonstrates some of the key implications of simplicity.

		EXPLANATION
 SOUTHER CROSS	 STARS	In the left hand frame, the formation of the Southern Cross constellation is readily recognisable (particularly to anyone in Australia). Therefore, pattern matching is likely to be carried out, and the information is likely to be comprehended appropriately. However, although the Southern Cross is also visible in the right hand example, the presence of the additional visual complexity may create misunderstanding. Therefore, the viewer may see the right hand example as just stars, rather than perceiving the Southern Cross, because they will try to simplify the complexity.

Figure 12: Simplicity

- ***Focal Point.*** The principle of focal point refers to the need to provide a key point of focus within groups of objects to create a centre of interest or point of emphasis, by utilising some form of salience (Chang et al., 2002)[18]. If a focal point is not provided, or too many focal points are implemented, this can make the content confusing or uninteresting (Chang et al., 2002). The effects of focal point on Gestalt are illustrated in Figure 13.

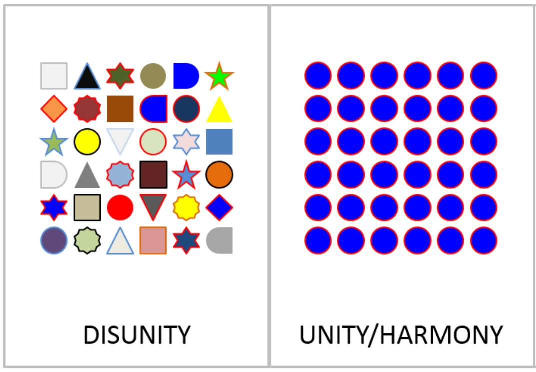


EXPLANATION

In the top group to the left, the salient yellow and high contrast black outline provide a single clear focal point. It is therefore most likely that a viewer would assess this as a group of objects trailing down and to the right. Alternatively, in the bottom example to the left, there are a range of highly salient focal points, and this factor adds to the chaotic nature of the group. Therefore, too many focal points can cause significant problems in interpreting visual information.
Providing a single focal point is therefore a very important aspect of visual design.

Figure 13: Focal Point

- ***Unity/Harmony.*** Finally, the concept of unity/harmony states that when elements appear to be congruent then they are more likely to be perceived as a whole entity (Chang et al., 2002). Unity/Harmony is therefore closely linked to the preceding Gestalt principles. For example, aspects such as similarity, proximity, simplicity and isomorphic correspondence all have an effect on the impression of unity and harmony, as illustrated in Figure 14.



EXPLANATION

The example to the far left presents information that is not harmonious, because different content is shown with various salience features. Alternatively, in the second example, the features of the component circles are highly similar, and therefore the visual content is more likely to be identified as united and harmonious. In practical terms, this means that a viewer is more likely to assess the second example as a larger square (e.g. unity), and less likely to achieve the same cognitive outcome for the example to the far left.

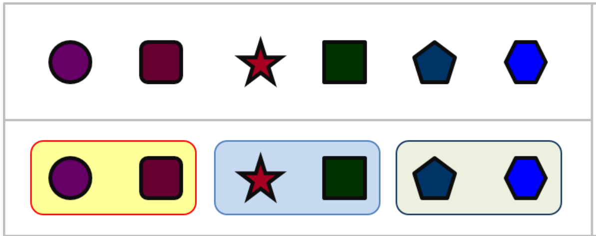
Figure 14: Unity/Harmony

As identified in Chang et al's. (2002, p. 7) experiments 'all of the 11 Gestalt laws identified were found to be useful by an overwhelming number or respondents', in terms of creating positive impressions and generating improved learning outcomes.

18. See Section 1.2.2.1.2 in Appendix 1 for more information on Distinctiveness.

Palmer, Brooks, and Nelson (2003) also identified two other important Gestalt principles that relate to the grouping of information. These can be characterised as follows[19]:

- ***Common Region.*** This Gestalt principle refers to 'the tendency for elements that lie in the same bounded area to be grouped (Palmer et al., 2003, p. 312). Figure 15 illustrates the concept of common regions.

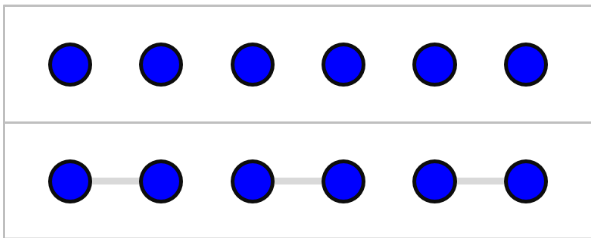


EXPLANATION

In the top example there is no explicit grouping of the objects, beyond the possible global grouping of the figures into a line. In the bottom example, boundaries have been applied to create common regions that make the grouping of the paired objects explicit.

Figure 15: Common Region

- ***Element Connectedness.*** 'Elements that share a common border' (e.g. touch each other) (Palmer et al., 2003, p. 313) or are visually linked in some other way, will tend to be grouped even if the connection is relatively tenuous (Palmer & Rock, 1994). The concept of element connectedness is shown in Figure 16.

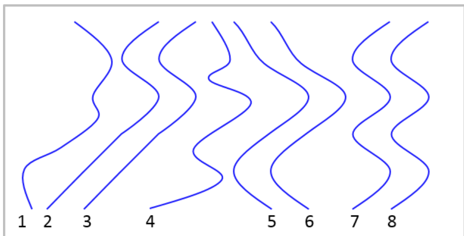


EXPLANATION

In the top example there is no explicit grouping of the objects, beyond the possible global grouping of the dots into a line. In the bottom example, a very light line has been added to connect the dots, and this provides element connectedness, that creates explicit grouping.

Figure 16: Element Connectedness

- ***Parallelism.*** This principle has been identified as an important factor in 'determining the perceptual simplicity of line configurations', and providing grouping cues (e.g. grouping by the orientation of edge elements into contours) (Wagemans, Elder, et al., 2012, p. 19). Parallelism is demonstrated in Figure 17.



EXPLANATION

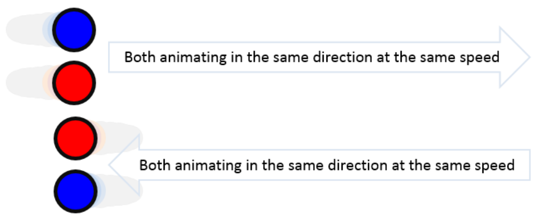
In the example to the left eight meandering blue lines have been shown. Because lines 2 and 3, 5 and 6, and 7 and 8 are parallel, a viewer is more likely to see these as being groups. In some ways this is related to similarity and symmetry principles (Wagemans et al., 2012). Additionally, this grouping is aided by the proximity of the parallel lines.

Figure 17: Parallelism

There is also another set of Gestalt principles that were not utilised by Chang et al. (2002), and these relate to animation or movement. These additional Gestalt principles include:

19. Figure 15 and Figure 16 have been developed from concepts illustrated Figure 2 in Palmer et al. (2003), but they have been modified to take into account key concepts described in Palmer and Rock (1994). Figure 17 is a rationalised version of Figure 1.H. at (Wagemans, Elder, et al., 2012, p. 9).

- ***Common Movement/Fate.*** The principle of common movement cites that 'elements moving in the same direction and at the same velocity are grouped together' (Sternberg, 1998, p. 179). Research by Kim (2007) identified that Gestalt movement aspects such as proximity, similarity (e.g. direction, speed, visual metaphor[20]) and continuity can significantly affect the grouping and cognitive processing of moving items. In some publications, such as Lee and Blake (2001), this principle is referred to as common fate[21]. However, common fate can also be applied in a broader sense. For example, Sekuler and Bennett (2001) identified that areas where the luminance changes simultaneously (e.g. they darken or lighten at the same time) are likely to be grouped. For this reason, common fate is directly associated with similarity-based grouping, and motion or common fate is just one of those similarities (Wagemans, Elder, et al., 2012). Figure 18 provides an example that explains this concept.



EXPLANATION

In this example the top pair are illustrated as though they are animating to the right at the same speed, and the bottom pair are animating to the left. As static elements the central red circles could be grouped, because of their proximity and similarity. However, in this case the top and bottom pairs would be grouped separately due to common movement (common fate).

Figure 18: Common Movement (Common Fate)

- ***Temporal Synchrony and Temporal Structure.*** The principle of temporal synchrony states that there is a 'tendency for elements that change at the same time to be grouped together' (Palmer et al., 2003, p. 313) (e.g. when animations such as abrupt onsets[22] happen at the same time the objects will be grouped). Temporal structure 'refers to the overall pattern of timing in which events occur', such as 'all stimulus elements chang[ing] according to a regular, periodic pattern over time' (Guttman, Gilroy, & Blake, 2007, p. 220). In other words synchrony refers to object animation (e.g. appearing, disappearing, moving, etc.) at the same time, whereas structure relates to the generation of some form of temporal pattern (Guttman et al., 2007). Experiments conducted by Guttman et al. (2007) identified that temporal structure may actually provide stronger cognitive impetus for grouping content than synchrony. Figure 19 (overleaf) illustrates this concept.

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20. The concept of *visual metaphor* in this context refers to the way in which the order, motion and reaction of moving objects on the screen affected the interpretation of the content (Kim, 2007). As an example, dramatic movement, or slow repetitive movements can create meaning through the motion metaphor (Kim, 2007).

21. Lee and Blake (2001, p. 2057) defines *common fate* as 'a temporal organising principle, [which] states that visual elements moving in the same general direction at the same speed tend to be grouped into a single global object.'

22. See Section 1.2.2.1.1 in Appendix 1 for a description of the concept of abrupt onsets.

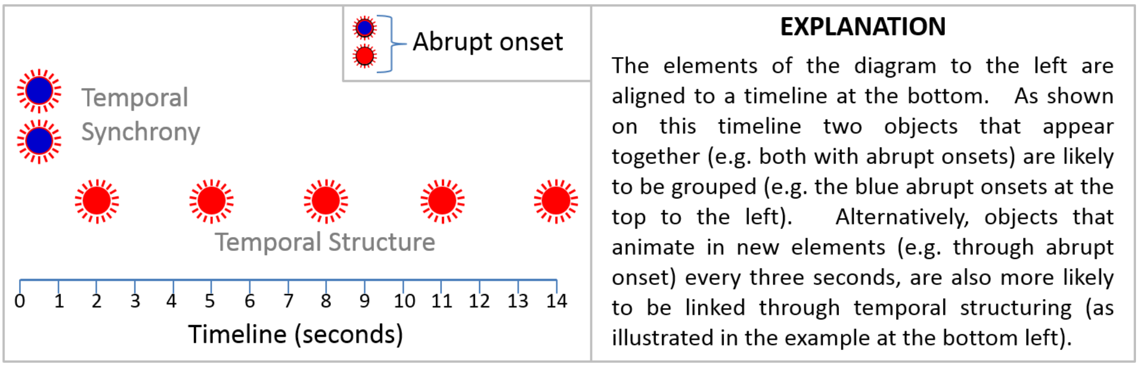

Figure 19: Temporal Synchrony and Structure

The effectiveness of Gestalt principles is also supported by other research (Fraher & Boyd-Brent, 2010; Glicksohn & Cohen, 2011; Yonggang et al., 2013). For example, some of the key benefits provided by Gestalt design may stem from a viewer's ability to handle Gestalt aligned visual information more effectively in working memory (Peterson & Berryhill, 2013; Xu & Chun, 2007)[23].

1.4.2. Aesthetic Principles

The aesthetic qualities of the layout of visual information can also directly affect the acceptability[24], learnability and comprehensibility of the content (Ngo et al., 2000). The key aesthetic measures identified by Ngo et al. (2000), are categorised as follows:

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23. Peterson and Berryhill (2013) postulated that these benefits may be generated by: (1) allowing the viewer to more readily create visual chunking due to Gestalt processing (e.g. creating Gestalt groupings from the content that can then be handled as chunks rather than having to manage each individual object as an separate entity in working memory); or (2) alternatively the Labelled Boolean Map (LBM) perspective may be generating benefits, because common elements sharing a feature can be mapped simultaneously, which means that multiple objects can utilise common mapping to reduce cognitive load. Alternatively, Glicksohn and Cohen (2011) refer to chunking, but their research indicated that the determination of chunks is based on Bayesian rules, which are learnt. The term Bayesian refers to the application of subjective probability, to determine and learn visual chunks (Orban, Fiser, Aslin, & Lengyel, 2008). In other words, within their theory, the mind utilises probabilistic analysis to identify chunks within a scene and then applies similar rules to assess if the chunk is reoccurring, which facilitates cognitive processing (Orban et al., 2008). It is unclear from the available information, which of these aspects plays the most important role, or if all of these aspects are equally valid. However, for the purposes of this thesis it is sufficient to support the concept that the utilisation of Gestalt principles assists in the effective processing of visual information.

24. Ngo et al. (2000) utilise the terms 'good' or 'bad' to describe these design aspects. As an example, Ngo et al. (2000) lists balance as 'good' and imbalance as 'bad'. The author of this thesis does not necessarily agree with these 'good' or 'bad' labels and sees that there is a purpose for each dichotomy in developing an optimal layout design approach. For example, imbalance, asymmetry, etc. can be utilised to generate psychological tension (Skolos & Wedell, 2006). Ngo, et al's. (2000) use of 'good' and 'bad' are therefore not included in this text, but in each case the example to the left within Figure 20 to Figure 32 represents the so called 'good' design, and the associated example to the right, indicates those design approaches that Ngo et al. (2000) characterise as 'bad'.

- ***Balance.*** Balance is 'defined as the distribution of optical weight' created by the different objects on the screen (Ngo et al., 2000, p. 4). As explained in Footnote 16, the relative perceived weight of an object is affected by visual factors such as size (larger objects appear heavier) (Ngo et al., 2000), and colour (Otsuka & Kawaguchi, 2009; Pilling & Gellatly, 2011), and this weight can shift the optical centre, which then affects the balance, symmetry and equilibrium (Yang, 1995). Balance 'in screen design is achieved by providing an equal weight of screen elements from left and right, and from top to bottom' (Ngo et al., 2000, p. 4). This aesthetic quality can therefore be closely linked to the Gestalt principle of Balance/Symmetry. Figure 20[25] demonstrates this aesthetic concept.

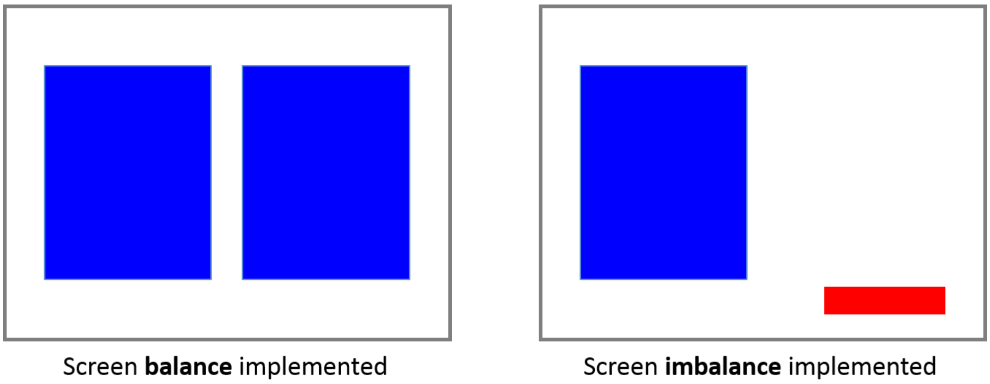


Figure 20: Balance versus Imbalance

- ***Equilibrium.*** Balance is also closely related to equilibrium, which is achieved when 'the centre of the layout coincides with that of the frame' of the slide (Ngo et al., 2000, p. 4). In other words, equilibrium 'is achieved by centring the layout' both horizontally and vertically within the slide (Ngo et al., 2000, p. 4), as illustrated to the left in Figure 21, whereas so called 'unstable' design is created when the content is not centred on the screen. This concept therefore also appears to be closely related to the Gestalt principle of Balance/Symmetry.

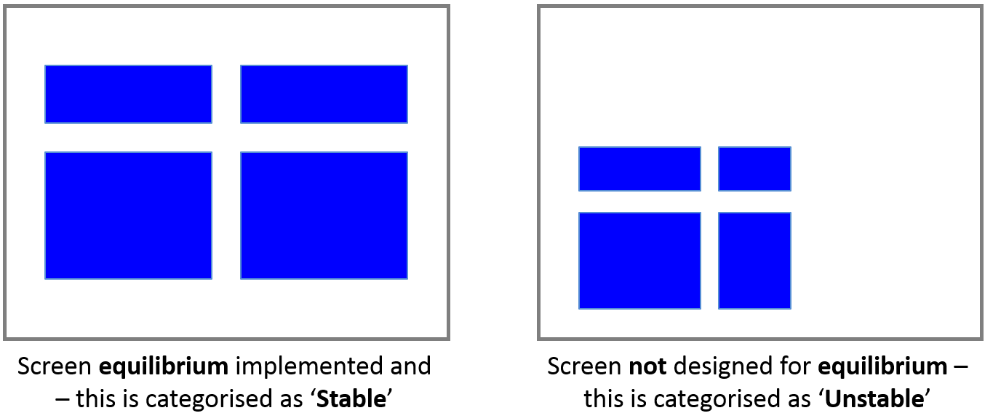
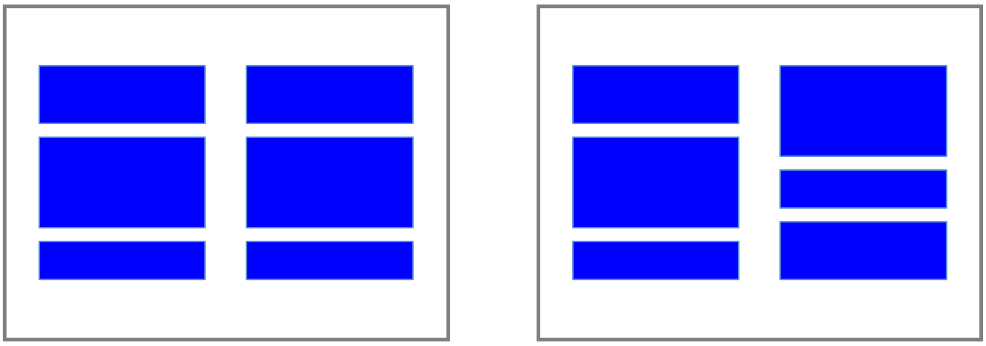


Figure 21: Equilibrium – Stable versus Unstable

25. Each of the diagrams provided from Figure 20 to Figure 32 are modified versions of Figures 1 to 13 in Ngo et al. (2000). These diagrams have been modified appropriately to better illustrate the concepts.

- ***Symmetry.*** Symmetry is achieved through 'axial duplication', which means that objects are replicated on either side of the centreline of the screen (Ngo et al., 2000, p. 4). Symmetry is therefore closely related to balance, but a equalised arrangement can be achieved without symmetry, as illustrated in Figure 22. In addition to the aesthetic quality, the provision of symmetry also appears to have a positive effect on memory (Zimmer, 2008). This aesthetic design element is therefore also closely related to the Gestalt principle of Balance/Symmetry.

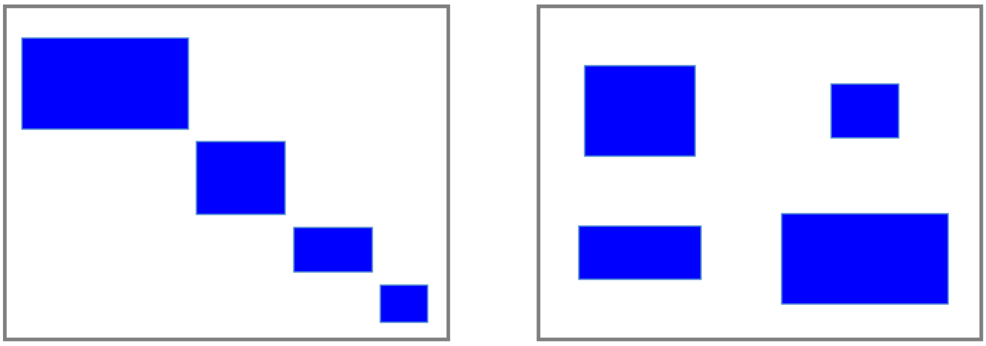


Screen **symmetry** implemented – this is both **symmetrical** and **balanced**

Screen **balance** is applied, but it is **asymmetrical** (e.g. the two sides are different)

Figure 22: Symmetry versus Asymmetry and Balance

- ***Sequence.*** This aspect refers 'to the arrangement of objects in a layout in a way that facilitates the eye through the information displayed' (Ngo et al., 2000, p. 5). For example, this concept can be associated with the Gestalt Focal Point principle, and to the application of good form that relates to the principle of Prägnanz. The scan paths described in Section 1.2 can also provide useful insights into the sequence of processing. Therefore, for Western Cultures, the upper left quadrant may be processed first, unless there are other salience issues influencing the perceptual processes (Smaldino et al., 2008). Additionally, as cited by Ngo et al. (2000, p. 5) active attention also typically moves from 'big objects to small objects' and this type of relationship can be applied to reinforce the standard scanning techniques. This reinforcement of the sequencing is illustrated in Figure 23.



Screen **sequencing** from large to small reinforces the scan from the top left to the bottom right

Screen **randomness** is applied, because the objects do not sequence appropriately with the standard scan patterns

Figure 23: Sequencing versus Randomness

- ***Unity.*** The term unity relates to the way in which the layout is designed to create the perception of totality for the elements (Ngo et al., 2000). In other words, this reflects the way in which the screen objects 'dovetail so completely that they are seen as one thing' (Ngo et al., 2000, p. 5). The perception of unity is affected by aspects such as spacing and the similarity of objects on the screen (Ngo et al., 2000). For this reason, this aesthetic concept can be closely linked with the Gestalt principle of Unity/Harmony. Figure 24 illustrates the concepts of unity and disunity (e.g. fragmented design).

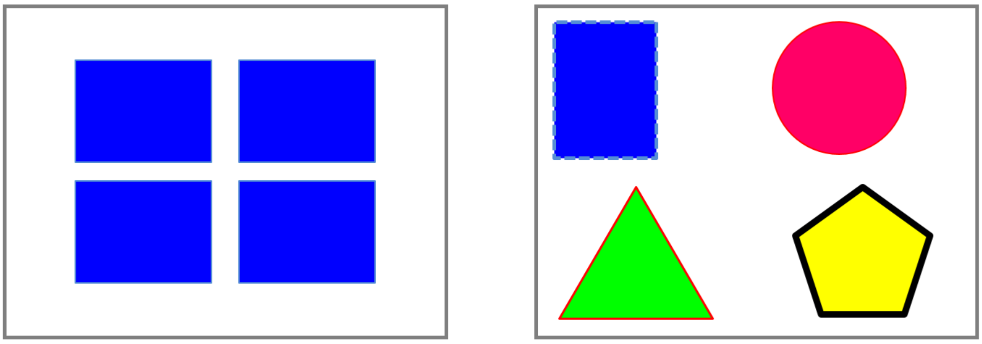


Figure 24: Unity versus Disunity (Fragmentation)

- ***Cohesion.*** The application of 'similar aspect ratios' (e.g. the relationship between height and width) of key objects in relation to the entire screen 'promotes cohesion' (Ngo et al., 2000, p. 5). Therefore, as illustrated in Figure 25, the layout of objects should ideally align to the visual ratios of the entire screen, to provide enhanced cohesion of the visual elements (Ngo et al., 2000). This aesthetic design element does not appear to have a strong link to any of the Gestalt principles.

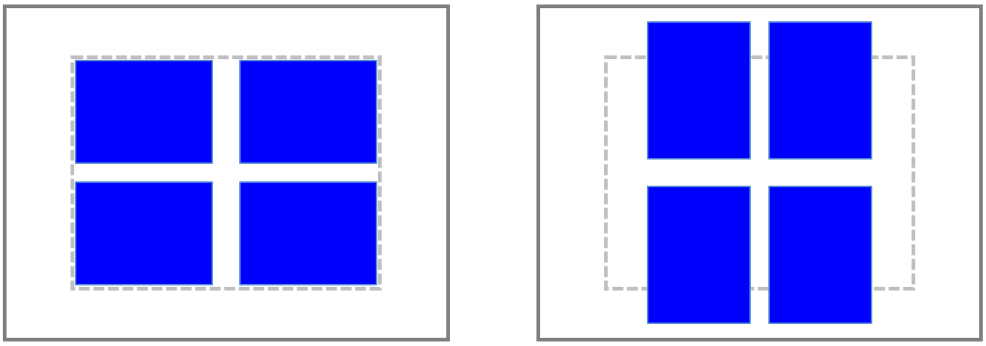


Figure 25: Cohesion versus Non-Cohesiveness

- ***Proportion.*** According to Ngo et al. (2000) the proportions (e.g. height to width) utilised for the screen objects may be more aesthetically pleasing if they apply the following types of ratio: square (1:1), one to the square root of two (1:1.414), one to the golden ratio (1:1.618); one to the square root of three (1:1.732), and double (1:2). Ngo et al. (2000) postulated that aesthetically pleasing proportions should therefore be considered when designing major screen objects. As an example, Figure 26 illustrates the effect of the application of the golden ratio. However, the empirical evidence to support the significance of the generic application of any of these proportions appears to be inconclusive(26). However, if this approach is valid, this aspect may have implications related to Prägnanz.

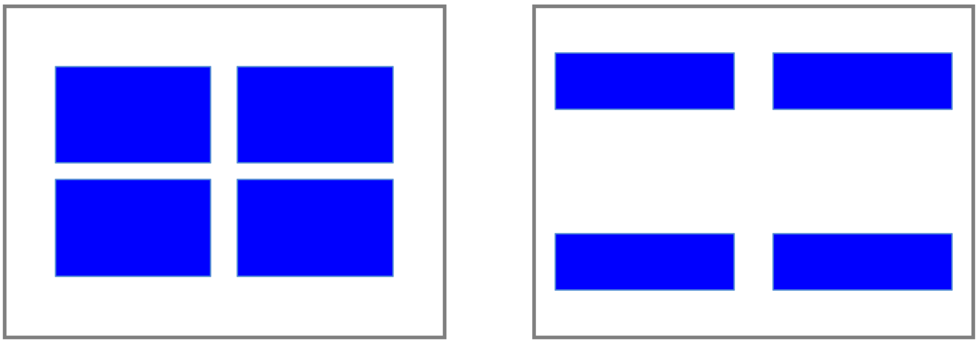
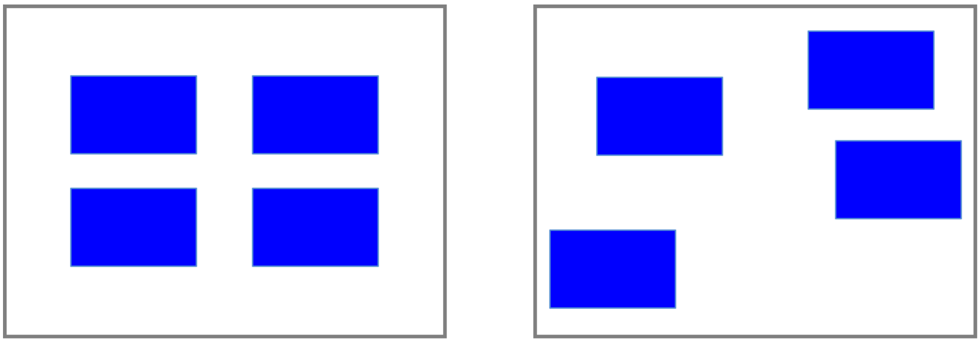


Figure 26: Proportional versus Disproportionate

- ***Simplicity.*** This aspect relates to 'the directness and singleness of form, a combination that results in ease in comprehending the meaning of a pattern' (Ngo et al., 2000, p. 6). Simplicity is 'achieved by optimising the number of elements on a screen and minimising the alignment points' (Ngo et al., 2000, p. 6). In practical terms, Ngo et al. (2000) are referring to complexity in terms of the number of objects on the screen and their placement in terms of alignment to support unity. In other words, this aspect is closely related to the Gestalt Simplicity principle. The effects of simplicity are illustrated in Figure 27 (overleaf).

26. Green (1995) identified that there may be some psychological benefits associated with the utilisation of some proportions, such as the golden ratio. However, he also indicated that the research, and the significance of the affect, was far from clear (Green, 1995). Jacobsen (2004) identified similar mixed findings in his experiments. For example, he found that the provision of squares were strong predictors of positive impressions, and the more extreme the proportional ratios were (e.g. height versus width), the more negatively the shapes were assessed (particularly for strong vertical dominance, in shapes that were positioned orthogonally) (Jacobsen, 2004). However, in terms of the ratios covered in this section, there was no broad consensus on the preferred aesthetic property (Jacobsen, 2004). Such preferences may therefore be highly individualistic (Jacobsen, 2004; Palmer & Griscom, 2013).

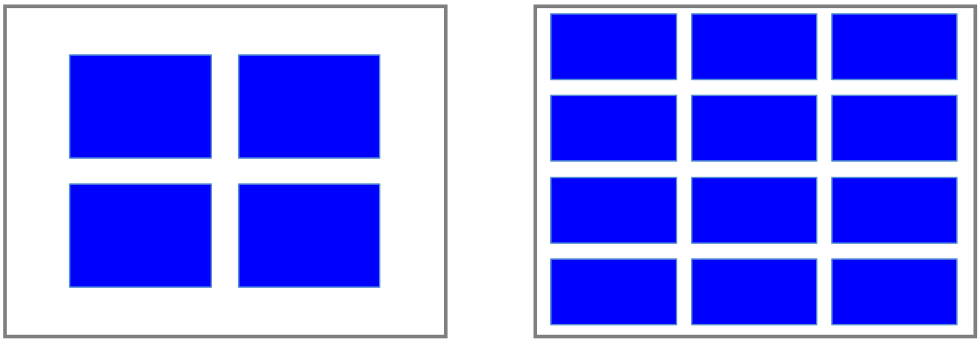


Four objects have been aligned against each other, so the arrangement is **simplified**)

Although there are still four elements on the screen, they are not readily aligned, so this arrangement is more **complex**

Figure 27: Simplicity versus Complexity

- ***Density.*** 'Density is the extent to which the screen is covered with objects' (Ngo et al., 2000, p. 6). Ngo et al. (2000, p. 13) assessed 'that the optimal screen density level for graphic screens is 50%' (in terms of objects covering the total space available on the slide). This general guideline appears to be supported by other research. For example, Halverson and Hornof (2004) identified that targets in sparse groups (e.g. low density) are searched earlier, found more quickly, and are less likely to be missed. Alternatively, Mayhoe, Shrivastava, Mruczek, and Pelz (2003) and Wolfe and Horowitz (2004) found that higher density in visual material can significantly slow the identification of critical information[27]. Density can therefore be closely linked to the Gestalt principle of Simplicity, and to some extent with Proximity (because lower density can support greater variability in positioning). The application of density in design is illustrated in Figure 28.



In this diagram the screen **density** is limited to 50% for graphic objects, which makes the positioning **spacious**

The objects in this example take up about 68% of the available space, and this **density** is considered **cramped**

Figure 28: Applying Density – Spacious versus Cramped

- ***Economy.*** This aesthetic design concept relates to 'the careful and discreet use of display elements to get the message across as simply as possible' (Ngo et al., 2000, p. 7), and is achieved by using as few object sizes as possible, as shown in Figure 29 (overleaf). This approach therefore appears to be related to the Gestalt principle of Simplicity.

27. This is particularly true when the differences in salient factors between the target and distractor elements in the scene are not large (Wolfe & Horowitz, 2004).

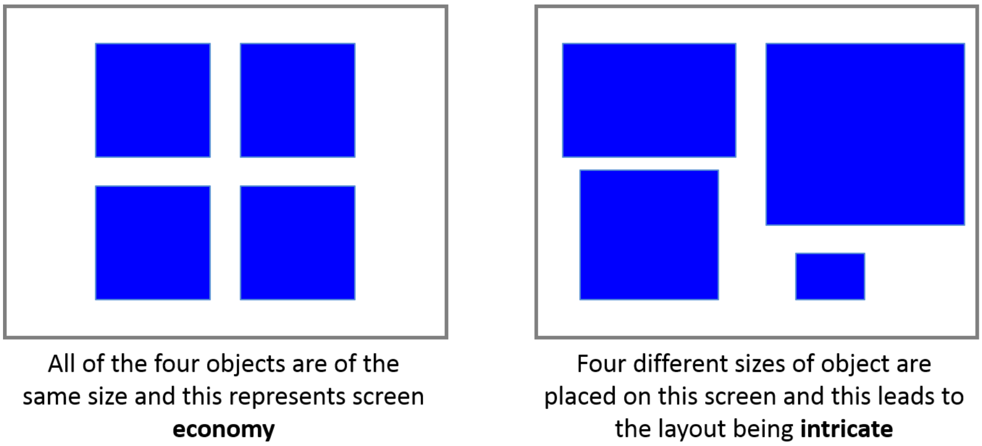


Figure 29: Economy versus Intricacy

- ***Regularity.*** This aspect refers to the ‘uniformity of elements based on some principle or plan. Regularity in screen design is achieved through consistent spacing and grouping of components’, and this aesthetic design element is ‘less sensitive to the number of elements on the screen’, but to the way in which they are arrayed (Ngo et al., 2000, p. 6). According to the research conducted by Feldman (1999), and van den Berg, Kubovy, and Schirillo (2011), regularity could be considered analogous with the Gestalt principles of Unity/Harmony, because this aesthetic aspect supports the generation of groupings and the interpretation of perceptual linkages. Figure 30 demonstrates the concept of regularity.

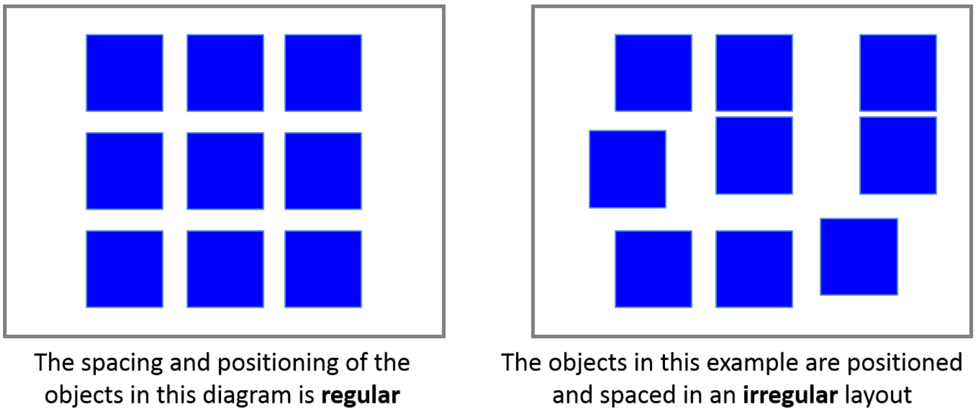


Figure 30: Regularity versus Irregularity

- ***Homogeneity.*** This aesthetic design component ‘is determined by how evenly the objects are distributed among the four quadrants of the screen’ (Ngo et al., 2000, p. 7). From the information provided by Beck (1982), homogeneity in this sense could be seen as analogous with the Gestalt principles of Prägnanz and Unity/Harmony. The homogeneity concept is shown in Figure 31 (overleaf).

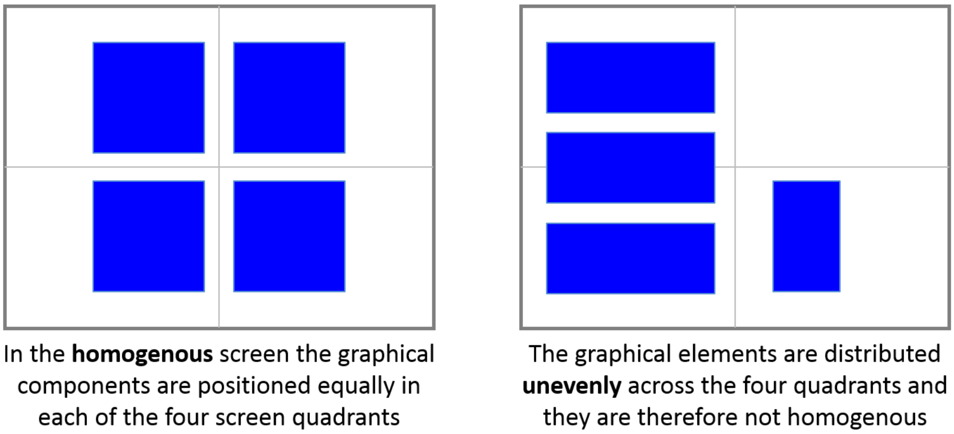


Figure 31: Homogeneity versus Uneven Design

- ***Rhythm.*** 'Rhythm in design refers to regular patterns of changes in the elements' and this 'order with variation helps to make the appearance exciting' (Ngo et al., 2000, p. 8). As shown in Figure 32 rhythm is created by positioning the screen objects, so they can form some recognisable and repeated pattern (Ngo et al., 2000). Kripintiris (2008) identified that visual rhythm creates good form and supports flow through the content. Rhythm can therefore be linked to the Gestalt principles of Prägnanz and Unity/Harmony.

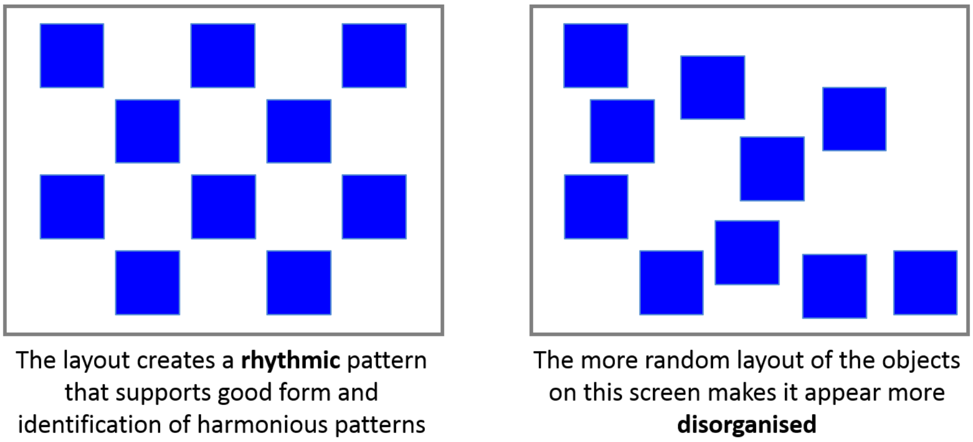


Figure 32: Rhythm versus Disorganisation

The interplay of these aesthetic measures aggregate to create impressions of order and complexity (Ngo et al., 2000). Ngo et al. (2000) created a complex mathematical model to quantify the effect of these measures on the perception of aesthetics, and then conducted experiments(28) to determine the validity of this model. They found that the viewer perception of aesthetics was generally consistent with their mathematical model (Ngo, 2001; Ngo et al., 2000). Unfortunately, this mathematical model is far too complex for practical usage in PowerPoint® design, but it does demonstrate that the measures appear to be valid.

However, later research conducted by Altaboli and Lin (2011) indicated that not all of these aesthetic variables provided significant variations in the impressions generated. For instance,

28. The experiments involved 180 Malaysian University Students, who viewed graphical displays that were laid out to demonstrate the various measures.

their findings indicated that balance, unity and sequence may have the most significant effect on aesthetics.

Additionally, research conducted by Ziemkiewicz (2010) added another concept, which relates to the application of metaphors (e.g. laying out information in shapes that create reminiscent meaning), which aligns with key Gestalt principles such as Isomorphic Correspondence and Prägnanz. Finally, other researchers such as Tractinsky, Inbar, Tsimhoni, and Seder (2011) and Gault (2012) identified that animation can form an aesthetic element, in much the same way as Kim (2007) and Sternberg (1998) listed motion as a Gestalt principle.

1.4.3. Creating a Conjoint Model

As illustrated within the preceding section, there appears to be some clear linkages between the Gestalt principles and the identified aesthetic elements. These identified linkages are listed in Table 1.

Gestalt Principle	Aesthetic Element
Unity/Harmony	Unity, Regularity, Homogeneity, Rhythm
Figure-Ground	
Balance/Symmetry	Balance, Equilibrium, Symmetry
Proximity	Density
Similarity	
Parallelism	
Common Region	
Element Connectedness	
Continuation	
Focal Point	Sequence
Closure	
Prägnanz	Sequence, Proportion, Homogeneity, Rhythm
Simplicity	Simplicity, Density, Economy
Isomorphic Correspondence	Metaphors
Motion/Change (Common Movement, Common Fate, Temporal Synchrony, Temporal Structure)	Animation
	Cohesion

Table 1: Conjoint Model of Gestalt Principles and Aesthetic Elements

These Gestalt principles and aesthetic elements can therefore be applied conjointly to enhance layout. However, the selection and application of this conjoint layout approach should also take into account the following general rules.

1.5. General Rules for Layout

The following general rules have also been identified for optimising layout:

- ***Utilise relatively standard layouts.*** Relatively standard layouts can be very useful in design (Durso, Pop, Burnett, & Stearman, 2011), because viewers rapidly learn where to expect information and this can significantly improve the shaping of attention to the most important task-specific elements on the display (Jiang & Song, 2005; Kunar et al., 2006; Waller & Richardson, 2008). Therefore, a relatively standardised layout approach should be utilised within most PowerPoint® slides.
- ***Variations are useful.*** By occasionally inserting novel layouts, greater attention and processing of the different visual material can be achieved (Epstein, Harris, Stanley, & Kanwisher, 1999). In practical terms, this means that optimal standards should be applied predominantly, but when it is applicable, non-optimal layout approaches can be applied to create impressions (e.g. imbalance in a slide to create psychological tension).
- ***Reinforce the layout.*** Aspects such as colour salience and contrast can also be used effectively to reinforce the layout (Kunar et al., 2006). Additionally, the layout can be reinforced by design aspects such as the provision of continuous shapes, forms, or gradations (Smaldino et al., 2008). These concepts are illustrated in Figure 33.

Figure 33: Continuous Shape, Form, and Gradations

- ***Minimise unnecessary distractors.*** The number of distractors should be rationalised to support the viewer to focus on the important content (Kunar et al., 2006).
- ***Be aware of cultural differences.*** Different cultures may find different layouts aesthetically more pleasing (Wei, 2011). For example, Z-Pattern and F-Pattern layouts may not be as appropriate for viewers from non-western cultures.

1.6. Layouts – Summary

As illustrated in the preceding sections, layout is an important element in slide design within tools like PowerPoint® (Farkas, 2005). It also appears that some commonly espoused principles are correct. However, some of the design recommendations should be applied with care. For example:

- Scan patterns (e.g. Z Pattern, F Pattern, Gutenberg Diagram) are not universally applicable, and are really only suitable when developing text-based or similarly analogous content for viewers from western cultures. Additionally, for non-text content the visual centre should act as the starting point, and salience issues can be more important than the application of standard scan paths.
- PowerPoint® designers should utilise a grid to lay out the content in relatively standard form and provide common visual structures. The most appropriate of these for general utilisation may be based on the Rule of Thirds.
- The application of Gestalt principles and the aesthetic elements can greatly assist in generating effective layouts. For standard slides these should be taken into account to optimise the design, but non-optimal techniques can also be applied occasionally to gain attention or generate specific impressions.
- These principles should be utilised as general guidelines, and should be varied as appropriate to achieve the required visual outcomes.

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