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RENAISSANCE 3.0: SPEAKING DESIGN

Jan JERVIS

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Diverse perceptions of the terms design, design thinking and digital design literacy can cause confusion and will challenge communication for the 21st Century. This paper presents a map of early research emergent from the literature survey of contemporary design theories and analysis of their robustness with respect to developing a language of design across industries. The proposed language is not envisaged as a curriculum design or as a substitute for formal education but as a fundamental element in bridging the gaps of understanding between collaborative partners. The paper reviews the questions that present themselves and pilot data that indicates support for a cohesive language in which all participants have shared meaning.

Keywords: Design, Design Thinking, Digital Design Literacy

INTRODUCTION

A renewed focus on the importance of design in a global context can be attributed to rapidly developing communication technologies and the dissolving boundaries surrounding design (Watson, McIntyre, & McArthur, 2009; Margolin, 1996). As many discipline boundaries merge within an expanding global marketplace, it is evident firstly, that design is becoming more valuable in previously disassociated fields, and secondly that design is no longer just the domain of the specialised designer, namely a person who designs (Brown, 2008; Mau, 2004; The Genius of Design, 2010, Disc. 1; Queensland Design Strategy 2020, 2010). Furthermore, there is evidence to suggest that design is central to solving significant problems; issues such as global warming, disease and terrorism among others (Mau, 2004).

The word design can be difficult to define, as perceptions of its meaning may come from individual points of view or from members of specific professional disciplines. For example, the engineer learns design as a process, extending an idea to implement a purpose, whereas the graphic designer may focus on visual and aesthetic appeal rather than on practical or non-functional requirement (Main 2002). These examples highlight increasing cross-disciplinary communication issues and confusion within individual design disciplines each accustomed to its own pattern of thinking.

Bruce Nussbaum (2007), one of the most influential people in design (as voted in I.D. Magazine) states “… CEOs and top managers hate the word design as they associate it with “…curtains, wallpaper, and maybe their suits” (para. 6). Business managers are facing a future of increasing ambiguity and rapid change, with many ill equipped to meet the challenges. In 2011 Nussbaum expressed frustration that the construction and framing of design thinking has not been successfully adopted by organisations. Despite these assertions there is evidence that management leadership is fostering design culture in several successful international organisations such as IBM, Sony, Apple and Samsung (Jeong Song and Chung, 2008).

While it is acknowledged that not everyone wants to be a designer, or even be involved with design, it is nevertheless predicted that a new economy, namely the Creative Molecular Economy, will emerge over the next ten to fifteen years (2022 – 2027) (Centre for Communities of the Future, 2012, para.5). The technologically enabled and globalised collaboration occurring with the onset of this Creative Age will require 21st Century business leaders, executives, designers, non-designers, human resource managers, higher education students and enabled amateurs from any field to communicate through sharing a common language based around design.
This paper presents a map of early research emergent from the literature survey of contemporary design theories and analysis of their robustness with respect to developing a language of design across industries. The language is proposed as a benchmark or index for use across a variety of sectors that integrates fundamental knowledge of design, design thinking and digital design literacy. The proposed language is not envisaged as a curriculum design or as a substitute for formal education but as a fundamental element in bridging the gaps of understanding between collaborative partners. This paper incorporates an illustrated map (Figure 1) that displays design, design thinking and digital design literacy as a Tri-Unity of Design. The map situates the Tri-Unity of Design in the centre to represent its relationship to economic ages, world issues, communication, technologies, employment and selected theories that underpin design. The placement of the circles within the category clusters is provisional as positioning will be determined with further research. Blue represents the categories that require a human centred approach to design, in other words focus on design thinking. The paper will further outline the categories, sub-categories and renaissance analogy, displayed in Figure 1, in order to establish relationships within the research map.

For the purposes of this paper theories that merit investigation are grouped within the Theories of Design category. It is beyond the scope of the paper to review all the theories identified. The paper does include a preliminary comparison of Functional Theory by philosopher, John Dewey (1910, in Littlejohn & Foss, 2008) and the problem solving steps of Design Thinking as proposed by Tim Brown (2008). It provides a definition of the Concept-Knowledge Theory (C-K Theory) introduced in 2003 by Hatcheul and Weil; the Theory of Pure Design (Ross, 1907); and Gestalt Laws (Behrens, 1994). Other theories that will be explored at a later date include the Design-Driven Innovation Process Model, (Acklin, 2010), Deconstruction, and Semiotics (McDermott, 2007). The paper concludes with a review of the questions that present themselves and pilot data supporting further research.

![Figure 1: The map of design, design thinking, and digital design literacy positioned centrally as a Tri-Unity of Design. The position of the Tri-Unity of Design illustrates its relationship to economic ages, world issues, communication, technologies, employment and selected theories that underpin design.](image)

**AN OVERVIEW OF THE RESEARCH MAP**

Terms such as design, design thinking and digital design literacy are appearing regularly outside the traditionally recognised design disciplines (Adobe Education, 2011). To the non-design professional, it may appear these terms are connected and thus share similar meaning. Literature, however, confirms that design thinking is not actually about design and a designer may not ‘think’ like a designer regardless of their expertise or design education (Mootee, 2012).

In the United Kingdom, the Arts and Humanities Research Council (AHRC) acknowledges how contemporary research is adjusting to changing technologies and emerging cross-disciplinary
employment (AHRC, 2010). In Australia, Professor Roy Green, Dean of the UTS Business School and a member of the Australian Prime Minister's Manufacturing Taskforce, supports a motion by the Australian Design Alliance (AdA n.d) towards a National Design Policy for Australia. Green emphasises, “The question is not whether Australia can afford to invest in design, but whether we can afford not to” (para. 6). Similarly, Professor Sue Wills, on behalf of the Australian Council for Humanities Arts and Social Sciences (CHASS) and a member of the AdA, pledges support for a design policy with the proviso that it embeds design thinking into all levels of Australia’s education curricula. These claims echo those made by President Obama, in his State of Union address, 2011, as he calls for America to embrace innovation and “…out-innovate, out-educate, and out-build the rest of the world” (cited in Wingfield, 2011).

DEFINING DESIGN
There is no single definition to adequately define and cover the variety and range of concepts grouped under the word design. Professor of Design, Management and Information Systems at the Weatherhead School of Management at Case Western Reserve University, Dr. Richard Buchanan acknowledges the polysemy of design. He appeals for a definition of design, not aligned with trade, industry or profession, but rather as a new ‘liberal art of technical culture’ (Buchanan, 1992, p.5).

DEFINING DESIGN THINKING
The expression ‘design thinking’ is attributed to Herbert A Simon, 1969 (as cited in Buchanan, 1992) and is an attempt to identify and describe a holistic concept. Rylander (2009) disagrees and contends that this term is confusing and that the concept cannot be defined in a straightforward way. Nevertheless, there appears to be a common viewpoint that the design thinking process can be applied to both analytical and experiential engagement. Design thinking can provide a powerful way to interact (Teal, 2010) and it may also overcome limited imagination and the perception that something is impossible (Buchanan, 1992). Tim Brown, CEO of the global design consultancy IDEO, identifies Thomas Edison as an early example of a design thinker. Edison’s ability to envision human interactions with his innovations is a fundamental step in the design thinking process as it places humans at the centre of design (Brown, 2008; Julier, 2008). Similarly, Fry (2006) illustrates how collaboration on the design of a bridge can demonstrate a human centred approach. He emphasises the focus must be on the whole problem, namely how to cross the river, rather than the physical measurements of the bridge. The bridge design should come from the perspective of the “…70-year-old pedestrian, 45-year-old motorist, 12-year-old bicyclist, and the 19-year old laborer who will participate in the construction” (p.6). A human-centred approach to design can be described as the holistic process of addressing the whole problem rather than a particular problem and as such becomes the foundation for design thinking.

DEFINING DIGITAL DESIGN LITERACY
A definition of digital design literacy is merging and morphing along with the changes occurring in the digital world (Adobe Education, 2011). The contribution made by digital technologies is resulting in new roles that are directly related to each individual’s interaction with the media (Oxman, 2006). For instance, statistics support that knowledge and skills relating to software, such as Adobe Photoshop, Adobe Flash, Adobe Dreamweaver, Adobe Premiere and Adobe Acrobat, are increasingly expected outside traditional art and design professions (Adobe Education, 2011). To manage these rapidly changing needs for business and academic faculty, Ellen Lupton (2007), designer and author of many books and articles on design, calls for a new perspective towards the teaching of software. She notes there is no theory to underpin the commercially driven software that is used to visually demonstrate the language of design. Lupton further argues that software is a ‘bridge between theory and practice” (p. 150). Dr Clarence Tan, Adjunct Professor Bond University, the Australian and Malaysian ambassador for Singularity University, asks us to embrace technology, arguing that it can be used to solve any issue (The Arch, 2012). On a more cautionary note, however, Ramneek Kaur Majithia (2011) reminds students not to rely only on software, but rather use it as a support for the brain and for design thinking. The influence of digital media on design and thinking is emerging as a major research topic within a constantly and rapidly evolving field (Oxman, 2006).

THEORIES OF DESIGN
Although the practice of design research is increasing, it is not yet a fully recognised academic discipline (Chen, 2007). To establish a better understanding of design, and the theories relating to the different design disciplines, this research seeks to explore, compare and contrast a selection of theories that underpin the triangle made up of design, design thinking and digital design literacy and referred to in this paper as a Tri-Unity of Design. Figure 2 is a visual representation of the Theories of Design category, extracted from the concept map, illustrating this research outline. The cluster of
circles represents the group of theories identified for further investigation. The placement of the theories within the circle cluster is conditional and it is proposed the theories will be positioned within a hierarchy of importance and relevance to the Tri-Unity of Design.

![Diagram of Theories of Design category. The cluster of circles represent selected theories that merit further investigation. Blue circles represent a theory underpinned by a focus on humans that can be associated with design thinking.](image)

The following sections offer a brief overview of Functional Theory, Concept-Knowledge Theory, Theory of Pure Design and Gestalt Laws. The definitions provide an opportunity to consider relationships within the research map; for example, there are alignments between Dewey’s (1910) Group Functional Theory and Brown’s (2008) Design Thinking steps as shown in Table 1.

### DEFINING FUNCTIONAL THEORY

Functional Theory considers how a group functions and processes the sharing of information, thus identifying possible methods for shaping the outcome of a group. Philosopher John Dewey has influenced this approach since his work entitled *How We Think*, first published in 1910. Subsequent work by Dewey includes a theory for the process of problem solving in which he proposes a set of six specific steps. The first step calls for an expression of the dilemma, the second requires definition of the problem, the third is an analysis of the definitions, the fourth encourages possible solutions, the fifth compares and contrasts the suggested solutions to determine the most appropriate path for acceptance and the sixth and final step implements the chosen solution (Littlejohn and Foss, 2008).

### COMPARING FUNCTIONAL THEORY AND DESIGN THINKING

The steps and processes outlined in Dewey’s Group Functional Theory are comparable with steps applied to design thinking. Although design thinking is not promoted as an academic theory it can be referred to as a process for group problem solving (see Table 1). Brown (2008) separates the process of design thinking into three major categories with steps within the categories to assist with navigating the process. Brown’s first category is inspiration, which includes the steps of defining the problem and then observing the requirements. This category aligns closely with Dewey’s first three steps that are expression, definition and analysis of the problem. Brown’s second category is creating the idea, with three inclusions: organisation of information, brainstorming and rapid prototyping of multiple solutions. In the same way Dewey defines suggested solutions and alternative comparisons. The third and final category of Brown’s design thinking process is implementation where two steps call for the final solution to be completed and then presented. This step aligns closely with Dewey’s final step of implementation of the best solution.

See Table 1 for a comparison between Brown’s (2008) steps for design thinking and Dewey’s (1910) steps for group problem solving.

<table>
<thead>
<tr>
<th>STEPS</th>
<th>DEWEY (1910)</th>
<th>STEPS</th>
<th>BROWN (2008)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Expressing a difficulty</td>
<td>1</td>
<td>Inspiration</td>
</tr>
<tr>
<td>2</td>
<td>Defining the problem</td>
<td></td>
<td>Define the problem or issue to be resolved</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Look at the world, observe, what do people think, need, want?</td>
</tr>
</tbody>
</table>
DEFINING CONCEPT-KNOWLEDGE THEORY (C-K THEORY)

Creativity is often considered an essential component of design. It has been argued that design, in any form, is unable to exist without creativity (Sarkar and Chakrabarti, 2011). Professor of Mines ParisTech Dr. Armand Hatchuel and Professor of Mines ParisTech Dr. Benoit Weil have created a theory called the Concept-Knowledge Theory (C-K Theory). They consider their relatively new theory unique, particularly in comparison to other design theories, as it encompasses both creativity and design (Hatchuel and Weil, 2003).

The C-K Theory seeks to address the enigma of design space and the logical and non-logical components that contribute to the uniqueness of design thinking. It considers that the beginning of any design process is conceptual, for example, a thought or desire on the part of the participants. The C-K Theory can be synthesised within a Design Square (see Figure 3) and its proposed application is not limited to any one discipline or field. The Design Square highlights the dynamic dependence of Knowledge on Concepts and vice versa (see Figure 4). However, to be considered a Concept (C), within this theory, the proposed factor cannot be considered logical, in other words, and in keeping with the randomness of creativity, it cannot be labelled true or false. As soon as a concept is defined as a factually based idea, it is no longer a concept and becomes knowledge; therefore it must pass to the Knowledge (K) space. The design process develops and expands as the concepts become defined as true or false. Once defined the concepts merge into accepted knowledge thereby producing potentially unexpected results (Salustri, 2005). It is anticipated that further investigation into this new theory will be undertaken to determine its alignment with the research map, design, design thinking, digital design literacy and the proposed language of design.

DEFINING THEORY OF PURE DESIGN

In 1899, Arthur Wesley Dow, frustrated with the traditional academic view that art must be realistic, proposed the concept of design as an organisational principle within a studio environment, not as art criticism, but as a ‘perceptual and creative skill in studio practice” (cited in Kim, 2006, p.14). In later years a contemporary of Dow, Denman Ross, a Professor of Art at Harvard, published the Theory of Pure Design, Harmony, Balance, Rhythm that was based on his observations of the order and balance he observed in nature (Ross, 1914). Unfortunately the theory failed to resonate with the academic environment. Its limited academic acceptance, subsequent to publication, is attributed to its “…dry text and uninspiring illustrations…” (Kim, 2006, p.15). Nevertheless, in retrospect, Dow and Ross are considered influential in design education.

DEFINING GESTALT LAWS

The Gestalt Laws are the fundamentals of Gestalt Psychology, a process of scientific thinking originally proposed by Max Wertheimer at the end of the 19th Century. The laws reflect the separate parts that make up a whole event and are regularly used by visual artists and designers to determine a cohesive view of their work (Behrens, 1994; Graham, 2008). For the purposes of this research the Gestalt Laws are aligned with other theories that reflect human-centred design.
DEFINING THE ECONOMIC AGES
A review of historical events and influences of design can assist with anticipation of contemporary and future social transformations (Margolin, 2009). A brief outline of the main economies associated with the West is presented in this paper (see Figure 5). It is envisaged that further investigation will also include influences of design and technology from within the seven emerging economies of China, India, Brazil, Russia, Indonesia, Mexico and Turkey (Hamilton, 2011). The blue circle within the cluster represents the Creative Age and an economy focused on a human-centred approach to design.

DEFINING HUNTER GATHERERS
Early humans, in order to survive, were compelled to hunt, gather food and protect themselves from the elements. More than 10,000 years ago humans lived a transient existence roaming to find more abundant resources. Anthropologists refer to this era as the age of the Hunter Gatherer (Marlowe, 2005, The Genius of Design, 2010, Disc. 1). It was not until the hunter-gatherer acquired knowledge of the seasons, and devised solutions to combat food shortages, that cultural and economic growth could advance.

DEFINING THE AGRICULTURAL AGE
Solutions designed by the hunter-gatherer to assist economic growth also facilitated the development of commercial craft enterprises that created an early civilisation referred to as the Agricultural Age (Elliott and Jacobson, 2002). In the 14th and 15th Century a rebirth of interest in the arts, quests for knowledge and the birth of the liberal arts, became known as the Renaissance (Buchanan, 1992). The Renaissance began in Italy eventually spreading to, among other countries, France, Holland and England and is retrospectively recognised as the first stage of modern design practice. Artists of the time practised disegno, the word for drawing, creating an apparent division of labour, where thinking and observation about the work is separated from the practice (Julier, 2008). The development of the printing press in Europe, by Gutenberg in 1439 further revolutionised the spread of knowledge throughout societies as the new technology ignited an unprecedented demand for books. In addition to the inevitable economic benefits for industries, such as papermaking, there was significant increase in levels of literacy and knowledge and ultimately a strengthened economy (Annerberg Learner, n.d.). The Agricultural Age, dominated culture and society until the industrial revolution began in Britain in 1760, marking a period of disruption and change brought about by advancing technologies, which signalled the transition into the Industrial Age.

DEFINING THE INDUSTRIAL AGE
In Britain from 1760 onwards, there was massive population growth, with radical advances in technology and industrial mass production that saw the Industrial Age eventually spread around the world. Steam powered machines operated with minimal human aid enabling increased efficiency and production thus providing economies of scale and reduced costs. Manufacturing became all encompassing and the main source of economic growth. In retrospect the period can be viewed as the turning point, the dividing line, between the productions of effects and the emerging role of the designer (Ashton,1994; Elliott and Jacobson, 2002). An example of emerging design practice at this time was Henry Ford. Although Ford did not invent the automobile, he is recognised as the creator of the efficient manufacturing assembly line. Although Ford and his collaborators did not call or think of themselves as designers, their Model T Ford, transformed society and people's perception of freedom, along with the manufacturing process, in an unforeseen way (The Genius of Design, 2010,
Disc. 2). In 1913, the manufacturing process, introduced by Ford, became the basis for Fordism, which is considered a major 20th Century achievement.

The Arts and Crafts Movement emerged in the late 19th Century as a direct reaction against the effects of industrial advancement and the perceived erosion of traditional human values. One of the founders, William Morris (1834-96) is considered an influential figure in artisan design. The movement placed Britain at the centre of a new interest in design, and as design culture evolved, Morris focused on reviving traditional art and craft methods. The disruption of World War I (1914 -1918) affected the actions of the Arts and Crafts Movement, leading to its eventual decline but the debate on the merits of craft versus machine and the purpose of design continues (McDermott, 2007).

As design became more separated from the arts, it began to acquire its own identity with specific rules and expectations (Julier, 2008). Although, traditional teaching and learning continued as if the Industrial Age did not exist; architecture, in particular, appeared in crisis (Whitford (1984). Despite this resistance, reform of design education emerged in Europe in 1919 with the establishment of the Bauhaus, referred to as an art school for the modern times. The original aim of founder and architect, Walter Gropius, was to unite every discipline, within the agenda of the building (Bauhaus Archive Museum, n.d). Despite the school’s revolutionary ideals the curriculum did not focus on integrating new technologies. This is attributed to Gropius who, previously attracted to the processes of Fordism, changed his focus after experiencing terrifying interactions with the power of the machine during World War I. He became convinced technology was not a positive contribution to German reform and as a result early Bauhaus placed its emphasis on craftsmanship. It was not until Hungarian Lazlo Moholy-Nagy joined Bauhaus, that the potential of embracing technology was recognised. In 1922, Moholy-Nagy wrote an essay entitled Constructivism and the Proletariat, in which he positioned machines and technology as the emergent core strength of the century (Whitford, 1984).

Subsequently, in 1923 Bauhaus changed its program to embrace the new unity of art and technology (Bauhaus Archive, para. 2). Bauhaus went through three distinct phases in Germany and was eventually shut down by the Hitler régime in 1933. Bauhaus is regarded as revolutionary in art education and establishing standards, and continues to exercise a profound influencing over aesthetics, form and structure in architecture, industrial design and graphic design to the present day (Whitford, 1984).

DEFINING THE INFORMATION AGE AND THE KNOWLEDGE WORKER
The Information Age emerged after a communication renaissance of unprecedented access to knowledge occurred: the Internet. The first documentation regarding the creation of the Internet is 1962 (Internet Society, 2012). This era, referred to as the Information Age, places the Internet, computers and telecommunications at the centre of manufacturing and production for the 20th Century. However, it could be said that it was the invention of hypertext and subsequent development of the World Wide Web by Sir Tim Berners Lee in 1989, combined with the prolific mass adoption of the personal computer, which revolutionised global communication and collaboration for the 21st Century (W3 Consortium, 2012).

It is the nature of this global communication and collaboration that has created unprecedented challenges for the workplace. Drucker (1994) coined the term knowledge workers in 1959 when he predicted social transformation for the 21st Century. He argued that the ownership of knowledge, rather than the traditional industrial work model of previous economies, could potentially create social and economic inequality. Furthermore, technologically enabled mobility means the knowledge worker is no longer confined to a desk but engaging and collaborating in solving global issues, which in turn can affect business and its perception of, and engagement with design. (Drucker,1994; Watts-Perotti, Wall, & McLaughlin, 2010). By extension, the vast amount of information available to anyone connected to the World Wide Web encourages personal control over education and knowledge acquisition. This developing environment has given rise and new prominence to the enabled amateur. This is significant as there are large numbers of amateurs, such as non-design professionals and workers, who are required to create, produce and interact with media every day. Debate exists over the amount of help with design such amateurs should receive and whether it is best for them to understand the complexity of design therefore raising their levels of design literacy and the quality of work outcomes, or whether such assistance will devalue the design professions and diminish the value of formal training. (Beegan and Atkinson, 2010).

DEFINING THE CREATIVE AGE
The predictions for the Creative Age, labelled the Creative Molecular Economy, position it as a direct response to the transformations occurring in organisations of the Information Age. Molecular refers to the biological and dynamic framework that represents transformation stemming from new ideas. It is predicted a creative culture will require collaboration and personal responsibility for continued learning
as well as a developed capacity for identifying gaps in trends and the ability to nurture continuous innovation. (Center for Communities of the Future, 2012).

DEFINING RENAISSANCE 1.0, 2.0, 3.0
In this paper Renaissance 1.0, 2.0 and 3.0 are used analogously to illustrate how communication has had multiple rebirths over time. In Figure 6, extracted from the research map, the three renaissance periods are offered as summaries of the key influences on human-centred design. Renaissance 1.0 represents the much-documented Renaissance of the Middle Ages and the cultural changes that occurred during this period. In addition to the artistic rebirth it was also the period of scientific investigation and the spread of knowledge facilitated by the innovation of the Gutenberg printing press. Renaissance 2.0 refers to the creation of the Internet and World Wide Web that enabled unprecedented global communication. Renaissance 3.0 represents the transformation and re-emergence of design as a human-centred process embracing creativity, innovation and design thinking to form a nexus with global communication.

Figure 4: A visual representation of the Economic Ages and their relationship to the analogy of Renaissance 1.0, 2.0 and 3.0 from the research map. The colour blue is used to represent a human-centred nexus in the categories.

EMERGENT QUESTIONS
This research was initially inspired by observations of instances where different perceptions of design caused confusion and hampered communication. These observations further prompted the researcher to seek perspectives from students of higher education that were undertaking an introduction to digital media class. The question “What do you think or understand when you hear the word design?” was framed. The class was presented with a survey during the first lecture, and prior to any structured learning. Students may enrol from any discipline, not necessarily a design related discipline, with any level of experience from within the university, therefore the respondents varied in cultural background, degree program, age and digital design experience. Responses revealed differing perspectives in defining design. It is acknowledged that the responses of the students may have been influenced by their enrolment in a design class and consideration of this will be taken into account when gathering further data for the research.

The results have been determined by extracting keywords from student responses and aligning them with the discipline areas of the students to create categories (see Table 2). Thirty-three students responded to the question “What do you think or understand when you hear the word design?” Responses indicate that 33% of the students relate the word design to having a visual or aesthetic context, 33% used the word creative or align design with creative tasks and 18% felt it related to products or end results such as advertisements, websites, logos and images. It is noted that while all students, except one, had an opinion about design none of the respondents considered design as a problem solving process in keeping with design thinking as defined by Brown (2008).

Table 2: A table displaying the responses of higher education students to a single question class survey: “What do you think or understand when you hear the word design?” Groups of degree categories are aligned with keywords extracted from the responses and to represent individual student perceptions of the word design.

<table>
<thead>
<tr>
<th>Student Discipline Area</th>
<th>Responses</th>
<th>Generalised keywords of student responses to: “What do you think or understand when you hear the word design?”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multimedia Design</td>
<td>11</td>
<td>Creating, creativity, colour, layout, image, artistic, visual communication, beauty, individuality, weapon of selling, planned.</td>
</tr>
<tr>
<td>Computer Games</td>
<td>4</td>
<td>Art, fashion, architecture, music, thought behind media, pictures, fancy designs, colours, space, layout, text.</td>
</tr>
</tbody>
</table>
The results, while informal, are considered relevant as students originated from multiple disciplines, not necessarily related to design, with varied cultural backgrounds, ages and degree experience (see Figure 5). The discipline categories are defined as 33% of the students in Multimedia Design, 27% Communication/Marketing/Business and 12% in Computer Games Design. Figure 5 represents the thirty-three students surveyed and the diversity of backgrounds combined within the subject.

Figure 5: A percentage chart of degree discipline areas extracted from student responses to the question in the student survey.

A percentage graph of the keyword categories, extracted from the responses, illustrates the variations in perception of the term design (see Figure 6). The categories of keywords show 33% of the thirty-three students surveyed define design as Visual, Aesthetic or Communication, 33% as creative or creativity, 21% as Strategic Placement or Structure and 18% as Adverts, Logos, Websites, Fashion and Images.

Figure 6: Reflects the categories developed from the keywords that have been extracted from student responses to the question in the survey.
DISCUSSION, CONCLUSION AND FUTURE IMPLICATIONS

The different perceptions of the terms design, design thinking and digital design literacy cause some confusion and will challenge communication for the 21st Century. This paper explores the following questions emergent from the literature survey of contemporary design theories and analysis of their robustness with respect to developing a language of design across industries. The proposed language is not envisaged as a curriculum design or as a substitute for formal education but as a fundamental element in bridging the gaps of understanding between collaborative partners. The questions that present themselves are:

- What fundamental design theory, design thinking or digital design literacy knowledge/skills are consistently requested by employers in [selected] job recruitment advertisements?
- What categories, disciplines or fields are represented in these advertisements?
- How do [selected] universities integrate design theory, design thinking and digital design literacy within non-traditional discipline areas?
- How do [selected] professional organizations (not necessarily design organisations) perceive the importance of design theory, design thinking and digital design literacy knowledge in employees?
- How do [selected] students in design and non-design fields, within higher education, perceive the importance of design theory, design thinking and digital design literacy knowledge for the future?

The data collected from the research questions should indicate whether an International Design Thinking Index (IDTI), as a connecting design language, will bridge the gaps of understanding between collaborative partners of industry as they face fast paced developments in information and communication technology in a Creative Economy.

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