

Research in Art and Design: A common ground between science and creative practice

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Research in art and design is at the forefront of debate, when art and design schools try to cope with new challenges in society. This polemical issue has been much discussed in several fora, in search of a definition what could be named a “disciplinary research culture”. Since there are few examples of doctoral research using creative practice, this paper intends to give a contribution to the clarification of the subject. It does so by presenting a reflection based on a PhD process and results in the domain of arts, which combine academic methods of enquiry with creative practice. The very process of art production as a medium to investigate in the field of perception of colour in architectural space is combined with rigorous analysis and the achievement of outcomes that produce communicable knowledge for the area. This research project integrates art and science by linking the perception of the quality of architectural space with the dimensions of art and colour-key issues for designers, architects and visual artists. The fact that the doctoral degree was not awarded by an art university, demonstrates the importance of holistic and multidisciplinary ways of considering investigation nowadays and also that art and design can benefit from the experiences drawn from other disciplines.

Key words: Research in art and design, research through creative practice, methodology, colour and architectural space design

1. Introduction

Investigation in art and design is nowadays brought to the fore and is framed by an intense debate focused on its philosophical basis, methods, results and criteria for evaluation, as well as links to teaching, scholarship and organization of universities and research centers.

Unlike other areas of human knowledge and activity, there is a lack of traditions in research culture in arts and design. Reasons for this were identified by several authors

(e.g. Newbury, 1996; Frayling 1993; Allison 1994; Karlsson 2003) and they are on the basis of much reflection and discussion in order to face a different approach. Karlsson (2003) refers the skepticism of academisation of practical teaching and the concern of art schools to be subject to the scientific and humanities views of research, instead of specific art forms and paradigms. Newbury (1996) states two main points working against the development of a research culture in the domain of arts. One is the conviction that the artistic work is the antithesis of the academic work and another one is the argument that the craft of art and design involves already a research process, since artists deal with several issues, from concepts, meanings and communication to technology and materials. Newbury based on Coyne and Snodgrass (1991) explains that against the successful development of art and design research militates the “dual knowledge thesis” which incorporates the perspective of two different ways of thinking: a logical, analytical and rational one and a subjective, idiosyncratic and irrational. Newbury (1996: 217) states that the perception held by many people that art and design are “inherently mysterious activities, which are in some way inaccessible, and about which little can be said”, feeds the conceptual basis for a division between theory and practice.

Similar reasons are pointed out by Allison when focusing the area of design arguing that the difficulty in recognizing the value of research is grounded on an ambivalent attitude about the nature of design. This attitude consists not only in the long-held view that any design activity is already research by its very nature, but also the belief that its intuitive character is against the systematic enquiry research implies.

Great changes and pressures from society, market and funding of universities triggered a new perspective on research in the field of arts and design. As stated by Hazelkorn (2003:46) “the global knowledge economy and thirst for knowledge has elevated the role and importance of research”.

There is an increasing recognition of the benefits of research in arts and design, beyond the immediate benefits of fund-raising and getting a status of parity with other disciplines. In any area of knowledge, research outcomes are indispensable information to guide better practice. Social and technological developments occur very fast in society and research based knowledge is an important way to keep up with the developments. Research nurtures the innovative and creative attitudes needed nowadays to face changes and uncertainties in societal development. Some characteristics of contemporary art as diversity, interdisciplinarity, self-reflexivity,

erosion of boundaries between traditional disciplines, mixed-media, seem to open the way to a culture of research in arts. Moreover, as pointed out by Coumans (2003:3) “creating new knowledge and finding the way to knowledge are inextricably related to contemporary art and design practice”. The production and dissemination of knowledge that investigation can bring to the field of arts will then be relevant in helping to bridge the gap between theory and practice and between science and art.

Benefits of research are synthesised in this quotation from Hazelkorn (2003: 48) based upon an international OCDE study:

(...) to be at the forefront of learning, creativity and the practice in the arts, communication and design (...) to achieve its mission (...) to foster a lively and innovative community in which professional practice, research and scholarship, underpin teaching and learning.

However, the philosophy and criteria of what counts as research in the field of art is the core question underpinning the debate, with different perspectives about its nature, methods and results. Whilst the requisite of research -the production of new knowledge-, has got consensus, the discussion of what is new knowledge in arts and the processes and methods to its achievement feed the debate. Is a work of art or an artifact of design new knowledge by itself and the research inherent to its production an accepted methodology? Research is defined by abilities to develop new concepts that can be used by others through a reflective systematic enquiry. Should research in arts and design develop its own new epistemological paradigm? Much discussed, as a point of departure for this debate is the encompassing Frayling's (1993) framework, based on a tripartite approach between the research subject and the object: research into arts, research through arts and research for arts.

Research into art and design is the most conventional and recognized form of investigation in art, where art and design become the very object of study. Using the academic forms of research, especially critical investigation, it is commonly acknowledged as history of art, art theory, art critique, sociology of art etc. As Montag (2000:9) puts it “the researcher is not using art to generate knowledge but is using art as a subject about which knowledge is generated”.

Research for art and design is defined by Frayling as “research where the end product is an artifact – where the thinking, is so to speak embodied in the artifact, where the goal is not primarily communicable knowledge in the sense of verbal communication,

but in the sense of visual and iconic or imagistic communication". This is closer to the traditional view that art and design activity already involves some kind of research in concepts, materials and techniques to produce the artifacts, what Newbury names research with "r". This research does not qualify for PhD in Frayling's perspective. Although this type of research produces original works of art it is not implied that original contributions to knowledge are achieved as Montag (2000:10) argues: "Original art may lack explicit transferability to the work of other researchers which is also a defining characteristic of research".

Research through art and design is according to Newbury (1996: 216), research "where art and design is the vehicle of the research and a means of communicating the results". In this kind of research the artwork is emphasized. It is considered by many the best method to manage research through creative practice, since the researcher works in practice within a field of interest but also reflects and contextualizes it. Again, Montag's assertion puts the act of creating knowledge in the proper perspective, i.e. that it is obtained by combining artwork with reflection and contextualization, engendering a viewpoint that is both internal and external to the subject of research.

If it is increasingly recognized that art and design present some specificity in its forms of producing knowledge and in the knowledge produced, it is also much recognized that research must abide by general rules, principles and criteria in order to be accepted as such. For instance, the UK model adopted by Arts and Humanities Research Council (AHRC) states criteria for research projects to be considered, where the research process is stressed, whereas considering that creative output can be produced or practice undertaken. It is necessary to define objectives, research questions or problems to be addressed as well as to state the importance to the advancement of knowledge and understanding in the area. It is also necessary to specify research methods and justify why they are appropriate to the foreseen outcomes. On this issue Montag (2000: 8) states:

(...) the creation of art designed explicitly to advance knowledge at a doctoral level is a relatively new form of activity. The small number of established examples in this area of academic research has led to a variety of different opinions about what qualifies. Some recent conferences on the subject have generated much discussion and some disagreement about the balance between written texts and visual artifacts. The disagreement is largely the result of having relatively few completed projects to refer to when discussing methodologies"

The case study presented here seems to be an important contribution to the clarification of the issue. It is a PhD work in colour and space where an innovative way of exploring direct links between theory and practice is achieved and where art is used to generate knowledge in the area of perception.

2. Colour and space - an investigation with an integrated approach between art and science

The focus of the research work is on the relationships between colour meaning expression and the perception of architectural space. The project has an interdisciplinary nature since it combines various areas of knowledge. The coloured stimuli used were coloured paintings and lighting on the public interior space of the Bridgewater Concert Hall in Manchester where the responses of artists, designers and architects, as well as those of the general public were evaluated using the methodologies of science. Based on the researcher's background, paintings were created as a means to grasp the very subject of the investigation. The nature of the researcher's work as a painter led to the construction of a multi-method model with both quantitative and qualitative data used to reinforce each other and validate the findings.

Research was approached as an ongoing process in the pursuit for the understanding of interactions where the development of questions, data collection and analysis, carries with it an extension of thinking that allows for the development of theories. In this process are involved the literature, personal insights and the practice of research as a substantial contribution of the study.

2.1 Aims and research questions

Four main objectives were established with respective research questions:

1. Build a suitable frame of reference with an interdisciplinary approach to highlight the relative character of colour and the meanings that colour has in different areas ranging from physics, optics, neurology, psychophysiological and cultural. Research questions:
What meanings does colour have in the different fields of colour research?
What dimensions of colour meaning have been previously researched?

2. Determine whether a pattern of differentiation between two 'chromatic sets' or colour ranges occurred in the different areas of colour research. Research question: Is there a significant differentiation in meaning between the two colour ranges?

3. Determine whether a differentiated pattern of response would occur when these two chromatic sets were part of a painting and their effect judged in a real environment. Research question: Is there a significant differentiation in meaning between the two colour ranges? What effects do these two 'chromatic sets' have on the perception of space when they are part of a painting and their effect judged in a real environment?

4. As the paintings were installed in a concert hall, the natural subjects of the study were the users of the building, either visitors or members of the audience. However, research on environmental and architecture meaning has acknowledged differences in reactions of architects and non-architects while claiming those differences to be due to education and experience. Research question: Is there a differentiated pattern of response between the Focus Group and the Users Group?

2.2 Methodology and development

An interdisciplinary background was used to frame data collection in the fieldwork carried out in a real space. Research into colour relationships required that research design be flexible and exploratory, interpretative and holistic. The data on respondents' motivations and reasons was best obtained through a qualitative approach where meanings of the data would not be distorted by reduction to a numerical format. On the other hand, a quantitative approach allowed for a body of comparative information to be collected. The decision between quantitative and qualitative research analysis was based on their respective strengths and weaknesses and concluded that both were desirable. There are three main stages in this project that work interactively. The research process was not linear but cyclical and fed back into different stages (see Fig.1).

Phase 1 - Establishment of the interdisciplinary conceptual framework

This phase corresponds to the achievement of an encompassing framework that enables the fieldwork to progress with the systematic character research might have. As a comprehensive study it identified the current state of knowledge, the key players and ideas, as well as the statement of the perspective taken from which the research will be judged. From this perspective research questions were raised in the particular

interpretational context and the research design was constructed. This is also the phase where the frame of reference is initially grounded in literature and the first two research questions are answered.

The dimensions of colour meaning previously researched are found in disciplines such as psychology, physiology, linguistics, philosophy, social and art history, physics, psychophysics, architecture or painting. A synthesis of existing theories was carried out in order to frame the underlying assumptions of the present research that is of the relativity of the phenomenon of colour. Relativity of colour implies that the phenomenon has various views, readings and meanings. Theories were discussed and integrated historically: Newton's (1666/1704) objective and quantitative approach was compared to Goethe's (1770/1810) description of the subjective, practical, sensitive and aesthetic effects of colour, an approach which was taken up by the research. The centrality of subjective vision was marked by the discovery of after-images systematically demonstrated in Chevreul's (1839) work and based on phenomenological observations by Leonardo da Vinci (1452/ca.1500), Goethe and Hering (1878). Theories that demonstrate the relative nature of the colour phenomenon were addressed and include Land's Retinex Theory (1986); the Purkinje Shift Theory; the phenomenon of colour constancy and the Bezold – Brucke effect (Albers, 1975). Having established the relativity of the colour phenomenon the next step was to provide a rationale for the choice of colours to deal with in the fieldwork of the research project.

The second research question required an integrated interpretation of the physical psychophysiological, aesthetic and social aspects of colour made with a view to ground the choice of the use of four basic colours. Literature suggested that there is a differentiated response pattern for the long-wavelength and short-wavelength colours. In order to select a set of dimensions to be studied in a real environment using coloured painting and lighting, the review of psychophysiological responses was informed by the following question: Along which dimensions does differentiation occur most significantly?

Different sources were used for data collection: experiments isolated from a physical context using coloured samples as stimuli or otherwise coloured lights; from experiments in contrived spaces such as laboratorial settings, space models and also in the context of built environments. Data was obtained in experiments which associate

colours to one or more of the following objective measures, e.g.: EEG; GSR; heart rate respiration rate; blood pressure, oximetry and eyeblink frequency.

Data was also gathered from observational techniques or self reported measures in which questionnaires or some form of question-answer format was used. In view of the complexity that involves treating the effects of colour in a real environment, most of the dimensions that were selected have been dealt with previously and therefore provided some measure against which to compare findings. The psychophysiological dimensions investigated by other researchers provided the map for devising the questionnaire that was used in the fieldwork, and supported the separation of the colours of the paintings into short and long wavelength colours. The dimensions of interest to this particular study were those along which a differentiated pattern of response was observed most significantly.

Literature review revealed dichotomies in the responses to colour in terms of arousal, measured physiologically by the autonomic activity, such as increased heart rate, blood pressure, respiration rate and also measured in behaviour by increased motor activity or as self-reported arousal. Recent neurological studies of the structure of the brain suggest that scientific evidence of synaesthesia may be established in the future, hence synaesthetic dimensions were also identified, namely along the following: temperature, depth, weight, and taste. Response to colour is emotional and impulsive therefore affective responses to colour were also considered, alongside the aesthetic considerations that pertain to colour harmony.

Phase two – Fieldwork

This phase corresponds to the creative phase that involved the act of painting oil canvases as well as to the application of research techniques used to collect empirical evidence.

Paintings were produced with the purpose to be installed in a context of a real environment where colours were judged in their relationship with space and where the effects of the colour in the perception of a space were also assessed. There was a huge preparatory work for the paintings, linking the objectives of the research work (investigation on the perception of colours in space) with the context for the fieldwork. The latter corresponds to the specific character of the Bridgewater Concert Hall meanings that comprehends the sense of place: historical and cultural meaning,

planning features, architectural and design concepts (functional, structural, aesthetics, colour, materials, decoration, lighting at different hours) use of the building, the way people use the space, integration of the building and relationship with the neighbourhood. This information was collected through direct observation, documents, articles and interviews with the staff of the Concert Hall which allow the definition of the places where to put the paintings as well as the characteristics to create the paintings. The paintings responded to specific qualities of the building, and even though they were not intended to be representational, they should respond to the composition of the building in terms of:

- The transitory character that is manifested in the movement of the painting particularly as it develops from slow to fast movements;
- The rhythms within the painting with similarities to music in the rhythmic changes from adagio to allegro;
- The boldness of size and impact;
- The attention to the selection of colours and the treatment of surfaces;
- The dynamics patterns of interactions.

Two large paintings (11.5 m x 2m) were then installed in the public space of the foyer of the Bridgewater Hall, arranged in two stages. In stage one a predominantly blue and green painting was on display and in stage two a predominantly yellow and red painting was installed. Questionnaires and interviews were used to investigate the aesthetic experience created by the predominant colours used in the paintings. The evaluation of the way in which these paintings and lighting installations affected the experience of space and interpretation of meanings was grounded in a set of qualitative and quantitative research techniques.

This methodology is real world, immersing, contextual and sensitive to respondents' experiences, thus the combination of interrelated quantitative and qualitative techniques provide the possibility for the effects to be mapped out by the former and explained in real situations by the latter. Standardized questions offer the necessary structure to the methods and ensure that questions asked are consistent and provide the possibility of comparing results between different respondents. The semi-structured interview schedule with open-ended questions resolves these needs and allows discussion and comparability, while in-depth probing allows a full understanding of the issues raised by the respondents.

The nature of the research required a detailed examination of the responses to colour and a flexible research design to allow for discussion of complex issues that are not pre-defined thus requiring in-depth research methods. The different techniques used in the collection of data resulted in the need for the use of questionnaires and interviews to the group of experts.

Fieldwork techniques aimed at capturing the subjective situation and enter the social world. The interpersonal and social context was examined through participant observation and interviews to a group of experts – Focus Group. The record of interviews allowed for systematic comparative work of content analysis. Qualitative methodologies for measuring meaning emphasised experience rather than behaviour and this way recognize the holistic nature of a person's mental processes. This approach was particularly appropriate when respondents were questioned on the associations they established with the colours of the paintings. Data from 80 questionnaires of the Focus Group (40x2 installation periods) was compared with data from 200 questionnaires (100x2) and submitted to content analysis and statistical treatment. The respondents included the audience (Users Group) and a group of experts (Focus Group): artists, architects, interiors designers and textile designers, thus allowing for a comparison of results among groups to be carried out.

As the space lacked in red or green features, the chosen colours for the lighting were yellow and blue so as to highlight and emphasize the underlying chromatic features of the building: it's yellowness and in particular it's blueness. Therefore, during the installation period of the Blue–Green Painting, the foyer space was lit with blue lighting. During the installation period of the Yellow–Red Painting, the foyer space was lit with yellow lighting. The opportunity to change the lighting scheme of the foyer space, blue

in stage one and yellow in stage two allowed for another set of data to be gathered based on the perception of the space.

This procedure allowed the research to tap a hypothesis that constituted the response to the research question that relates to the aesthetic and psychosocial issues of education and experience. In fact, results demonstrated that the Focus Group responded more in terms of aesthetic issues while the Users Group responded in affective terms. This hypothesis was also confirmed with the results that explored the meanings for the concept of *harmony*. The analysis of responses to each of the paintings in terms of how they harmonize with the space was informed by these attributes and concepts of colour harmony.

- (1) Preference: based on the viewer's previous experience;
- (2) Commonality: based on the grouping of various colours in terms of their expressive qualities;
- (3) Colour affinity: colours which have some kind of similarity;
- (4) Appropriateness: based on colour association and symbolism where colour depends on the objects and therefore dependent upon familiarity;
- (5) Dynamics: based on physiological phenomenon such as after-images, simultaneous contrast, phenomena as advancing and receding colours;
- (6) Perception of size.

Both groups considered the Blue-Green painting more harmonising with the space basing their opinions on the understanding that the concept of harmony is interconnected to that of similarity, affinity, appropriateness and analogy between colours. Users' responses to harmony were nevertheless more conditioned by affective preference, whereas the Focus group respondents, due to training and practice were more aware of the physiological, visual and aesthetic phenomena. Constructs used in the interpretation of colour relationships are also different. The Users Group use constructs that relate to affective dimensions of meaning whereas the Focus Group use constructs that relate to conceptual categories.

Phase 3 – *Findings and contributions*

1. The frame of reference provided a synthesis of existing theories in an integrated interpretation of colour, combining the major factors involved in the perception of

colour, as follows: physical, neurological, psychophysiological, aesthetic, sociological. Links between colour and space were found in literature in the field of colour relating to the following issues: physiological (size, depth, strength, expression); real world experimental issues; aesthetic (differences between laypeople and designers); content of semantic scales, their selection and application.

2. Dimensions of real world differences

One of the major general contributions of this study is that it was carried out in a real environment instead of in a laboratorial setting or in a contrived space. This allowed for the effects of colour and interrelationships to be examined and explained in a real world context. The interpretation is therefore the result of direct experiences which is not possible when using representations of buildings, e.g. photographs or slides. Besides the expansion of the study beyond the laboratorial work, various issues were assessed:

- Response to the effects of colour on space, when part of paintings
- Response to the effects of coloured lighting on space
- Comparison of responses by users and an expert group

3. In real world research interpretation of colour is by association and dependent upon various elements:

Training and perspectives;

Background (proportion of space, light, size);

Visual interactions of colours;

Concepts of harmony (analogy; contrast);

Depth and movement.

4. Semantic variability

- Expression of colour is semantically variable and questions the assumptions and applicability of generally used terms. It questions the conventional parameters and their meaning.
- People do not relate to some terms and concepts
- People differ in meaning according to education
- There are differences between meaning in semantics and literature
- There are differences on some semantics between users and focus groups

- Layers of deeper meaning were identified in semantics, relating to uncertain meaning in literature applications.

5. The dimensions of colour that were considered in the questionnaires included the affective dimensions: *happiness, friendliness, comfortingness, dynamism, excitement*; the synaesthetic dimensions: *sweetness, softness, wetness, warmth, quietness and heaviness* as well as the aesthetic dimensions: *beauty, originality, interestingness and complexity*. These were explored and set against a background of results that considered *associations* as determinants of response to colour, the *real world* determinants, the *aesthetic* and psychosocial aspects of education, *interactions* and colour *harmony* relationships.

6. Diagrams were created to illustrate the levels of differentiation of response to lighting and painting according to statistical results. The V diagram, presented in Fig. 2, concerns the differentiation between quantitative results for the effects of the paintings, in response to the question:

Along which dimensions are the responses to the effects on the space of the Blue-Green Painting and of the Yellow-Red Painting differentiated?

Figure 2 indicates the relative position of the results of the judgments made to both paintings along the 15 bipolar semantic scales, which constitute the dimensions that were quantitatively treated. The data presented is based on statistical results obtained from the judgments by the Focus Group and the Users Group considered together. In order to illustrate the relationships between the various dimensions in terms of degree of differentiation, the following scheme was devised. Two lines were placed in relation to each other so that they were joined together at a point of convergence -the vertex- that represents the degree of no differentiation between the Blue-Green Painting results and those of the Yellow-Red Painting.

Results concerning the judgements of the effects of the Blue-Green Painting were placed along the blue line and those of the Yellow-Red Painting were placed along the red line. The placement depended upon the level of differentiation between the results to both paintings. At the vertex, the point where the two lines meet to form an angle, differentiation is null, so both paintings were judged equally interesting. Moving downwards, the results are differentiated so that the highest level of differentiation was

found in the response to the dimension of warmth: the effect of the Blue-Green Painting was judged cold and that of the Yellow-Red Painting was judged warm.

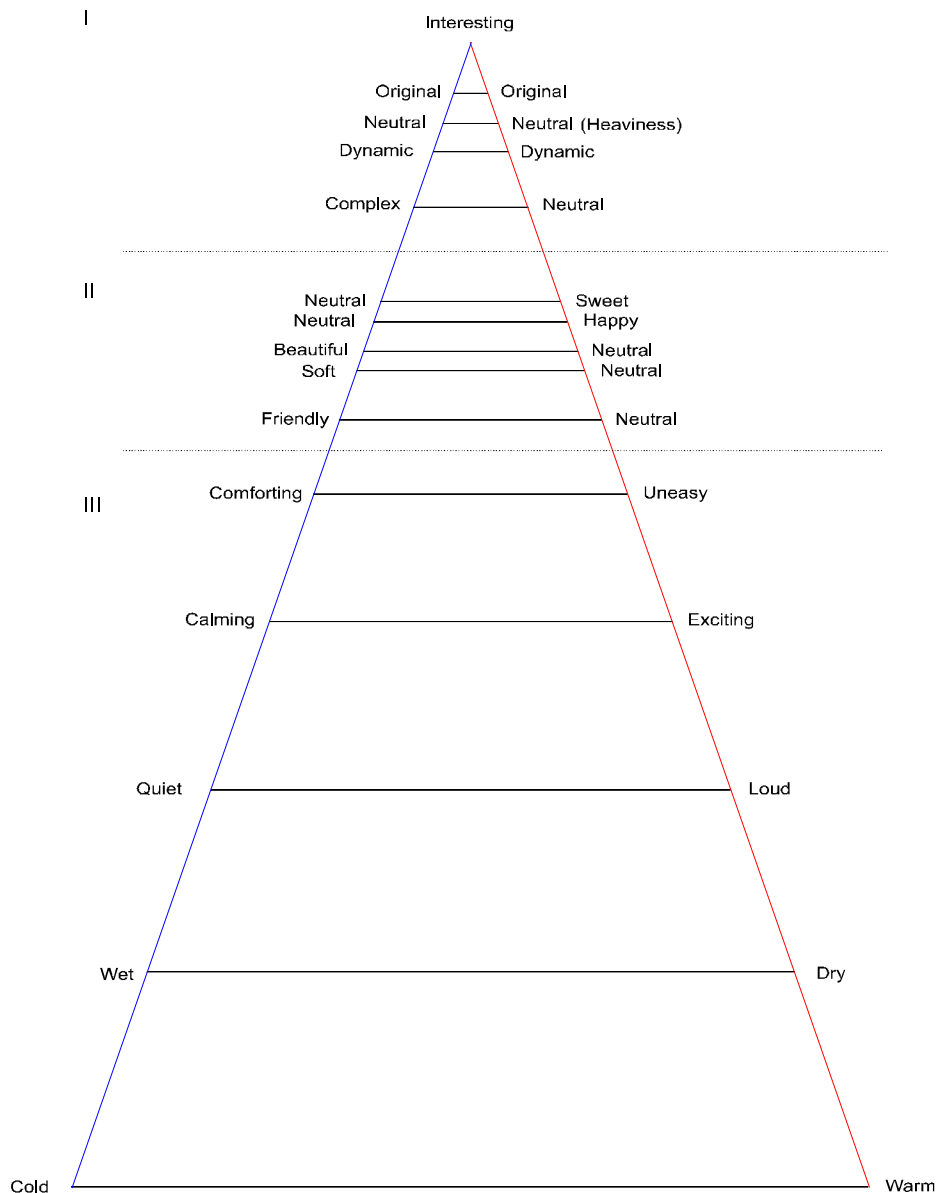


Fig. 2: V diagram indicating the relative position of the results of the judgements made to both paintings

At level I judgements along the dimensions of Interestingness, Originality, Heaviness, and Dynamism are not differentiated. The effect of both paintings on the space was judged *interesting*; *original*; neither heavy or light but *neutral*; and *dynamic*.

At level II judgements along the dimensions of Sweetness, Happiness, Beauty, Softness and Friendliness are differentiated but not dichotomic.

At level III judgements along the dimensions of Comfortingness, Excitement, Quietness, Wetness and Warmth are not only differentiated but polarized.

This technique was also used to differentiate results for the effects of the lighting schemes but will not be presented in this paper due to constraints that regard word limitations.

3. Conclusions

“The project brings together, in a unique way, her theoretical studies of colour as a psycho-physiological phenomena and symbolic form, and her ongoing practice as a painter. (...) Her paintings evoke a feeling for the natural world as a hedonistic blossoming and a troubled, brooding atmosphere. They encourage us viewers to participate in their chromatic improvisations on the themes of transiency and instability, but our interaction with the paintings is then submitted to a critical appraisal through which underlying structural forms and patterns of behaviour are revealed. ...(the) project can be seen to aspire to the very condition of music by which the passionate, expressive statement is made more accessible and coherent through patterns of organization which are clearly structured and reflect analytical thinking.” Dunbar (1998)

This research has developed knowledge through the creation of art itself and using the mean of art creation to investigate in the area. It is an innovative path of exploring ways and establishing direct links in the field of practical arts and theory. The research work combined effectively not only the traditional dimensions of academic investigation (cognitive and methodological) but also the very process of creative art making (producing paintings) using this result as a means to produce new knowledge in the area of colour and space. Practice embodies the research process, “according to Allen’s view that both the register of text and the register of practice have the capacity for theory and practice” (Biggs 2002:113). The research work clearly bridges the traditional categories of research through art and design and for art and design, since the creative practice has been an integral part of the investigation. The findings were translated not only into traditional expression of results – a written doctoral thesis but also in paintings and documentation of the process of production. The paintings are

presently on display in public academic spaces of the University of Salford to be used as source of transdisciplinary research projects.

The interaction between different research traditions seems to be very fruitful for arts research. In the present case, the original contribution to knowledge was not obtained by the paintings alone but the way they were conceptualized, created and served as a vehicle to test concepts with scientific methods and new insights in the area of colour perception. The results obtained allow explicit transferability to the use of other research to the built environment as a whole (Durão 2002b); and even to the very particular domain of aerospace architecture (Durão, 2002a; 2005; Durão & Favata, 2003). We agree with Newbury (1996:217) that the way to improve art and design research as an established and accepted practice can be better achieved by the integration of traditional divisions of knowledge and that the best of art and design seems to facilitate interactions between research traditions.

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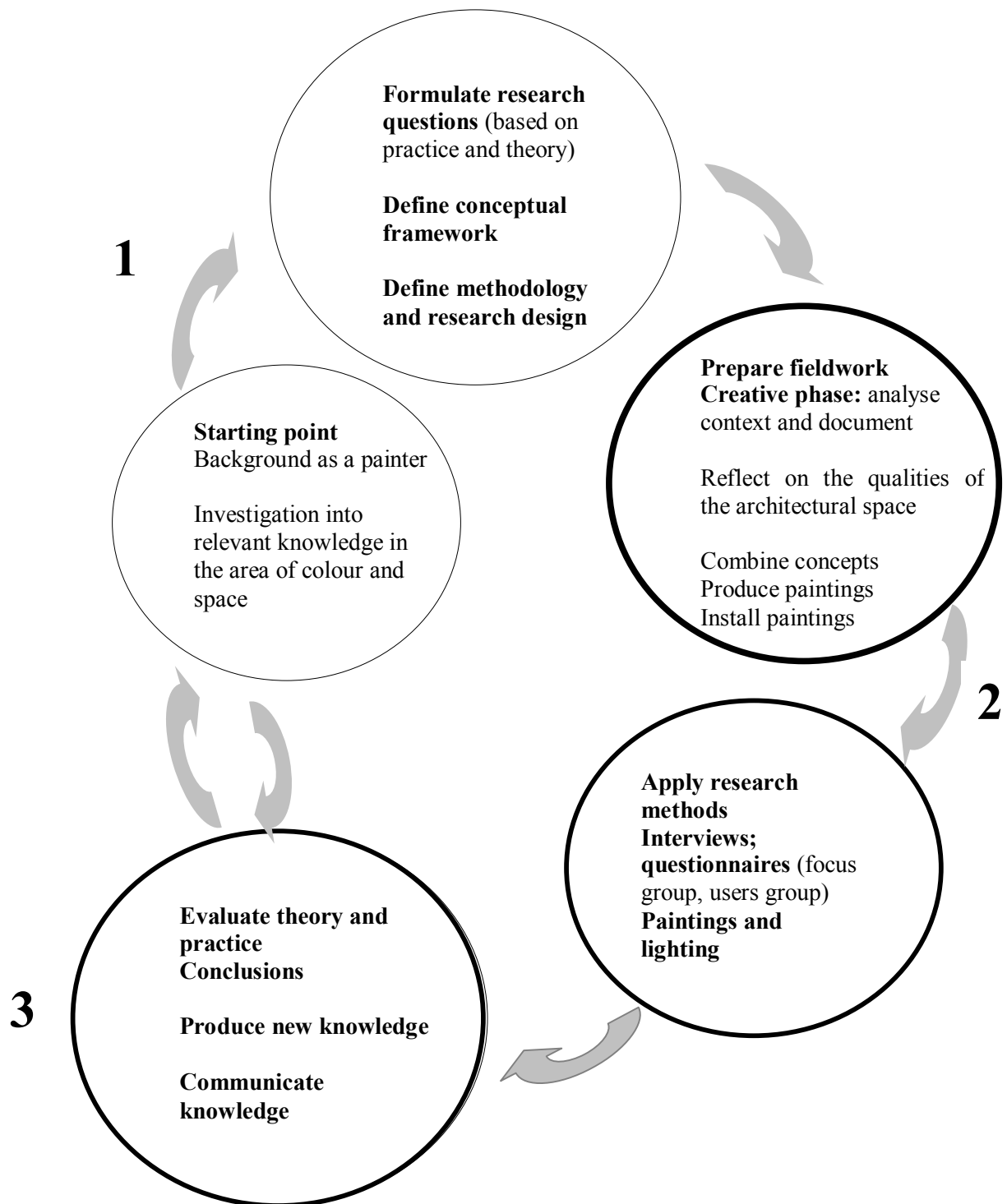


Fig.1 Research phases



Fig. 3 Work in process at the studio – Blue-Green Painting



Fig. 4 Work in process at the studio – Yellow-Red Painting