Art, Interaction and Engagement

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Introduction
This chapter reviews the development of frameworks for thinking and talking about interactive art in the context of my personal practice over the last forty years. It traces a number of paths taken, from an early simple direct notion of interaction through to communication between people through art systems and, more recently, interactive art for long-term engagement. The frameworks consist of an evolving set of concepts, over several dimensions, which are developing together with the practice of interactive art.

A significant part of art making, for me, is the development of an understanding of the forms and material being used, what Cezanne called “a language and a logic” (Doran, 2001: 17). The language that the artist evolves is a language of form, of course: shapes, colours, textures and so on. However, it is sometimes helpful to have a language of words to help one think about and discuss the art. For example, although the key issues about an understanding of colour are embodied in artworks exploring colour, it is also good to be able to name hue, saturation and intensity etc. This helps in the thinking about colour that provides the context for using it.

The practice discussed in this chapter is concerned with developing and exploring interaction in the context of art. It is concerned with the form, language and logic, of interaction. The frameworks discussed are sets of words that help in the development of interactive art in the same way that words such as hue and saturation help with the painting of colour. So the frameworks help to frame the thinking and hence the practice of interactive art. It is not surprising, therefore, that they are always evolving.

Interaction and the computer
In the 1960s, although my art was primarily painting, I took an interest in ‘happenings’, in which direct and physical audience participation became, at times, an integral part of the artwork, such as in Allan Kaprow's Eat which, for example, included, amongst its props, fruit that the audience was invited to eat (Kirby, 1965a). Artists devised situations in which the audience was meant to engage by actually taking part and so explicitly shape or create the artwork. It seemed to me that involving audiences explicitly in the creative process of art making was ‘in the air’ at the time. Even in the case of the novel, B.S. Johnson published "The Unfortunates", which consisted of 27 sections which, with the
exception of the first and last, could be read in any order that the reader desired (Johnson, 1969). The visual artist Roy Ascott was working on a range of artworks that could be modified or re-arranged by the audience. He saw a potential for computers to enable the development of interaction in a number of ways, including what he termed ‘telematic art’ (Ascott, 1966).

Thinking about audience engagement and interaction in the arts led to me also thinking about those ideas more generally. Cybernetics, and the closely related study of Systems Theory, seemed to me to provide a rich set of concepts that helped us to think about change, interaction and living systems (Bertalanffy, 1950; Wiener, 1965). Whilst my art has not been built directly on these scientific disciplines, many of the basic concepts, such as interactive systems and feedback, have influenced the development of the frameworks discussed below.

I first became interested in exploring interaction within my art practice in the late 1960s and, meeting with Stroud Cornock, I worked with him on an interactive artwork called *Datapack*, which was shown in the CG70 exhibition at Brunel University in 1970. This was a very early computer-based interactive artwork. At the same time, we realised that we needed a conceptual framework for talking and thinking about such artworks. We presented a classification of interactive art systems, which we called “the matrix”, at the CG70 conference (Cornock and Edmonds, 1970). We identified four situations, which we termed ‘Static’, ‘Dynamic-Passive’, ‘Dynamic-Interactive’ and ‘Dynamic-Interactive (Varying)’. Briefly, ‘Static’ applied to works that do not change, ‘Dynamic-Passive’ to works that changed but were not influenced by the audience, ‘Dynamic-Interactive’ to works that changed as a result of audience actions and “Dynamic-Interactive (Varying)” applied to interactive works that were also influenced by other factors, so that their response varied. This was the initial framework that I worked with. As we will see, it did not cover all the cases that have turned out to be interesting in my practice, but it did provide a fairly robust starting point.

A useful explanation of the first Cornock and Edmonds framework was described as follows:-

“Static: The art object does not change and is viewed by a person. There is no interaction between the two that can be observed by someone else, although the viewer may be experiencing personal psychological or emotional reactions. The artwork itself does not respond to its context. This is familiar ground in art
galleries and museums where art consumers look at a painting or print, listen to
tape recordings and talk to one another about the art on the walls and, generally
speaking, obey the command not to touch.

Dynamic-Passive: The art object has an internal mechanism that enables it to
change or it may be modified by an environmental factor such as temperature,
sound or light. The artist specifies the internal mechanism and any changes that
take place are entirely predictable. Sculptures, such as George Rickey's kinetic
pieces, that move according to internal mechanisms, and also, in response to
atmospheric changes in the environment, fall into this category. The viewer is an
observer of this activity performed by the artwork in response to the physical
environment.

Dynamic-Interactive: All of the conditions of the dynamic passive category apply
with the added factor that the human ‘viewer’ has an active role in influencing the
changes in the art object. For example, by walking over a mat that contains
sensors attached to lights operating in variable sequences, the viewer becomes a
participant that influences the process of the work. Motion and sound capture
techniques can be used to incorporate human activity into the way visual images
and sounds are presented. The work ‘performs’ differently according to what the
person does or says. There may be more than one participant and more than one
art object. An example of this work is the Iamascope, a work which includes a
camera looking at the viewers and is connected to a controlling computer. The
work reacts to human movement in front of it by changing a kaleidoscope-like
image and making music at the same time in direct response to the viewer’s
movements.

Dynamic-Interactive (Varying): The conditions for Dynamic-Interactive apply,
with the addition of a modifying agent that changes the original specification of
the art object. The agent could be a human or it could be a software program.
Because of this, the process that takes place, or rather, the performance of the art
system cannot be predictable. It will depend on the history of interactions with
the work. In this case, either the artist from time to time updates the specification
of the art object or a software agent that is learning from the experiences of
interaction automatically modifies the specification. In this case, the performance
of the art object varies, in addition to case 3, according to the history of its
experiences.” (Candy and Edmonds, 2002c).
#Datapack was of the third kind, Dynamic-Interactive. By modern standards it was technologically very clumsy (this was a decade before the advent of the PC). However, it demonstrated the point. The participant sat at a ‘tele-type’ (keyboard and printer combined) and entered into a ‘conversation’ with the computer. This conversation was rather like the famous Eliza software (Weizenbaum, 1966) that spotted keywords and used various tricks to respond in ways that could be seen to be plausibly ‘intelligent’. For example, when someone typed in “I feel sad”, Eliza might respond with “Why do you feel sad?” As in our case, Eliza had no smart intelligent system that understood the user’s remarks but rather presented a simulation of conversation that sounded (mostly) plausible.

As a result of the conversation, the computer software made certain decisions that determined what graphical output would result. This was in the form of a drawing executed on a plotter. The drawing identified a notional space around the Vickers Building next to the Tate Gallery (now the Tate Britain) in London. A package, including the drawing and a printed copy of the conversation (as produced by the teletype), was then handed to the participant as their artefact to take away. The key issue at this time was to find a way to explore interaction at all. The technical limitations made it difficult to match the theoretical goals, but *Datapack certainly was interactive and informal discussions with participants at the exhibition indicated that it was also engaging.

**Interaction: from simple to complex**

Working with the relative complexities of #Datapack, I wondered if it would be possible to make a very simple work that encompassed the same principles. I came up with *JigSaw* (Fig 1), which was just sixteen wooden pieces that could be fitted together, rather in the manner of a jigsaw puzzle. The key point was that they were so designed that there were hundreds of different ways of putting them together but each way was highly constrained. The participant could interact with the work by arranging or re-arranging it, but its internal logic constrained the result.
Fig 1: JigSaw being arranged in an exhibition, 1970, photo Ernest Edmonds

Having worked on an interactive and a re-arrangeable artwork, I started to explore the nature of interaction itself. I began to ask myself questions like: What was going on when a human interacted with the world around them? What motivated or limited those interactions? This led me to read about various psychological studies of human interaction with the world and with other humans. Current scientific studies of very young infants provided the clue that led to my next development. It seemed that right from birth a child interacts with its environment in a purposeful way: not just to obtain food and so on, but also to try to construct understandings about that world. “If I do this and that, will the world do some particular other thing?” This very early and basic form of interaction is conducted without a shared language, just by prodding the world and looking at what happens: trying to find patterns (Bower, 1974).

As a result of my reading about early infant behaviour I started to think about ways in which I might deal with such issues in an artwork. I did not want to build an imitation of an infant, but I tried to think of what might be essential elements of their situation in relation to interaction. As a result I started building what I came to call my Communication Game series of works. These interactive works were concerned with humans interacting with humans through technology (rather than humans interacting with technology). In part, they represented a realisation of Ascott’s ‘telematic’ art in that they transformed the viewer into an active participant in creating the artwork (Edmonds, 1975). The key points about the work’s intentions were to restrict communication between participant to a very low bandwidth, to provide no instructions or code and to add a certain amount of complexity. The complexity was injected by having what a participant saw controlled by two other participants, only one of whom saw the results of that participant’s actions. We could say that the data that a participant was working with was incomplete or noisy, as tends to be the case in all real life situations.
After a few iterations of the *Communication Games* work, including the use of sound, I left it alone until about 2006, when I re-started the development of that series in the form of the *Cities Tango* works, of which more later on.

In my own art practice, I left interaction alone for some years. I was still interested, but I was not content with any of the technological methods that I found. However, I worked with PhD students and other artists on a number of approaches to making interactive art. Steve Bell, for example, looked in detail and different strategies. He concentrated himself on work that used a ‘life’ model of growth and restricted the participant’s actions to very specific roles, such as seeding the growth of a dynamic work (Bell, 1991). This work was time-based and certainly involved interaction, but the interaction was essentially quite simple. The complexity was more in the growth of the image over time. Mike Quantrill is a different case. He explored interactive drawing using an electronic whiteboard and made experimental works in which participant movement (detected by floor pads) determined the nature and dynamics of a visual display. The audience could almost play the work as if it was an audio-visual instrument (Edmonds and Quantrill, 1998). So in Quantrill’s case, the interaction was continuous and fluid. Growth is the central interest in Bell’s work and interaction is the central interest in Quantrill’s.

There are a number of strands to my work and I have not only explored interaction. My central concern is with the implication of the notion of computation in art, of which interaction is certainly a significant example. At the time when I was not directly working with interaction (1980s and 1990s), I was largely concentrating on another implication of computation. That was generative time-based work, in which a set of rules that I designed led to the unfolding of an abstract work over a period of time, sometimes extending to hours or days (Edmonds, 2003). The work was determined by the rules and not influenced by the audience. The generative works had come about through the realisation that as a computer program worked through the sets of rules that were intended to define the art system, it could display its progress. Hence the generative search could become the core of time-based art rather than a route to a final object. The key issue here, for me, was finding ways of thinking about the rules and this time-based process. The only way that I found to do this was to build a platform, an art making software environment, that I could use to both experiment with rules and learn about their implications.

By 2001, however, I had seen how to incorporate interaction into my time-based generative works. The addition of interaction to the generative works represented a particular example of the category discussed above, Dynamic-Interactive (Varying). In
this case, the variation came from the internal generative system. The interaction came from the analysis of images of the audience captured by a camera. The camera used was typically a small webcam.

The generative process in these works is dynamic in itself but what I added was an input to the art system that could cause a change in that dynamic process. The mechanism was to have the process consult data from the camera as part of the determination of the next action. Thus, activities external to the artwork itself, such as audience behaviour, altered the generative process. I used image processing, taking data from a video camera pointing at the audience and analysing movement or sound analysis of voice. To begin with, I made works in which the alteration was direct and immediately visible: audience actions caused visible responses.

**Interaction: from reaction to influence**

Most artists would probably say that they aimed for their work to encourage long-term engagement with their audience. Much interactive art, however, seems to emphasise attraction and immediate engagement. Why is this? There are two possible reasons for the focus on the immediate. One is the seductive appeal of direct interaction that has been so powerfully exploited in computer games. There is no doubt that the model of the game is interesting. However, it also represents a challenge to the artist taking the long-term view. How is the interactive artwork going to retain its interest once the initial pleasure has worn off? An answer may be implied in the second reason for the emphasis on the immediate, which seems to me to be an over reliance on an action-response model of interaction.

The psychological underpinning of interaction as it is employed in human-computer interaction (HCI) as well as in art is the study of action and response. Each action leads to a response that, in turn, encourages or enables another action. This view of interaction is seen today by science as oversimplified. It does not take long-term influence properly into account and that point is clearly relevant to a concern for long-term engagement. Put simply, the key issue is that a system as complex as a human (or animal etc) must have internal states that represent memory, mood, state of development etc. An interaction, be it with another human, an artwork or a game, can influence internal states. This can happen whether or not any immediate action is made. Engagement over long periods of time almost certainly involves changes in these internal states and so an interactive artwork that is successful in these terms must take these things into account.
From my perspective, the psychological models most interesting for interactive art are not action response ones, but Systems Theory ones. In Systems Theory, the interchanges between interlinked entities are studied in a much broader context than in the action response case. For interactive art, this perspective introduces the possibility of considering interactions that have effects in the future and that may even have no observable response at the time. A simple example would be where an artwork has a memory of audience actions that is only used to affect the artwork’s behaviour days or weeks later. I have suggested elsewhere that influence might be a better term than interaction to describe such cases (Edmonds, 2007).

**Long term engagement**

I started to explore the idea of moving from interaction to influence in 2003 and we might term it Dynamic-Interactive (Influencing). This idea matured in a series of artworks begun in 2007, called *Shaping Form* (Fig 2), in which images are generated using rules that determine the colours, the patterns and the timing. These are generative works that are changed by the influence of the environment around them. Movement in front of each work is detected by image analysis and leads to continual changes in the program that generates the images. People can readily detect the immediate responses of the work to movement but the changes over time are only apparent when there is more prolonged, although not necessarily continuous, contact with it. A first viewing followed by one several months later will reveal noticeable developments in the colours and patterns. The *Shaping Form* series are the latest works arising from my preoccupation with interaction and time expressed in a wide range of abstract generative forms over many years.

Digital artworks like *Shaping Form* are designed to interact with the environment in which they are found. Exactly how they behave depends on what kind of compositional elements or principles are being worked with at the time. I work with structural relationships between visual elements, the colours and shapes that determine how the images are constructed. Some works are made to learn from external movement such as a hand waving or a person walking by. The way the art systems accumulate information from these inputs, or ‘learns’, determines how they select future choices of colour and pattern in the images displayed. The behaviour of the works is not intended to always be obvious, so that if you continuously try to force a response by waving it might result in a period of quiet. *Shaping Form* has a generative element, a computer program, which produces a continuous stream of images using predefined rules that control the rectangular pattern, the pallet of colours and the timing. The program continuously analyses movements detected in front of the work. As a result of this analysis, the rules
are steadily modified in a way that accumulates a history of experiences over the life of the work. The shaping of the form is a never-ending process of development.

Fig 2: Shaping Form works © Ernest Edmonds, Conny Dietzhold Gallery Sydney, 2007.

**Distributed interaction**

My earlier concern for communication through digital systems, exemplified in the Communication Game works, continued and was revived firstly by making a version of Shaping Form that worked on the World Wide Web. This changed the structure to include a shared memory and the possibility of many remote users and so united the core ideas of Shaping Form with Communication Game. The main step, however, came about between 2008 and 2009 with the development of the Cities Tango series (figs 5,6) (Edmonds, 2009). I call this type of interactive art ‘Dynamic-Interactive (Communicating)’. This category more-or-less corresponds to Ascott’s early concept of Telematic Art, which advocates the use of computer-mediated networks as an art medium.
Fig 3: *Cities Tango*, Belfast and Sydney, 2009
In *Cities Tango*, two or more ‘nodes’, consisting of *Shaping Form* like works with camera input, are connected over the Internet. The first major example had one node in Sydney and a second in Belfast. In addition to the typical colour bands that I use, I added two other elements. First, I used photographs of a single location at each site at different times of the day as abstract elements that substituted for certain colours and gave a sense of the remote site. Second, occasional live stills were transmitted from one site to another, typically at a time of significant audience activity. In this way, we have the idea of distributed interactive art systems that can involve instant response and/or communication as well as long term influence in the *Shaping Form* sense.

**Interaction engagement and experience**

The physical way in which the audience interacts with a work is a major part of any interactive art system. Three main approaches are used. The first is as in #Datapack, where members of the audience physically manipulate the work in some way (typing at the teletype in #Datapack). The second approach is where members of the audience are provided with special devices of some kind, such as headsets as in Char Davies’ works using virtual reality (McRobert, 2007) or *Cardiomorphologies* (Khut and Muller, 2005). The third approach is ambient, such as many of the examples described in this book, where audience movements, or states, are detected by non-invasive devices, such as cameras, floor pads or infrared beams.

We can term these approaches:

- Direct
- Facilitated
- Ambient

In making Dynamic-Interactive works, issues about the audience reaction to them are significant and have gained increasing attention, in particular, by many of the contributors to this book. One specific area of interest is engagement. Do people become engaged with the artwork? Is that engagement sustained? What are the factors that influence the nature of the engagement? Does engagement relate to pleasure, frustration, challenge or anger, for example? Of-course, the artist can use themselves as typical of the audience and rely on their own reactions to guide their work. Much art is made like that, although asking the opinion of expert peers, at least, is also normal. However, understanding audience engagement with interactive works is quite a challenge and needs more extensive investigation than introspection.
There are many forms of engagement that may or may not be desired in relation to an artwork. For example, in museum studies, people talk about ‘attractors’, that is, attributes of an exhibit that encourage the public to pay attention and so become engaged. The immediate question arises of how long such engagement might last and we find that the attributes that encourage sustained engagement are not the same as those that attract. Another form of engagement is one that extends over long periods of time, where one goes back for repeated experiences such as seeing a favourite play in many performances throughout one’s life. We often find that this long-term form of engagement is not associated with a strong initial attraction. Engagement can grow with experience. These issues are ones that the interactive artist needs to be clear about and the choices have significant influence on the nature of the interaction employed.

The discussion of engagement needs to be significantly extended in order to cover the complexities of Dynamic-Interactive (Communicating) art systems. This is an area that remains in need of exploration and research. However, there is another aspect that interactive art research has brought very much to our attention. This is the nature of the experience that audiences have during their engagement with an interactive art system.

In my own practice, I have considered just three kinds of engagement. Let’s call them

- Attracting
- Sustaining
- Relating

‘Attracting’ is a matter of drawing attention, so that a sudden noise (or a sudden silence) will attract attention. ‘Sustaining’ is the process of retaining that attention for a period of time. ‘Relating’ is developing a long term interest, which occurs when the audience wants to experience the work again and again, perhaps over many years. Attracting and relating do not always go together. Sometimes, what is most immediately engaging is also easily discarded. My Shaping Form works, for example, clearly aim at a ‘Relating’ type of engagement. The challenge is to provide just enough attracting and sustaining engagement to draw the audience in, but not so much as to induce boredom.

Other, more detailed categorisations of engagement are discussed in other chapters of this book, in particular by Zafer Bilda, Brigid Costello and Andrew Johnston.

**Categories of Interaction Re-visited**

I have discussed three kinds of classification in relation to interactive art. The first was the one that dealt with what kind of art ‘systems’ are at play, based initially on the
Cornock and Edmonds set. The second was of the different kinds of way that the physical exchange takes place. The third was the set of different kind of experience that the interaction encourages in the audience.

The ‘systems’ categories that have been discussed above extend the early Cornock and Edmonds terminology. To make the naming more consistent, we can replace ‘Dynamic-Interactive’ by ‘Dynamic-Interactive (Responding)’. This implies that the system responds directly to audience action, at the time of that action, and so is directly reactive.

Thus we now have:

- Static
- Dynamic-Passive
- Dynamic-Interactive:
  - Responding
  - Varying
  - Influencing
  - Communicating

The central interest in relation to interactive art in this chapter, and in the book, is in the dynamic-interactive cases, so we might simplify our categories by saying that we have four kinds of interactive art systems:

- Responding
- Varying
- Influencing
- Communicating

Naturally, art systems may fall into more than one of these categories. For example, the Shaping Form works are both ‘Varying’ and ‘Influencing’. The Communication Games are both ‘Responding’ and ‘Communicating’. All four categories apply to Cities Tango.

As discussed above, the physical interactions might be any of:

- Direct
- Facilitated
- Ambient

Each kind of system might be implemented with various physical interfaces. However, we can see that the ‘Influencing’ case, for example, may not be easily realised by the
‘Facilitated’ method, for the simple reason that it may not be practical to facilitate over long periods of time.

In relation to experience, I have discussed

- Attracting
- Sustaining
- Relating

Thus we have three dimensions in which to consider interactive art systems.

**Revisiting the example artworks**

Having discussed and established the three dimensions, I will revisit the examples of my work cited and discuss each of them in terms of those dimensions.

**#Datapack**

This work was purely a responding art system. A single participant typed at a keyboard and the machine responded directly, asking a series of questions. Once the conversation was complete, the plot was drawn and the participant was handed their personal pack. The physical interaction at the Teletype was direct. The participant pushed keys.

However, the whole process was facilitated. A human helper was needed, first to help a participant operate the Teletype (unfamiliar to most people in 1970), and then to operate the plotter and put the pack together. In terms of the intended experience, perhaps the main concern was to provide sufficient interest to encourage a participant in sustaining interest through the process. There was no expectation that people would particularly come back and try it again, although there was a hope that the pack would be intriguing enough to have some longer-term interest.

**Jigsaw**

Jigsaw was not an interactive work at all. Its main feature, from an active audience perspective, was that it could be re-arranged, by physical action, within constraints that were integral properties of the shapes themselves.

**Communications Game**

The various versions of this work were all communicating art systems. *Communications Game* is not a responding system because, should there only be one participant, no responses occur at all. Everything that a participant sees or hears (there were two versions based on lights and one based on sound output) came about as a result of other participant actions. The physical interactions were direct, the flicking of switches without
any facilitation or instruction being provided. The work was ‘attracting’ in so far as available switches in a public space tend to invite action, but in no other sense, unless seeing others interacting raised interest. The ‘sustaining’ element came from the fact that, whilst participants typically felt as if they were controlling something, the responses were not consistent, depending as they did on the behaviour of others. This tension between feeling in control and not being able to predict seems to be a significant factor in achieving a ‘sustaining’ experience.

**Shaping Form**
The core of these works includes a time-based generative system together with an image analysis system that slowly modifies the generative rules governing, hue, saturation, brightness, stripe patterns and timing. The image analysis primarily generates internal information about the amount of movement in front of the work at any one time. The **Shaping Form** works are ‘influencing’ art systems. The actions taken by the audience influence the behaviour and appearance of the work in an accumulating way over long periods of time. In order to give some indication to the audience that the work is interacting there is a ‘fast response’ component that works in a ‘responding’ mode. When movement above a particular threshold is detected, a clear immediate visual change is made that signals recognition of the movement. The physical interaction with a **Shaping Form** is purely ‘ambient’, relying as it does on image analysis. The intended experience is one of the audience ‘relating’ to the work, most probably through living with it or seeing it regularly in an often visited space. The fast response behaviour is provided in order to provide an ‘attracting’ quality. However, it has proved difficult to judge the correct balance between the ‘influencing’ and the ‘responding’ behaviours. If the response is too frequent and easily achieved it seems to dominate the experience. Later **Shaping Forms** have, therefore, reduced the fast response activity. The ‘sustaining’ element of these works is not intended to come through interaction at all, but relies on their intrinsic aesthetic interest.

**Cities Tango**
This series of works brings the concept of **Communication Game** together with that of **Shaping Form**. In effect, two shaping form-like elements are located in different cities (e.g. Belfast and Sydney) and connected together via the Internet through a shared server. In **Cities Tango**, the movement analysis, taking place at one location, is used to influence the generative behaviour at the other. Hence the work is essentially a ‘communicating’ art system. To make the link more concrete, a set of images at each location (taken from the same spot at different times of the day) is used in an abstract
way to replace one of the colours in the generative system. Hence, the displayed stripes include, from time to time, images of the remote city. The work is, however, also ‘responding’ in a more significant sense than in the *Shaping Form* pieces. When movement is sufficient to trigger a fast response, the latest image from the remote camera is displayed for a few seconds. Thus, activity at one location reveals a real-time image from the other. The ‘responding’ element of *Cities Tango* is more central to the work than in *Shaping Form* and the dilemma of balance with the ‘influencing’ element is therefore not problematic. In fact, the ‘influencing’ element only becomes important when the work is in place over a long period, which has not been the case at the time of writing. As with *Shaping Form*, the interaction is ‘ambient’. However, the experiences that are facilitated are more general. The work is ‘attracting’ in the sense that a dynamic display including images from afar is shown. It is ‘sustaining’ in part by nature of the revealing of the real time images that often include pictures of participants in the other city. The intention is that it is ‘relating’ because of the developing and changing nature of what is seen.

**Conclusion**

As interactive art developed since the various innovations of 1960s, I have become more concerned with the nature of interaction itself. There are many aspects to this issue, which I have explored above. As the developments in my art practice have unfolded a concern for the active audience’s perspective on the work has grown. This is where my discussion of the issues of interaction, engagement and experience is important.

Interactive art systems involve artefacts and audiences equally. The artist sets up situations that develop in ways that are, at least in part, determined by the audience. The cybernetic and systems principles that informed the early developments are now applied more completely than at first, by the equal and reflexive consideration of art object and active audience experience. As a result, the frameworks that inform our thinking and practice have had to evolve appropriately. There is no question that they will evolve still further as new opportunities, new understandings and new practices emerge.