An activity theory focused case study of graphic designers’ tool-mediated activities during the conceptual design phase

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Similar to other design disciplines, graphic design employs a range of symbolic and material resources through the conceptual design phase. Personal, social and technological resources are used as tools to interpret a design brief and work towards a solution. This study investigates the problem-solving process of graphic design practice within an activity theory framework, focusing on data collected using ethnographic methods concerning tool-mediated activities and strategies undertaken by three mid-weight freelance graphic designers. Employing a theory that explicitly acknowledges and diagrams the interplay between subjects, tools and tasks offers new insight into the design decision-making process, particularly the significance of tool mediation for the realization of tasks during design work.

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Graphic design, as a practice, has seen complex changes in its social and industrial settings over the last half century, with the result that graphic design literacy is no longer considered solely to consist of competence in drafting or formal aesthetics, but now reflects an increased notion of professionalism (Heller, 2004; Jobling & Crowley, 1996; Sauthoff, 2004; Swanson, 1994). In the contemporary practice of graphic design, creative freedom is subject to complex commercial and industrial pressures; this is particularly so in independent practitioner-based design consultancy (Frascara, 1988; Owens, 2006; Soar, 2002). Despite its significance, research on the nature of graphic design practice as professional practice has been limited to date (see Frascara, 1988). Logan (2006), particularly, suggests that few have approached graphic design through qualitative studies of situated practices. A systematic, situated study of graphic design as a practice could therefore contribute to our general understanding of the nature of professional practice in the graphic design field (Cross, 2001), as well as offer the possibility to illuminate specific issues in design theory itself, such as problem solving and the gaining of practice mastery.

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A study of this kind would require a multi-method approach, one consistent with ethnographic methods together with an analytic framework with which to make sense of the data (see Vinck, 2003). Following a recent interim report by the authors (Tan, Melles, & Lee, 2009), this paper therefore develops a fuller situated account of professional freelance graphic design practice through the analysis, using an activity theory framework, of data derived from ethnographic methods within a small group of professional design settings. While exploratory in nature, the current study is a small first step towards understanding this complex and intriguing field of lived design practices.

1 Tool-mediated, iterative problem solving in graphic design

Research within architecture (Lawson, 2006), product design (Dorst & Cross, 2001), and engineering design (Kruger & Cross, 2006) indicates that there are complex processes at work during design problem solving. Graphic design practice is no exception, and the diverse problem-solving contexts of the field are addressed through the use of a particular design language, centered historically on type and image and inflected by an increasingly broad research palette (Meggs, 1992; Noble & Bestley, 2005; Resnick, 2003).

As with other design disciplines, the initial stages of addressing a graphic design brief involve idea generation, particularly the interpretation of parameters and the design of initial responses. The idea generation stage is defined therefore as the period from when the designer begins actual investigation and research into the design problem, through exploration and creation of visual ideas, until that point at which the designer begins preparation for client presentation. This early stage is observed to involve a range of personal decision-making and creative activities, together with the use of preferred tools and strategies.

This complex interplay of strategies and tools employed in resolving contemporary graphic design problems is not well understood at present, although it is a fundamental aspect of all design practice (e.g. Newman & Landay, 2000). Nor are the interdependencies between phases of decision-making in the typical iterative problem-solving process particularly well represented in the existing literature. This coupling of clarifying, interpretation and other processes during decision-making means ‘revising an understanding of the problem in the context of developing or revising solution elements — or, from the perspective of Schön, engaging in a conversation across problem and solution spaces making processes’ (Adams, Turns, & Atman, 2003, p. 287). Activity theory, as a model for analysis of tool-mediated professional and everyday practice, offers a potential framework for such an analysis.

2 Activity theory for graphic design research

Among the different socio-cognitive theories that are available for analysing practice, activity theory is offered as a particularly useful model for
understanding the way practitioners use tools to achieve objectives in a range of activities, ranging from the routine to the creative (Nardi, 1997). Christiansen (1997) describes the goal of activity theory as the analysis of actions performed in practice with the aim of explaining why subjects undertake distinct activities in particular ways.

Activity theory is based on the premise that subjects acting in the world both create and represent their intentions and desires as *objects* (note that the term also denotes an objective), while the *tools* (consisting of both concepts and artefacts) used in this process mediate between subjects and their goals (Kaptelinin & Nardi, 2006). Within an activity theory framework, an *activity* comprises those actions undertaken by subjects while interacting with tools and their environment (Nardi, 1997). Simply put, activity theory focuses on subjects using tools to achieve objects.

The relationship drawn between these elements (tools, subject, and object) reflects a set of activities, actions and operations undertaken by a subject in producing an outcome. Activities are the highest order frame for objectives while actions and operations designate lower level acts embedded in activities. Subjects rely on tools to help reach objects, while tools help to mediate activities between subjects and objects. Even simple household activities can provide clear explanatory examples of these conceptual relationships. When putting up a picture frame (outcome), a householder (subject) may choose to use a hammer and nail (tools) to pin a nail into the wall (object). Simultaneously, the tool (hammer and nail) determines the subject’s approach to its object (hammering, determining requirement to seek alternate preferred tools). This model of activity — a cooperative process between subject, object and tools — thus forms the basis of a coherent analytic framework for describing and understanding human action (Tuikka, 2002).

It is one thing to claim that a theory is generally useful, and another to demonstrate its applicability in the particular. If activity theory is to be considered as a means by which researchers can understand better the nature of graphic design practices in a professional context, then the grounds for such a claim of suitability must be made explicit. Three main rationales will be considered here, namely 1) its applicability to the complexities of the observed world, 2) its utility when considering ethnographic data collection methods, and 3) its avoidance of objectification in the analyst account.

While activity theory provides both a broad theoretical approach and a set of basic principles for studying contextually embedded interactions (Kuutti, 1997), it also takes account of the complexities of the observed world. In addition, Gregory (2000), argues that activity theory provides an ideal starting point for the description of real-world practice, as it is concerned with the practical aspects of activity. In its approach to modeling, it is suggestive of
constant interactions between components of activity within workplace practi-
ces. Activity theory thus allows for a rich description of an activity system in
such terms, describing activities as products of the intentions of acting human
agents (Nardi, 1997). This description is achieved by visualising the various
levels of activity in professional practice situations, firstly through understand-
ing how subjects utilize tools, and secondly by focusing on the social dynamics
of subjects in context (Redmiles, 2002). For this reason, much use of the frame-
work has been made already in computational design disciplines, particularly
in human–computer interaction and interaction design.

Being based on a dialectical theory of knowledge and thinking, activity theory
is particularly suited to ethnographic data collection methods. It is a develop-
mental theory that seeks to explain and influence qualitative changes in human
practices over time (Engestrom, 1999). With its emphasis on the mediation of
human intentions within communities of practice, activity theory provides
a foundational context for anthropologically oriented studies (Cluts, 2003).
As such, ethnographic methods lend a powerful and rich description for inves-
tigating activity systems while avoiding objectifying the subject (Kaptelinin &

Activity theory also assists the researcher to avoid objectification in the anal-
yst’s account. Engestrom and Miettinen (1999) remind us that within a broad
concept of activity theory, a unit of analysis also takes into consideration both
the analyst’s views and subject’s views. It is the analyst’s top down construc-
tion of the activity through observing the chosen subject undertaking the ac-
tivities that gives rise to analysis. Activity theory is suited to studies of
design process. Both Lauche (2005) and Tarbox (2006) advocate that activity
theory is therefore a useful framework for studying the design process, as it can
constructively describe the activity structure and development of designers’
practices within a contextual perspective.

3 Methods
The study presented herein was situated in a professional practice context. The
primary author recorded the work processes of three participants in their re-
spective studio environments. The focus was not the total duration of the com-
pleted project; instead, emphasis was placed on the conceptual development
period between briefing and first client presentation. The primary author si-
multaneously chose to focus the study on print-based projects, as these provide
outcomes reflective of traditional graphic design practice, and are usually gen-
erated in short duration.

For this study, mid-weight graphic designers (those with between 5 and 8 years
professional practice) were chosen as the sample set. The rationale for this cri-
terion was that mid-weight designers have normally gained sufficient
confidence in decision-making to lift them beyond novices, whilst not yet hav-
ing become experts in their field (Dreyfus & Dreyfus, 1986).

Three graphic design practitioners fitting specific profiles of expertise, practice and commercial engagement were chosen using criterion, combination, and intensity sampling (Miles & Huberman, 1994, p. 28). Criterion sampling ensures that all cases meet the same level of quality assurance; combination sampling triangulates data sources in order to meet multiple research requirements; intensity sampling ensures that the information-rich nature of the phenomenon under investigation is captured.

Data collection methods included taking notes, collecting visual evidence of development and outcomes and conducting open-ended interviews with the participants. To enhance the rigour and analysis of the qualitative empirical data gathered from the three cases, verification methods such as data triangulation and member validation were employed (Stake, 2005; Yin, 2003). A set of boundaries and limitations for application of the cases were also applied to each case prior the investigation.

Interviews with designers were conducted at the start and finish of the investigation, recording both their intentions at the project’s commencement and their reflections after the project’s presentation. Data was also collected through observation of the activities undertaken throughout the study period. Any relevant visual outcomes and visual reference material generated from the design process were collected for analysis.

A four-stage model of the conceptual process (Figure 1) was developed to structure data collection, drawing both on prior studies (Frascara, 2004; Hurlburt, 1981; Nijhuis & Boersema, 1999; Resnick, 2003) and the primary author’s professional experience as a graphic designer. This model identifies four general stages in the conceptual process, beginning with briefing and followed by interpretation, idea generation and presentation.

3.1 Briefing
A designer’s first formal contact with the client normally provides an opportunity for the client to discuss the parameters and boundaries of the design problem with the designer, and to achieve agreement on a deadline and budget. Design briefs are often written, though they also may be explained verbally to the designer either through telecommunications or in person.

3.2 Interpretation
A designer usually analyses the problem before undertaking any idea generation activities, in order to clarify those aspects of the brief that are unclear after discussion with the client and to request any further information required. The
designer’s understanding of the design brief, responses to the brief, and intention of actions for problem solving are reflectively examined in this phase.

3.3 Idea generation
After the initial briefing and interpretation, designers usually take time to undertake practical work in line with the brief, articulating their initial thoughts and understanding of what the brief requires through verbal, textual or visual means. It is expected that this stage may take from a few hours to a few days; this is dependant on the designer’s intentions, the project scope and the overall complexity of the problem.

3.4 Presentation
In accordance with client brief requirements, designers are required to present and explain initial visual outcomes for client approval and feedback upon completion of the idea generation phase. In this stage, designers will focus on developing presentation media and written rationales to support their outcomes when presenting to the client.

4 Analytic focus on tool mediation
By observing what tools are used to realize objectives and outcomes during professional activity, it is possible to identify the meaningful activities that designers undertake during problem solving. All participants had their own client and individual projects. Designer one’s (D1) design brief was to design a children’s storybook for a local book publisher (C1). Designer two’s (D2) client was a marketing consultant (C2) representing a local entrepreneur, who had requested a brand identity to market a series of homemade jam and biscuit products to be sold at local markets. Designer three (D3) was also briefed by a marketing consultant (C3) representing a client, in this case concerning a set of business stationery for the third party’s image and events consultancy.

Figure 1 Case study investigation overview
Given space limitations of this paper, only one case (C1) has been chosen to illustrate the data and analysis process. The full range of data is presented in Tan (2009).

4.1 Case study: a storybook design

4.1.1 Interpreting the design brief

C1 provided D1 with a written brief, required material for the project such as artist’s illustrations and text, sample cover designs, and publisher’s logo through email. D1 needed these tools from C1 in order to proceed with the project (Figure 2).

The client and designer did not meet in person to discuss the project, but chose to communicate via telephone and email, with a detailed written brief to follow by email. These tools required both designer and client to have both a competent understanding of similar problems and sufficient specialised vocabulary with which to exchange ideas. It would appear that C1 had confidence in the written brief’s capacity to explain the scope of the project, as little mention was made of the design problem itself during the phone conversation. Instead, both D1 and C1 discussed pertinent project issues such as timeline and designer fees, indicating that, while visual outcomes are important, design problems are multi-layered and other project factors need to be considered in any adequate mapping of the process.

D1 started the project by studying the materials C1 had sent through. D1 used these materials extensively as tools when defining the design problem. It would appear that these tools created the design situation within which D1 could proceed. Indeed, D1 commented when interviewed that the project outcomes would have been difficult to achieve had not the client provided these materials. D1 began this process by writing down keywords on paper while reading through the emailed design brief. D1 also highlighted keywords while studying

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Figure 2 Some client material: design brief, manuscript, sample cover
the author’s manuscript of the book, which arrived via post. Whilst studying 
the material provided by C1, D1 also produced a mind map of words relating 
to the design problem (Figure 3). The mind map showed several conceptual 
directions, each one a possible route for problem solving.

4.1.2 Developing designer interpretation
Motivated by the outcome of mind mapping, D1 undertook two main activi-
ties to determine a creative direction for the design problem. Firstly, D1 
wanted to gather information on Chinese culture as it related to the author’s 
story. In order to achieve this goal, D1 called a Chinese friend on the tele-
phone. Secondly, D1 visited bookshops in the city, with an intention of under-
taking a general market analysis of current children’s storybooks on sale.

While calling, D1 first exchanged pleasantries, and then casually conversed 
with the friend for a brief period before steering the conversation towards 
the primary objective of finding out relevant information about Chinese cul-
ture. The conversation turned on the meaning of specific symbols unique to 
traditional Chinese culture; in turn, this exchange provided D1 with certain 
new ideas and understandings that did not align with the existing mind map 
(Figure 4).

This simple activity had several sub-actions attached to it. While the primary 
objective was to gain further insight into Chinese culture, D1 also took the op-
portunity to reestablish friendship ties with the Chinese friend, and in asking 
for information, also learned something new about Chinese culture in general. 
Communicating with a friend provided D1 with the opportunity to pass on 
firsthand experiences and exchange knowledge, while at the same time gain 
support and assurance for the visual conceptual direction chosen for the design 
problem. This represents a classic example of division of labour within activity

Figure 3 D1’s design activities
theory, wherein a practitioner relies on a friend within the community to gain knowledge for decision-making.

While at the bookshop, D1 surveyed the children’s section to investigate current design styles of children’s storybooks. At the same time, D1 also took the opportunity to browse through any available visual books relating to Chinese culture. This kind of opportunistic activity is common, often allowing for new directions to take form, and appears to be in line with observations by Cross and Cross (1995) that although designers may begin with clearly mapped strategic directions, their activities do not always follow them precisely.

4.1.3 Refining idea generation
Throughout this stage, D1 focused on creating visual outcomes. For the most part, D1’s activities reflected a dynamic, iterative and (at times) unexpected process. The diagram below (Figure 5) represents an example captured while D1 was designing a graphical element for the book chapter. The solid lines show how outcomes from AT(a) influenced and contributed to the next activity in AT(b). At about the same time, any outcomes from AT(b) was also used to provide feedback and aid in decision-making, as a comparative outcome to that produced in the previous activity. Throughout this stage, the flow of actions within a set of activity was initially iterative, becoming more routine and linear towards the end of the activity, before a new wave of iterative actions were undertaken. The routine actions after a series of iterative actions may be an indication that a satisfactory outcome was achieved.

4.1.4 Overview of D1’s design process
D1 first broke the tasks down into sections, focusing on the cover design first, followed by the back cover and title page, and finally inside spreads. D1 broke down each task into further parts, focusing on specific design elements before
combining the elements to form the overall layout for that section (Figure 6). From the diagram below (Figure 5), a combination of iterative and routine actions (such as those in Figure 5) within each AT (Activity Theory), were observed. Outcomes from AT(1) to AT(3) were used as conceptual tools to guide the next part of the design process. Each outcome from AT(1) to AT(4) was then used as conceptual tools in AT(5), to create a balanced layout of the storybook design project.

This strategy that D1 used was observed in the other two participants as well. During the observation, all three designers would focus on specific elements, using the previous design outcome (see above diagram) to guide their

Figure 5 An example of D1’s iterative process

Figure 6 D1's design process, breaking down of tasks
decision-making process. When undertaking the final activity (e.g. AT5), all three designers reviewed and fine-tuned each outcome by comparing them with each other. In some instances during this stage, the design participants would reject a finalized design element and return to the drawing board.

In summary, multiple levels of activities and actions were observed throughout the design processes of all three designers. Within activity theory, these sub-activities are said to be dependent on an activity system, supporting the designer’s primary objective of creating visual outcomes. Not including conceptual tools, tool use in D1’s case relied on four main items: a computer, digital software tools (i.e. Adobe creative suite), Internet, and occasionally, a sketchbook (Figure 7).

4.1.5 Tool use
D1 used a computer as the platform for much of the observed design work. D1 used Adobe Illustrator, Photoshop, and Indesign interdependently to mediate exploration and generation activities. D1 also relied on the Internet to source information, visual images and fonts, and was observed switching back and forth different windows on the computer without leaving the desk for other resource materials. D1, like all study participants, used sketchbooks only when it was found difficult to create a design element using computer software tools. For instance, D1 would attempt to externalize through sketching, and when satisfied, returned to using digital software tools to recreate a finished visual (Figure 8).

4.1.6 Tool-use applications for client presentation
The activities in this stage appeared to take on routine patterns. The main activity was divided into two sub-activities, being the refinement of visuals and the preparation of files. D1 used Indesign and Acrobat software tools to

Figure 7 An example of a dependent activity system supporting a primary objective
mediate those actions undertaken to reach desired outcomes (Figure 9). Overall, digital software tools shortened the time D1 required to prepare and send presentation files to C1. Also, with email mediating the objective for client presentation, D1 was able to communicate the rationale of the designs through written descriptions, but with proportional loss of opportunities for relationship-building physical contact.

4.2 Analysis

D1 identified the design problem through the conscious action of reading and writing down notes and key phases, each of which supported the development of conceptual structures. Within an activity theory framework, we can understand written notes as externalizing D1’s thoughts as an aid towards clarifying the design problem. To interpret the design problem, D1 analysed the client’s material, and undertook extra research activities to support the initial conceptual ideas. Research was mostly embedded into the design process; D1 would be observed designing or experimenting with a possible visual outcome, then stopping midway to search for information required to support further development (Figure 10).

During idea generation, D1 relied mostly on digital software tools for designing and visual exploration. Internet searching provided the means for gaining quick and easily accessed information and visual reference images. This method of investigation allowed the designer to work on producing outcomes, whilst exploring and investigating new visual reference materials. Outcomes from each task were combined, analysed and cross-checked, and at times
redesigned. To present the visual outcomes to the client, D1 provided a set of thumbnails of the visual outcomes, accompanied by a short written rationale for the conceptual direction taken.

5 Discussion and limitations

Despite its small sample size, the current study has provided some insight into the activities of mid-weight graphic designers. Observations have demonstrated both similarity to and divergence from the literature concerning problem-solving in design, confirming the literature in some ways and drawing it into question in others. Findings indicate multiple levels of activity patterns and objectives during the design process mediated by a range of material and symbolic tools. Two main levels of activity were, firstly; iterative activity patterns were observed during periods of creativity, while linear activity patterns were observed during routine processes. Secondly, designers appeared to create short-term objectives, which acted as stages to support the design process.

Two key themes, namely design strategy and designer activities, stand out in all three case studies. Firstly, the design processes were organised through
a strategy of subdivision into manageable sections. This strategy allowed these designers to focus on a particular objective, while at the same time working towards a final outcome. Secondly, purposeful activities were directed at identifying the client’s design problem. A conceptual direction was produced, through gathering specific information and conducting visual explorations, which in turn enabled the construction of a visual message reflecting client requirements.

Even though each graphic designer started with a basic strategic direction, the activities undertaken during idea generation did not reflect linear implementation of a particular strategy. Instead, activities were observed to be for the most part dynamic, iterative, and opportunistic. This finding reflects Cross and Cross (1995), in that even when designers have a particular strategic direction to begin with, their activities do not always follow it precisely. Instead,
Cross and Cross note that, strategy is used as a guide to orient the search for outcomes. Similarly, initial strategic directions of practitioners in the current study were referenced by subjects only at the commencement of idea generation and at critical breakdowns and crises in the problem-solving process.

All three designers broke the design process down into smaller task cycles, in order to achieve a more relevant level of control over it. In all three case studies, the subject designer divided sections of the process into areas of focused activity, and then moved through each activity in sequential fashion. Schön (1987) describes this process, stating ‘...design processes may be broken into component parts by strategies of decomposition useful to practice...’ (p. 159).

All three designers appeared to rely on past experience to inform their strategic decisions. Past experiences, including client discussions, were used to inform new experiences, and therefore facilitate learning and expertise development. During idea generation, visual explorations were observed among all three designers, in which a series of temporary outcomes were produced. As each temporary outcome was created, it would be fed back into the design process and ground further exploration or else be discarded. Designers were observed talking aloud to themselves, as if in conversation with the design problem. When interviewed, designers could remember and describe what their goals and intentions were, but were often unaware of their own reflection-in-action, suggesting that this strategy implied use of tacit knowledge when problem solving.

Graphic designers observed in the current study were also found to undertake a range of activities, split broadly into routine and creative tasks. Routine tasks include making notes, setting up files, using keyboard short-cuts and searching for visual imagery, while creative tasks include gathering information, identifying constraints of the problem, understanding the requirements of design problem, sketching, and generating idea solutions. Routine tasks are typically operational, while creative tasks require conscious engagement. When it came to undertaking routine activities, the designers were observed to use those tools that allowed them to complete the task in the most efficient fashion. For example, the preparation of files for conceptual development and client representation was undertaken using a systematic and operational approach for all three designers. One activity was completed before the next, reflecting a linear activity model.

In comparison to other frameworks (e.g. protocol analysis), activity theory appeared to have certain advantages for analysing situated graphic design practices. While protocol analysis and laboratory studies are commonly used for research into graphic design, activity theory as a framework provides a model that is appropriately oriented towards qualitatively focused studies of real-world practice, where the concern is to achieve depth of data rather than large sample sizes. Activity theory generally focuses on the activities of individuals
in relation to the community, and can thus help develop meaningful accounts of activities undertaken. Furthermore, activity theory provides a diagrammatic, theoretically informed depiction of the interactive interdependencies between stages of design and problem solving (e.g. Figure 10). Finally, the language of activity theory is also flexible enough to describe a wide range of activities and to differentiate specific types of actions, without prescribing overly rigid definitions of either those actions or the overall activities.

This is not to say, however, that activity theory is an approach without problems for design practice analysis. As this research study progressed, the activity model presented difficulties in distinguishing detailed descriptions of an individual’s workflow. One possible reason is that the current study had chosen to focus on individual designers who had little outside interactions with third parties, and whose activities were intensely iterative and focused on a single motive — the initial design solution for client presentation. As such, the social—cultural aspect of an activity theory framework remained unanswered. Nonetheless, it was not necessary to reinvent the models because the core concepts of activity theory and the original checklist were primarily activity-focused. Despite their simplicity, these models provided a workable vocabulary that allowed the development of meaningful and detailed descriptions of the activities undertaken by each of the participants.

References


