

# Card-based tools for creative and systematic design

ROY Robin<sup>a\*</sup>; WARREN James<sup>b</sup>

<sup>a</sup>The Open University, UK

<sup>b</sup>The Open University, UK

\*robin.roy@open.ac.uk

doi: 10.21606/dma.2017.284

Many card-based design tools have been produced, initially mainly to stimulate creative thinking, with an upsurge after 2000 when many more such tools were produced, especially to aid user experience and human-centred design. Different authors have categorised the tools in different ways, usually based on small samples, and there is no accepted classification system. Our analysis of 72 card-based design tools produced a new classification and also identified that the tools work in several different ways – e.g. offering creative stimuli or summaries of design methods. Trials of card-based design tools for stimulating creativity seem to enable designers to generate more innovative design concepts, but the practicality of the concepts is not proven. The card-based tools most likely to lead to practical outcomes are those which summarise domain-specific design methods or good practices that designers can apply to real-world tasks. Often these tools are used and tested by those who developed them. Hence, more independent, controlled trials are needed to help establish their practical effectiveness.

*cards; design; tools; classification*

## 1. Introduction

Sets or decks of cards – similar to playing cards – are a long-established type of tool to aid designing. An Internet search shows that there is a large number of card sets that are relevant as tools for design. In this paper we provide a brief history of card-based design tools and examine previous attempts to classify them. We present a new classification based on a detailed survey of these tools, which reflects the number and range of such tools that have been developed. We also discuss how the tools are supposed to work and whether they are effective as practical design tools.

## 2. A brief history of card-based design tools

One of the earliest examples of design-based card decks is *The House of Cards* created in 1952 by the famous American designers, Charles and Ray Eames. Each of the 54 cards shows a different object. Charles and Ray refer to these objects as “the good stuff”, selected to celebrate “familiar and



This work is licensed under a [Creative Commons Attribution-NonCommercial-Share Alike 4.0 International License](https://creativecommons.org/licenses/by-nc-sa/4.0/).

<https://creativecommons.org/licenses/by-nc-sa/4.0/>

nostalgic objects from the animal, vegetable, and mineral kingdoms.” (Pitiot, 2011). Slots on each card enable them to be interlocked to build structures (Figure 1a). The cards are therefore often bought as a classic design object or used for play. But their intention is to provide images of the Eames’ favourite objects to help inspire design ideas. As Pitiot (2011) says, “The House of Cards was designed to stimulate innovative thinking... working with the cards was intended to improve creativity in a playful way.”

Other card decks to aid creative thinking, designing and problem solving began to appear in the 1970s, alongside the movement to develop systematic design methods. An example is the *Meta Cards*, published in 1972 for students of the design element of an Open University course. The 20 cards are based on the various chapters in the seminal textbook *Design Methods* by J. Christopher Jones (1970). The *Meta Cards* offer strategies and methods for correctly identifying problems, widening the search space, overcoming mental blocks, and helping in design situations where new insights are required. For example, one of the *Meta Cards* suggests starting a design project by “Collecting relevant information”, but warns “don’t collect more information than you can absorb in the time... which is very little unless it falls into a pattern”. Another card advises selecting concepts by setting measurable “Criteria” that “enable everyone to agree on whether the design succeeds or fails...they must be measurable.” (Figure 1b). On the cards’ reverse is further information, about collecting information and setting measurable criteria.

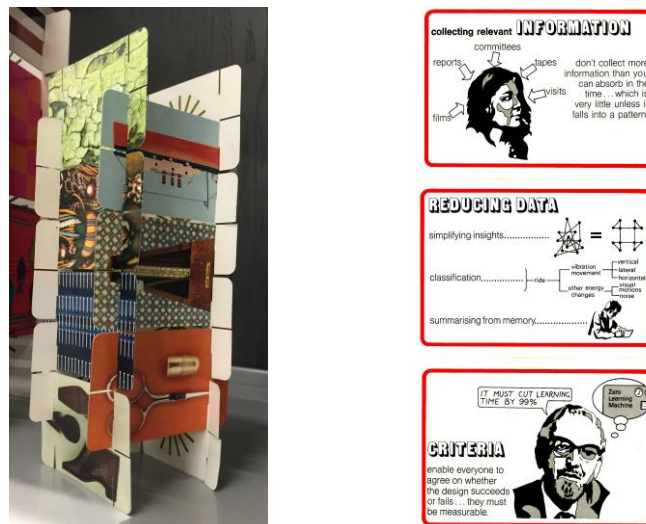


Figure 1a Charles and Ray Eames’ House of Cards (1952) slotted into a structure. source: R.Roy  
 1b Three of the Meta Cards aimed at different stages of the design process. source: Crickmay and Jones (1972)

One of the best-known card-based tools is *Oblique Strategies*, originally produced in 1975 by Brian Eno and Peter Schmidt, now in a fifth edition and available as an iPhone app. The cards, each of which offers a challenging constraint, were aimed at helping artists, especially musicians, to overcome creative blocks, but have been used in other fields, such as graphic design (Nassisi, undated). One of the card's creators, the musician Brian Eno, says,

*The cards evolved from me being in a number of working situations when the panic of the situation... tended to make me quickly forget that there were others ways of working and that there were tangential ways of attacking problems that were...more interesting than the direct head-on approach. (Eno, 1980)*

In section 4 below we discuss how *Oblique Strategies* and other card-based design tools are supposed to work.

Following these early examples, we found two card-based design tools produced in the 1980s and 1990s, which also aimed to aid creative thinking. They are the *Creative Whack Pack*, a deck of 64 illustrated cards offering strategies for stimulating creativity, produced by Roger von Oech in 1989,

which has sold over a million copies, and *Thinkpak. A brain storming card deck* by Michael Michalko first published in 1994. *Thinkpak* is based on Alex Osborne's (1953) SCAMPER idea trigger words (Substitute, Combine, Adapt, etc.). Michalko (2006) contends that Ray Kroc – the founder of McDonalds – could have applied *Thinkpak's* principles to create his fast food business. For example, Kroc 'adapted' the fast food concept, originally conceived by the McDonalds brothers for their hamburger restaurants. Kroc then bought and expanded McDonalds involving methods of 'substitution', 'combination', etc. Michalko does not claim that Kroc actually used *Thinkpak*, but demonstrates how its methods could be used to generate successful ideas.

The 1990s also saw the emergence of several card-based tools for participatory user-centred design, especially of computer systems, notably CARD (Collaborative Analysis of Requirements and Design). CARD is a card game to enable designers and users to analyse and redesign task flows in software systems to make them easier and more efficient to use. CARD has been used by major companies, including Microsoft, to improve their software systems (Tudor, Muller and Dayton, 1993). An improved tool, Layered CARD, was developed at Lotus Corporation and used to help design a system to enable its software designers to collaborate more effectively (Muller, 2001). Another development of CARD, PictureCARD, is a means of collectively building an understanding of how people do their work and any improvements they would like. PictureCARD was used by Apple to help design a computer system for Indian rural health workers (Tschudy, Dykstra-Erickson and Holloway, 1996). Card sorting is another tool developed in the 1990s for identifying users' mental models of a digital system's information structure. In this technique users sort elements (e.g. of a website's topics) displayed on cards into groups they find most comprehensible (e.g. Nielsen, 1995).

After 2000 there was an upsurge in the number and variety of card sets produced. Many more creativity card sets were produced. A major field of interest, building on the early CARD techniques, was in card-based tools for user experience (UX) design aimed at helping designers to create user-friendly websites, apps, screen interfaces, etc. One of many examples is nForm's *UX Cards*, which provide a menu of methods and techniques to help design usable and attractive digital products and services.

Related to the UX sets were card-based tools for human-centred design more generally. The most widely used example of the latter type is the *IDEO Method Cards*. These comprise 51 cards of human-centred design methods, which provide ways to empathize with people in design projects. The card set was originally compiled for IDEO's own design teams and to encourage other designers to try methods for making products, services and systems useful, useable and delightful to people.

Other card-based tools were developed to help designers in specific domains, including designing computer games and graphic design, and for specialised topics such as designing for sustainable mobility. Additional areas for card-based tools were as aids to team building and collaborative working and cards to stimulate and inform futures thinking.

### 3. Reviews and classifications of card-based design tools

Given all these card-based tools for different purposes, there have been several attempts to review and classify them in order to help designers decide which they might use.

One such attempt is that by Miemis (2012) who lists 21 card sets which she categorised into:

- (Design) Principles & Processes (e.g. *Oblique Strategies*)
- (User) Experience & Game Design (e.g. *The Art of Game Design*)
- Communication & Learning (e.g. *Service Design Tools*)
- Visioning & Foresight (e.g. *Drivers of Change*)
- Ideation and Brainstorming (e.g. *Thinkpak*)

Other online reviews of card sets include those by Donaldson (2010), who lists what he considers the ten best card decks to aid user experience (UX) design, and Baldwin (2011), who reviews his five

favourite decks for creativity, human-centred and UX design. Anderson (2012) lists 38 card-based tools classified into eight groups, including less common ones like Psychology+Design and Social Design, and including a Miscellaneous category reflecting the difficulty of classifying the large number of tools by then available.

One of the most comprehensive reviews is that produced for the website Deckaholic (2014), which provides details of 81 card decks in its Library in five categories: Diagnose; Ideate; Learn; Play; Present. However, by inspecting of the stated purpose and content of the decks, via the Library and their websites, we identified only 32 that could be considered as design tools, the rest being cards to help or provide information in areas such as personal growth, travel and sustainable living.

### 3.1. A comparative analysis of card-based design tools

As shown above, there are several online lists and reviews of card-based design tools and attempts to classify them. However, a literature search only revealed one previous academic paper, by Wölfel and Merritt (2013), that provides a comparative analysis of a sample of these tools. These academics analysed eighteen card-based design tools according to their purpose, function and characteristics.

They identified three broad types of card-based tools (column 1 in Figure 2):

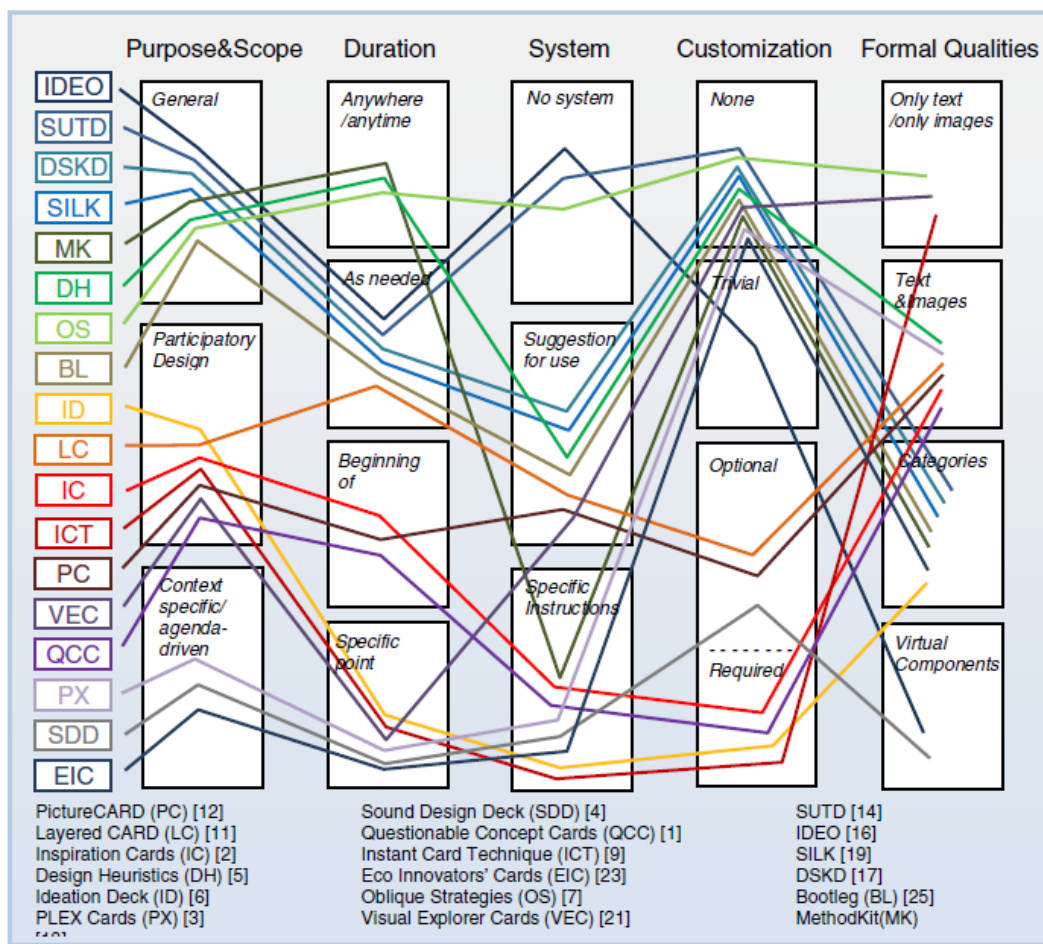


Figure 2 Classification of method cards for design. source: Wölfel, and Merritt (2013, p. 483)

*General/Repository* tools, some of which provide inspiration and challenge designers to take another point of view. An example is the *Oblique Strategy* cards, which can be engaged with at any time to increase creative thinking and stimulate design problem solving in general. Other tools in this group function as ‘methods repositories’ and offload the task for designers of remembering the many

available design methods. Examples of this type offered by Wölfel and Merritt are the *IDEO Method Cards* and the *SILK Method Deck*.

*Participatory Design* cards, which seek to develop empathy for the context, and engage designers and users in the design process. Some, such as the *Ideation Deck*, are designed for better communication between users and designers.

*Context specific/agenda-driven* examples. This group includes cards focused on a particular design agenda such as the *Eco Innovators* cards, which focus on designing for sustainability or the *Sound Design Deck* for acoustic expression in computer games.

Because Wölfel and Merritt only suggest three categories, classification issues arise. For instance, the *IDEO Method Cards* and the *SILK Method Deck* are classified as General/Repository tools, but it may be argued that their main purpose is to suggest methods for Participatory design. Conversely the *Ideation Deck* might better have been included as a creativity tool in the General/Repository group.

### **3.2. A new classification of card-based design tools**

In order to produce a less broad-brush classification based on a larger sample of card sets than Wölfel and Merritt's, we tried to obtain as complete an inventory as possible of card-based design tools. We compiled this from several sources: our historical survey; the Deckaholic library; the five reviews mentioned above; our own collection; and papers discussing individual card sets (e.g. Golembewski and Selby, 2010).

We then analysed this inventory of 72 card-based design tools. We did this by again consulting the lists and reviews of, and any websites for, the tools in order to identify their main function and content. This led to the following classification. It covers most of the card-based design tools developed since 1952 (although we are aware that there are some that we missed).

- **Systematic design methods and procedures** (7 tools). General purpose methods, approaches and techniques to find, analyse and tackle design problems. This category includes procedures or representations for different stages within the design process in order to help designers to work systematically from problem or brief to detailed solution (e.g. *Meta Cards*; *SUTD-MIT Design Methods Cards*; *Service Design Tools*; *iD Cards*).
- **Creative thinking and problem solving** (16 tools). Cards which could be used to help solve any type of problem, including design problems. These sets tended not to be addressed at any particular design field and many of the sets were dominated by cards that aimed to promote creative thinking generally (e.g. *Creative Whack Pack*; *Zig Zag Creativity Cards*; *75 Tools For Creative Thinking*; *Design Heuristics*, *Intúiti Creative cards*).
- **Human-centred design** (21 tools). Cards which aim to help focus on designing for the users of a physical or digital product, service or system considering their needs, wishes and requirements (e.g. *CARD*; *Questionable Concepts*; *Method Kit for Web Designers*; *Design Axioms*; *Innovating for People*). (This was a separate category, rather than being included below in *Domain-specific methods*, because of the number of card sets that aim to facilitate this approach to design.)
- **Domain-specific methods** (16 tools). This category provides methods, information or checklists for specific domains, such as game design, graphic design, designing products or services for ecological sustainability or for children (e.g. *Game Seeds*; *Sound Design Deck*; *The Design Deck: A playing-card guide to graphic design*; *Design Play (Eco Innovators) Cards*; *DSD Cards: Developmentally situated design of products for children*).
- **Team building and collaborative working** (9 tools). A category that concentrates on providing guidance to facilitate collaborative working, participatory and co-design that could be used to create effective design teams (e.g. *Totem cards*; *L+D Leadship + Design*; *Surviving Design Projects*).
- **Futures thinking** (3 tools). This category deals with awareness of change and scenario planning, often based on identified trends or from fact-based analyses. The cards may also be used for creative problem solving within future constraints or scenarios (e.g. *Drivers of Change*; *S-T-E-E-P Foresight cards*).

### 3.3. Validation of the new classification

Since the above classification was based on most of the card-based design tools we could find, we considered it to be fairly robust. Nevertheless, in order to check its validity we selected a sample for more detailed study.

For this analysis we selected 15 card sets that appeared in all, or most of, the other lists (e.g. *IDEO Method Cards*) or were in our own collection (e.g. *Meta Cards*). We only chose cards available in print rather than those just available as apps or online. The selected card sets were obtained from their authors or printed from their websites.

We then examined the content of every card and discussed whether and how the individual cards and each card set fitted our above classification. This revealed that all the sets fitted one of our six categories, but some individual cards within the sets better fitted other categories. This is shown in Figure 3, in which the main category of each set is shown in the upper segment of the circles and any sub-categories that particular cards from the set fitted are in the lower segments.

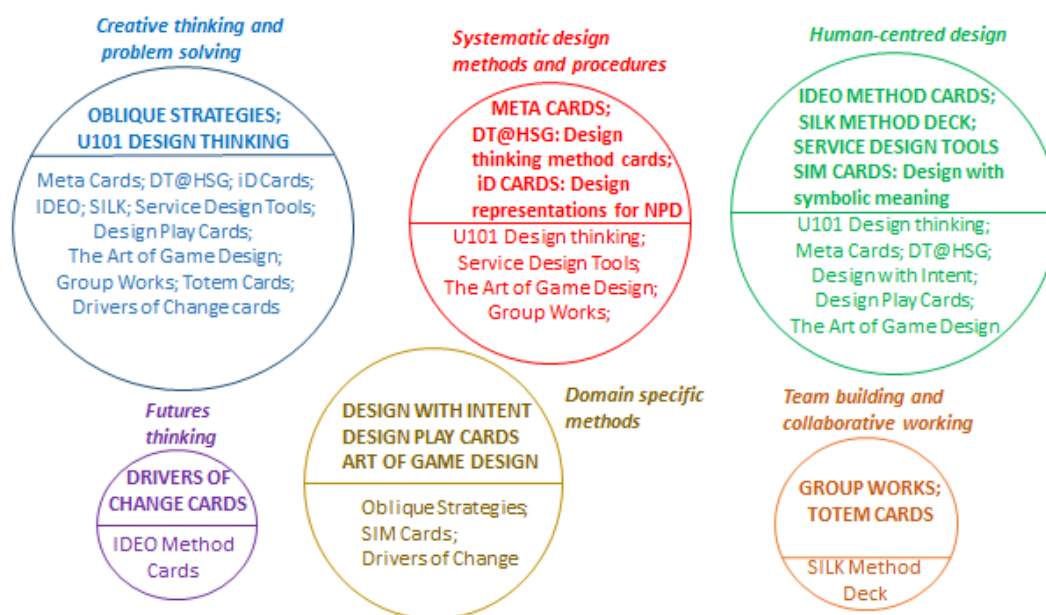


Figure 3 The 15 selected card-based design tools classified by their main function (upper segments) and sub-functions (lower segments)

Our detailed examination also showed that that some of the card sets are similar in function and operation. For example, the *DT@HSG Cards* appear to be an updated version of the *Meta Cards*, while the *Service Design Tools* overlap to a considerable extent with the *SILK Method Deck*.

## 4. How are the card-based tools supposed to work?

Examining the selected card sets and individual cards in each set, together with any accompanying instructions, also provided an understanding of how the tools are supposed to work. There were several different types and mechanisms.

### 4.1. Card sets that provide direct, cryptic or random prompts to stimulate creative thinking

The principle underlying these types of cards is that individuals or groups can be triggered out of their normal thinking patterns by, sometimes unusual, associations, suggestions or actions written and/or illustrated on the cards.

For example, some of the *Oblique Strategies* cards offer relatively straightforward suggestions e.g. “Look at the order in which you do things” or “Turn it upside down”. Others contain more cryptic ideas e.g. “Cascades” and “Gardening not architecture”. According to the card’s instructions, “They

can be used as a pack ...or by drawing a single card from the shuffled pack when a dilemma occurs in a working situation. In this case, the card is trusted even if its appropriateness is quite unclear.”

The *U101 Design Thinking Cards* also provide a number of prompts with images – based on what is known about creativity – to aid innovative design thinking, such as “take a walk”; “be playful”; “unexpected is good”; “change the scale” and “let chance decide” (Figure 4).



Figure 4 U101 Design Thinking: Creativity for the 21<sup>st</sup> Century cards. Developed for an introductory OU design course. source: Open University (2010)

#### 4.2. Card sets that provide useful information and knowledge in summary form

These cards provide summaries of potentially useful information for specific design tasks in a handy, shareable and combinable form, such as information on accepted good practice in web or game design. For example, in *The Art of Game Design* the “Lens of visible progress” card advises that in a computer game “players need to see that they are making progress when solving a difficult problem” and provides questions to check a game for effective player progression.

In the Futures thinking category, the *Drivers of Change: Water* card set includes a “Water consciousness” card that provides information on water scarcity and use per capita in various countries and provides suggestions for reducing household water consumption by redesigning toilets, appliances and showers.

#### 4.3. Card sets that provide summaries of design methods

These cards provide summaries of design methods, which might be generally applicable or specific to particular domains, in a handy and combinable form.

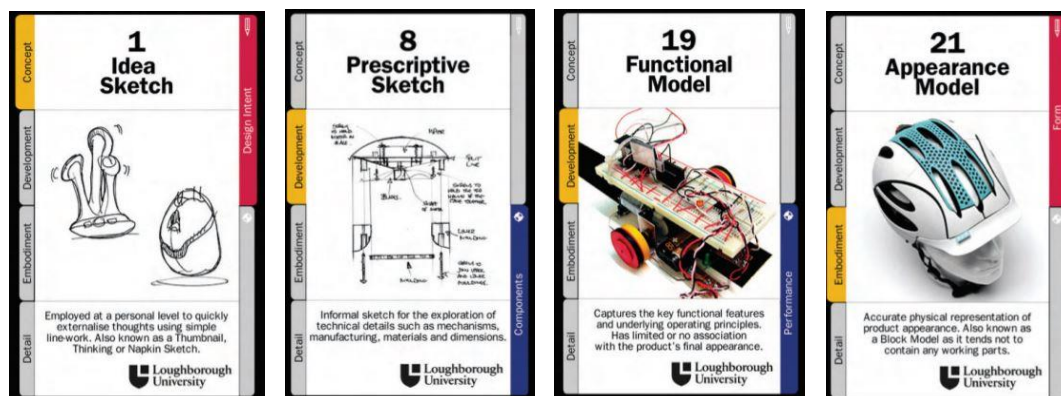


Figure 5 Four of the iD Cards which provide summaries of different representations suited to different stages of the design process. source: Evans and Pei (2014)

The *iD Cards*, for instance, provide images and descriptions of how a new physical product may be modelled and represented as it is developed from idea to detailed design (Figure 5). For example, card 8 is “Prescriptive sketch. Informal sketch for the exploration of technical details such as

mechanisms, manufacturing, materials and dimensions.” Card 19 is “Functional model. Captures the key features and underlying operation principles. Has limited or no association with the product’s final appearance.” The *ID Cards* also provide guidance on which representations are best suited to the concept, design development, embodiment design and detail design stages and so could also be considered as providing summaries of a general design method for new product development.

Another example, of this type from the *IDEO Method Cards* is “Empathy Tools”, which suggests using devices like clouded spectacles and weighted gloves to allow designers to experience how people with disabilities experience using products and systems in order to design new or improved versions. IDEO used this method, for example, when designing a home health monitor for people with reduced dexterity.

#### 4.4. Card sets that provide ideas and solutions for specific design problems or domains

An example of this type of tool are the *Design with Intent* cards, which provide ideas and solutions for influencing human behaviour through design to improve usability, safety security, health or sustainability. Figure 6 shows two cards from the 101 in the set, which offer examples of designs that guide people to operate a product correctly.

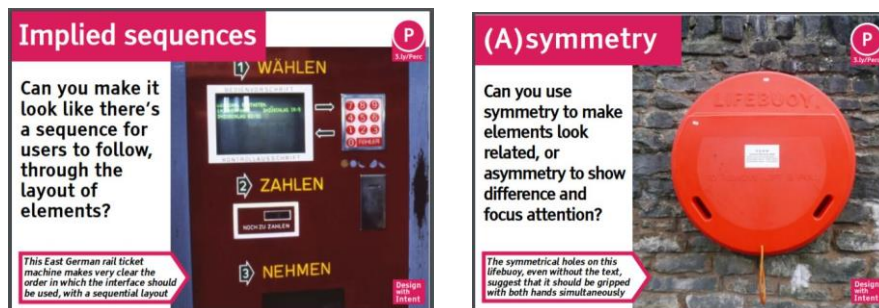


Figure 6 Two of the *Design for Intent* “Perceptual lens” cards.  
source: <https://www.flickr.com/photos/sludgeulper/4188746062> CC BY-SA 2.0 and Dan Lockton

Another card of this type from the *Design Play Cards* for facilitating eco-design is “Easy Disassembly”, which notes that laptop computers can be designed to be disassembled to increase the likelihood of repair and recycling, facilitated by having standard screws and labelled materials.

### 5. Do card-based design tools actually work?

This is clearly an important question, as there is arguably little point in producing these tools – apart from making money for the authors who sell their card sets – if they don’t help produce better designs.

Most of the card sets have been created by university academics or by design/management consultants or consultancies. This means that the university produced card sets have generally been trialled by their authors in educational or experimental settings; while the consultant produced tools have tended to be used by the consultants themselves or when working with their clients. Some of the pre-2000 tools (e.g. *CARD*) were created by developers in computing companies which they applied themselves to obtain user information for software design. Few independent, controlled trials have therefore been conducted.

This means that it is hard to establish whether the card-based design tools actually help to produce better, practical design outputs. Moreover, design outcomes depend on a variety of factors other than the use of a particular tool. The evidence that does exist is mainly based on trials of the tools being used by students or professional designers, and from cases provided by the consultants or designers who produced the cards, or from anecdotal reports on card use, often by other consultants. The sections below summarise selected sources of such evidence that we found.



### **5.1. Student trials of academic card-based design tools**

(a) Borneo, Bruun and Stage (2016) tested the use of different cards with 44 Danish undergraduate informatics design students given the task of redesigning a soccer team web-shop. Different groups used Fabrique's *inSights* web cards, which provide detailed information on good design practice; the *MethodKit for Web Development*, which only offers brief requirements to be considered; or no cards. Afterward, three web developers assessed the quality of the student teams' suggestions.

The authors found no obvious connection between card type and the quality of the redesign suggestions. Even a control group with no cards provided one of the best suggestions. Nevertheless, the findings indicated that the design cards helped to generate ideas, provoked participants to consider aspects other than personal knowledge and preferences, kept the groups focused, and helped progress discussions during the ideation phase. However, the cards did not compensate for the students' limited design experience. Especially, understanding the value of the cards and how they could be implemented was found to be a challenge.

(b) In other educational trials, 77 *Design Heuristics* cards were tested on first year American engineering and industrial design student groups given the task of designing a portable solar-powered cooking device given a sub-set of 12 cards (Daly et al., 2012; Yilmaz et al., 2012). Design Heuristics are prompts that encourage divergent exploration of the design space by providing ideation patterns used by expert engineering and industrial designers. Each of the cards describes a heuristic e.g. "Apply existing mechanism in a new way", gives a brief explanation of the heuristic and two examples of an innovative product application.

For the engineering students, the results showed that concepts created without *Design Heuristics* cards were less developed, and were often replications of known ideas or minor changes to existing products. Concepts created using the cards resulted in more developed, creative designs, although it was noted that practicality of the designs were not tested. Some students readily applied the heuristics, while others struggled to understand how to apply them (Daly et al., 2012).

Likewise for the industrial design students, the results indicated that using *Design Heuristics* cards helped students generate more creative, diverse, concepts. Concepts with heuristics evident were more complex and offered additional features, such as considering the context of how the product would be used. Concepts without heuristic application were often minor modifications to existing products (Yilmaz et al., 2012).

The authors of these two controlled studies conclude that *Design Heuristics* cards, given a brief instruction on heuristics, offer a sound method in ideation for novice designers leading to the generation of multiple designs judged more creative and diverse.

### **5.2. Practical trials of academic card-based design tools**

(a) The authors of the above student trials also tested the *Design Heuristics* cards in a company with professional engineers who applied the cards to their current project – an (unspecified) new outdoor product for the consumer market – in an innovation workshop. The authors conclude that the trial:

*...provides evidence for the success of heuristics in generating novel solutions and overcoming design fixation. The designers reported that they felt the cards stimulated novel thinking even though they had been considering these product designs for many years. After the study, the design team stated they felt the heuristic cards were effective, forced them to stay on track, and helped to focus their attention on one topic at a time.*  
(Yilmaz et al., 2011)

(b) Watson (2013) provides a case study of the use of the *DOC Method Cards* developed (with reference to the *IDEO Method Cards*) by the Designing Out Crime research centre (DOC), University of Technology, Sydney. The project concerned finding ways of reducing assaults, etc. in a Sydney crime hot-spot. Methods summarised on 14 DOC cards were employed to address the problem.

These included “Theme analysis” – the dominant themes were that partygoers weren’t looking for trouble, but an exciting night out; “Frame Creation” – if the area were treated like an event space the problems associated with large alcohol intake and absence of infrastructure would be addressed; “Design Exploration” – the exploration, subsequently adopted by the City of Sydney, generated concepts for street wardens, portable urinals, free water, integrated transport, chill-out zones, and more. Following from this project “a comprehensive research and policy design process has now been conducted by the City of Sydney, to explore in detail the workings of the late night economy”.

### **5.3. Use of card-based tools developed by human-centred designers**

The creators of *CARD* used the tool at Bell Communications to improve two software systems – a source code maintenance and a graphical layout system – by obtaining feedback and ideas from users. A post-project survey found that:

*Users had high confidence that CARD supported them in making effective comments, and in communicating their views to the analyst. They also believed that the cards helped them to check the analyst’s understanding of the users’ views. Finally, users indicated that they had found the sessions interesting, valuable, and enjoyable, and that they would like to participate in them again. (Tudor et al., 1993 p. 52)*

According to its authors, the *CARD* tool seems to have allowed more effective communication between users and developers than the previous informal methods used in the company.

### **5.4. Use of consultant’s card-based design tools**

(a) Each of the 51 *IDEO Method Cards* provides a short example of how IDEO applied the method in a real project. An example, outlined earlier, is “Empathy Tools”. Another example, “Behavioral Archaeology” suggests looking “for the evidence of people’s activities inherent in the...organisation of places and things...to reveal how artefacts and environments figure in people’s lives...” This method showed that people organised multiple work tasks by stacking papers in piles on their desks, which led IDEO to design a new item of office furniture. The existence of many examples of application, at least by IDEO itself, could be viewed as good evidence of the practical value of this tool.

(b) Another card set, now online, that seems to have value for designers are *UX (Trading) Cards*, which like IDEO’s cards, are a set of practical design methods in this case for user experience design. Giola (2014) describes how one of the long-established methods, “Card Sort”, was used for interface design of a supermarket self-service checkout. Users sorted a large number of cards containing names of different foods into groups to identify the best food categories for the checkout’s screen.

Baldwin (2011), a UX designer, writes,

*...when I was struggling for ways to approach a workshop with a client or for ideas on how I could solve a problem, nForm’s UX Trading Cards were often a point of reference... Just pulling a random card and talking about the method can spur ideas when a team is having a hard time determining an approach. Grouping or combining cards...is also a good way to map out a set of project steps and approaches. Another use is in explaining what you’re planning to do with clients or stakeholders. Rather than just saying you’re going to create a concept model, you can hand them a card showing what a concept model is and why it is used.*

(c) Arcila (2013) is a games designer who writes about the practical value of *The Art of Game Design*. The “Lens of Visible Progress” card, for example,

*...was very useful when I was designing my game miniQuest: Trials. I noticed...that I wasn’t clearly conveying the progress the player was making...thus making players confused about their expectations. That’s why I designed a playable level selection screen where you could unlock doors, and why I also changed the colors of each floor to*

*make the progress more visible.[...] After several years of using these cards with students in classes and workshops I've found that it's an excellent tool that sharpens your ability to look further as a game designer.*

## 6. Conclusions

Numerous card-based design tools have been produced. The first few, produced from the 1950s to 1980s, mainly aimed to stimulate creative thinking. Then in the 1980s and 1990s a few card-based tools were created to facilitate early forms of participatory software design. An upsurge occurred after 2000 when many more card sets began to be produced, especially to provide methods for user experience (UX) and human-centred design, but also for specific purposes such as eco-design and graphics and to provide guidance on systematic design methods and teamwork.

Several authors have attempted to classify the tools by their main function based on relatively small samples, notably Wölfel and Merritt (2013) and Miemis (2012). We have produced a new classification based on our more comprehensive inventory of 72 card-based design tools and validated it by a detailed examination of individual cards and sets in a sub-sample of 15 tools (Figure 3). While there are similarities between our classification and those of others, given our larger sample, we consider our classification to be fairly robust, while recognising that the system is based on judgement. The largest number of card sets aimed to facilitate human-centred (including UX) design, followed by tools for creative problem solving and for domain-specific design. The detailed check of the sub-sample revealed that while most card sets fell into one of our main categories individual cards in the sets often fitted another category better. Understanding these categories, and where sets may fit within them, can help designers decide which tool might be most appropriate for particular tasks.

We also found that there were a number of different ways that card-based design tools are supposed to work; ranging from providing prompts to stimulate creative thinking, or handy summaries of design methods, to offering concepts and solutions for specific design problems.

It is argued that card-based tools have many advantages over other media for helping to design (e.g. Möller, 2014; Rothstein, 2012). The evidence and feedback from trials and applications of the tools indicate that their advantages stem from certain characteristics of cards. They are tangible and engaging objects; summarise information, methods, or good practice in a handy form that designers can absorb and act on; they can be arranged and combined in multiple ways; serve as a common reference in teams of designers, users and others to facilitate discussions; can provide structure to a design process; and offer words and images to prompt people to think beyond normal patterns when tackling problems (Tudor et al., 1993; Wölfel and Merritt, 2013; Deckaholic, 2014; Borneo et al. 2016). Thus an important benefit of using physical cards is their being a tangible artefact and the way that people can interact with them. The importance of physicality also helps explain why a significant amount of effort has often been invested in their graphic design to make them attractive to own and use. The use of a physical tool can be viewed as 'going against the grain' of everything digital, although, perhaps ironically, many card sets aim to help to design digital products and systems. Hence unsurprisingly, some of the tools are now also available as apps or online for viewing on digital devices.

Do card-based design tools actually work? Trials of some of the tools for stimulating creativity do seem to enable both novice and professional designers to generate more numerous and more creative ideas, but the practicality of the concepts or designs produced is unproven. Novice designers, especially, sometimes struggled to use the cards and good instruction or facilitation seems to be essential (Daly et al., 2012). The evidence available indicates that card-based tools that are most likely to lead to practical design outcomes are those which summarise domain-specific design methods, or good practice guidelines, which designers can apply to real world tasks. However, often these tools are used by the people – academics, in-house designers or consultants –

who developed the cards, or after training, facilitating or working with other designers or stakeholders to use them.

Thus more work needs to be done, by those not involved in developing the card sets, in assessing these tools in independent, controlled trials, as well as to check the validity of the examples and cases of real-world products, services or systems said to be the result of using the tools.

## 7. References

- Anderson, S.P. (2012). What are some interesting playdecks to get creative/design inspiration? *Quora* 23 October. Retrieved from <https://www.quora.com/What-are-some-interesting-playdecks-to-get-creative-design-inspiration>
- Arcila, D. (2013). Testing Every Aspect of Your Game Design with a Deck of Lenses, *envatotuts+* 6 February. Retrieved from <https://gamedevelopment.tutsplus.com/articles/testing-every-aspect-of-your-game-design-with-a-deck-of-lenses--gamedev-4232>
- Babich, N. (2016). Using Card-Based Design to Enhance UX, *UX Planet*, 26 March. Retrieved from <https://uxplanet.org/using-card-based-design-to-enhance-ux-51f965ab70cb>
- Baldwin, S. (2011). UX Ideas in the Cards, *UX Magazine*, 3 February. Retrieved from <http://uxmag.com/articles/ux-ideas-in-the-cards>
- Bornoe, N., Bruun, A. and Stage, J. (2016). Facilitating redesign with design cards: experiences with novice designers, *OzCHI '16*, Nov.-Dec., Launceston, Tasmania, Australia.
- Crickmay, C. and Jones, J.C. (1972). *Imagination and Method*, Technology Foundation Course Units 32-34, Bletchley, UK: The Open University Press.
- Daly, S., Christian, J., Yilmaz, S., Seifert, C. and Gonzalez, R. (2012) Assessing Design Heuristics for Idea Generation in an Introductory Engineering Course, *International Journal of Engineering Education* 28(2), 463–473.
- Deckaholic (2014). Library. *Deckaholic*. Retrieved from <http://www.deckaholic.com/lib/>
- Donaldson, A. (2010). Using Cards in User Experience. *Ash Donaldson: Exploring a word of misinformation*, 17 December. Retrieved from <https://uxash.wordpress.com/2010/12/17/using-cards-in-user-experience/>
- Eno, B. (1980). Interview with Charles Amirkhanian. KPFA-FM Community Radio, January.
- Evans, M.A. and Pei, E. (2014). *iD Cards pdf*. Design Practice Research Group, Loughborough University and Industrial Designers Society of America.
- Giola, S. (2014). Examples of card decks. *Deckaholic*, video, 25 March, Retrieved from <http://www.deckaholic.com/blog/>
- Golembewski, M. and Selby, M. (2010). Ideation Decks: A Card-Based Design Ideation Tool. *Horizon DTC Report*, University of Nottingham. Retrieved from <http://research.cs.vt.edu/ns/cs5724papers/golembewski+selby-ideationdecks-dis10.pdf>
- Jones, J. C. (1970). *Design Methods: Seeds of Human Futures*. New York and Chichester: Wiley.
- Michalko, M. (2006) *Thinkpak a brainstorming card deck*, New York: Ten Speed Press.
- Miemis, V. (2012). 21 Card Decks for Creative Problem Solving, Effective Communication & Strategic Foresight. *Emergent by Design* 25 October. Retrieved from <https://emergentbydesign.com/2012/10/25/21-card-decks-for-creative-problem-solving-effective-communication-strategic-foresight/>
- Möller, O. (2014). 81 Creativity Card Decks. *MethodKit*, March 28. Retrieved from <https://methodkit.com/research-method-cards/>
- Muller, M.J. (2001). Layered Participatory Analysis: New Developments in the CARD Technique. In *CHI 2001 Conference on Human Factors in Computing Systems* (pp. 90-97). 31 Mar.- 5 Apr., Seattle, Vol. 3 Issue 1.
- Nielsen, J. (1995). Usability Testing for the 1995 Sun Microsystems' Website, 25 May. Retrieved from <https://www.nngroup.com/articles/usability-testing-1995-sun-microsystems-website/>
- Nassisi, B. (undated). Oblique Strategies for Graphic Design, *Behance*. Retrieved from <https://www.behance.net/gallery/34582345/Oblique-Strategies-for-graphic-design>
- Open University (2010). U101 Design thinking: creativity for the 21<sup>st</sup> Century, *Welcome Pack*. Milton Keynes, UK, The Open University.
- Pitiot, R. (2011). 20th Century Modern in America, *LinkedIn* Slideshare presentation, 8 December. Retrieved from <https://www.slideshare.net/rogerpitiot/eames-10505330>
- Rothstein, A.(2012). White paper: Open deck card standard. *Poszu*. Retrieved from [www.poszu.com/open-card-deck-standard.html](http://www.poszu.com/open-card-deck-standard.html)

- Tschudy, M., Dykstra-Erickson, E. and Holloway, M. (1996). PictureCARD: A Storytelling Tool for Task Analysis. In J. Blomberg, et al. (Eds.) *PDC'96 Proceedings of the Participatory Design Conference*, Cambridge, MA, 13-15 November.
- Tudor, L., Muller, M. and Dayton, T. (1993). A C.A.R.D. Game for Participatory Task Analysis and Redesign. *Conference: Human-Computer Interaction, INTERACT '93*, 24-29 April, Amsterdam.
- Watson, R. N. (2013). Designing crime prevention – a review of methods. *DS75-9 Proceedings of the 19<sup>th</sup> International Conference on Engineering Design (ICED13)*, Design for Harmonies, Vol. 9 Design methods and tools (pp. 109-116), 19-22 August, Seoul, Korea.
- Wölfel, C. and Merritt, T. (2013). Method Card Design Dimensions: A Survey of Card-Based Design Tools, In P. Kotzé et al. (Eds.) *INTERACT 2013*, Part I, LNCS 8117, pp. 479–486. IFIP International Federation for Information Processing.
- Yilmaz, S., Christian, J., Daly, S., Seifert, C. and Gonzalez, R. (2011). Idea generation in collaborative settings. *International Conference on Engineering and Product Design Education*, 8-9 September, City University, London.
- Yilmaz, S., Christian, J., Daly, S., Seifert, C. and Gonzalez, R. (2012). How do design heuristics affect outcomes? *International Design Conference – Design 2012*, Dubrovnik, Croatia, 21 – 24 May.

About the Authors:

**Robin Roy** is Emeritus Professor of Design and Environment, Open University. Since 1971 he has contributed to many OU courses on design, innovation and environment. He has published widely on topics from creativity to sustainable design. He is a Fellow and Council member of the DRS.

**James Warren** is a Senior Lecturer, Open University, since 1999. He authors on undergraduate modules (energy, environment and consumption) and publishes on transport emissions and impacts in the urban environment. He is a DRS member.