

# Regarding Value in Digital Serendipitous Interactions

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## ABSTRACT

Digital technologies have become our privileged method of interacting with information. With their ubiquity, and focus on personalisation, optimisation and functionality, chance and accidental interactions in the Digital Medium are being replaced with filtered, predictable and known ones, limiting the scope of possible user experiences.

In order to promote the design of richer experiences that go beyond the functionally-driven paradigm, we propose that digital systems be designed in order to favour serendipity. Through a literature-based analysis of serendipity, we explore the distinct meanings of value that are possible with serendipitous systems, offering examples of the current state of the art, observing the methods used to do so, and proposing a possible typology, while highlighting unexplored fields, experiences and interactions.

## KEYWORDS

Serendipity; Interaction; Experience; Digital Medium; Design; Defamiliarisation; Creativity.

## 1 | INTRODUCTION

Our daily lives are increasingly spent observing, interacting and gathering knowledge from digital artefacts [1]. Through them, we interpret our world, carry out our professions and communicate with others. This digital pervasiveness has made it so that “to design digital artefacts is to design people’s lives” (Löwgren & Stolterman, 2004). Thus, and as both the designers and interactors of digital artefacts, we need to create them in such a way that they are able to accommodate the richness of experiences of the human life.

While computational systems were initially optimised to the workplace and, as such, were mostly concerned with functionality and productivity (Dunne, 2005), these systems have expanded beyond mere work tools and have, gradually but surely, become companions, guides for all our interactions with the Digital Medium [2]. However, this user/tool paradigm remains in much of the design approaches of these interactive systems, where a successful design is an efficient one.

This can be observed in the growing popularity of machine-learning and user-profiling, particularly when applied to how we discover digital information. With the ever-expanding amount of content being produced every second, there was the necessity to develop tools that were able to discover what is relevant to the interactor in this sea of information, to discover the signal amidst the noise. This has led to the general adoption of algorithms for creating user-profiles: a collection of data that attempts to define the interactor through her behaviour patterns. This data is used to personalise interactions, catering information to what these systems perceive as the most relevant result to a particular need, be it the answer for a trivia question, a birthday present for a loved one, what book to read next or where to go to dinner.

The concern, however, is that the reliance on these catering systems is creating a bubble that filters out information that differs from the interests the algorithm considers relevant to the interactor, leading to a feedback loop and echo-chamber effect (Pariser, 2011) which narrows the available information to the interactor, preventing her from exploring what lies beyond the bubble.

*"These tools help us discover what we want, but they're not very powerful in helping us discover what we might need to know. What we want to know is shaped by what, and who, we think is important. . . . Our media tools, ranging from our newspapers to our social networks, embody those biases; they help us find what we want, but not always what we need."* (Zuckerman, 2014, p. 6)

This extends not only to the discovery of information but also to our social interactions in the Digital Medium, since social networks are currently designed in such a fashion that promotes our natural homophilic tendencies of preferring to be with like-minded people.

While the true impact of this personalisation of content is still unknown, it is not the only consequence of this convergent [3] approach to the design of interactive systems. Anthony Dunne in *Hertzian Tales*, for example, alerts to the risks of adhering blindly and without awareness to the ideological implications of user-friendly methodologies:

*"User-friendliness helps naturalise electronic objects and the values they embody. For example, while electronic objects are being used, their use is constrained by the simple generalised model of a user these objects are designed around: the more time we spend using them, the more time we spend as a caricature."* (Dunne, 2005, pp. 21–22)

Similarly, Wilson and Sicart (2010), regarding the design of video games, alert to the general conservatism in current game design in which design methodologies are mainly centered around catering to the players' expectations and not on the intentions of the game designer. Wilson and Sicart, therefore, propose an "abusive game design", one that "aims to break the instrumentality, the isolated "toolness" of "games", through "idiosyncratic, weird, and confrontational" experiences.

We believe that it is in the exploration of these and related experiences – which we shall refer to as *serendipitous* – that we are able to create interactions that are *divergent* and not convergent, that explore experiences that go beyond the user/tool paradigm, with novel, unpredictable and surprising value for the interactor.

## 2 | ON SERENDIPITY

The word serendipity was first introduced to the English lexicon by Horace Walpole, in 1754, in a letter where he uses the term to describe a particular mix of chance and reasoning, using, as an example, a fairy tale of three princes that "were always making discoveries, by accident and sagacity, of things which they were not in quest of" (Merton & Barber, 2004). Serendipity has since been approached through the relationship between these two traits: chance and reasoning, with varying degrees of emphasis on one or the other.

Van Andel (1994), for example, defines serendipity as "the art of making an unsought finding", while Merton (1968), who considers serendipity as an empirical fact, defines it as "the discovery through chance by a prepared mind of new findings that were not looked for", and Fine and Deegan (1996) as "the unique and contingent mix of insight coupled with chance."

For the purposes of this research, we refer to Boden's definition of serendipity: "the finding of something valuable without its being specifically sought" (2004, p. 234).

Boden's definition has the particularity of encapsulating serendipity in the act of finding, while at the same time denoting the necessity of value, distinguishing itself from, for example, coincidence [4].

As it relates to the Digital Medium, the "finding of something valuable" described by Boden would translate into the discovery of information, or what Robert Merton refers to as *datum*:

*"The serendipity pattern refers to the fairly common experience of observing an unanticipated, anomalous and strategic datum which becomes the occasion for developing a new theory or for extending an existing theory. Each of these elements of the pattern can be readily described. The datum is, first of all, unanticipated. . . . Secondly, the observation is anomalous, surprising, either because it seems inconsistent with prevailing theory or with other established facts. In either case, the seeming inconsistency provokes curiosity; it stimulates the investigator to 'make sense of the datum', to fit it into a broader frame of knowledge. . . . And thirdly, in noting that the unexpected fact must be strategic, i.e., that it must permit of implications which bear upon generalised theory, we are, of course, referring rather to what the observer brings to the datum than to the datum itself."* (Merton, 1968, pp. 158–159)

By considering datum as an individual manifestation of a particular instance of information, Merton's three requirements for the serendipity pattern (observation, newness, and value of information) correlate to Boden's own definition.

Both Boden and Merton refer to the necessity of the discovery to be unplanned or unforeseen, while at the same time leaving open the possibility for the discovery not to occur by chance alone: the discovery can be perceivably accidental but not necessarily unplanned or the result of fortuity. Boden offers the example of parents secretly leaving on the dinner-table, for their child to discover, a gadget that would

assist the child on a particular homework. From the child point-of-view, this serendipitous event was random: a coincidence, indistinguishable from others, truly, random events (Boden, 2004, p. 237). This leaves open the possibility for computationally-assisted serendipity, with the computer assuming the role of the parents and the interactor of the child. However, this would require comprehensive knowledge of the interactor, because what is obvious to the parents that deeply know their own child is not necessarily so for an artificial system, without the capacity to understand the interactor and to foresee the child's particular needs.

The moment of serendipity is, naturally, also dependent on the ability and cognitive awareness of the subject to recognise the value of the event (what Walpole referred to as "sagacity") since serendipity, at the moment and as we define it, can only be experienced by human beings, while the machine may be able to provide the necessary conditions for it to occur (Van Andel, 1994).

This leads us to the final condition for serendipity, as according to Boden's definition: the necessity of the finding be valuable.

### 3 | THE VALUE OF SERENDIPITY

Value is, naturally, highly subjective and depending on both context and subject: something that is valuable today, at a specific moment in time and space, might not have been yesterday and may not be tomorrow. Similarly, what is valuable for one interactor might not be for another. That decision is, ultimately, individual.

However, there are areas of interaction where value might be found and as designers and users of interactive systems, it is in our interest to identify these areas and explore their serendipitous potential. It is the intention of this research to highlight those particular areas and showcase how one might derive serendipitous value from unsought findings.

#### 3.1 VALUE THROUGH INFORMATION ENCOUNTERING

Perhaps the most common derived value from an unsought finding is through the discovery of new information, in the form of data. This form of serendipitous value is what Erdelez (1997) defined as *Information Encountering*, here defined by Raya Fidel:

*“People encounter information when they “bump into” information they were not seeking at the time—information that can solve a particular information problem that presented itself in the past or is scheduled to be solved in the future. . . . Today, various terms are used, such as serendipity, casual information-gathering, passive information-seeking, incidental information acquisition, and accidental discovery of information. All these phrases mean encountering, but they are not synonymous, as each represents a slightly different approach and has a unique flavour”* (Fidel, 2012).

*Encountering* is characterised by the unsought discovery of information, distinguished from the active, problem- and goal-driven information seeking, and is visible throughout the Digital Medium: from search results, to social networks, to *Wikipedia*. The question remains on where the serendipitous value, as information encountering, lies: in the discovery of the information (Merton’s datum), or on the possible outcome that was made possible by that information? Campos and Figueiredo (2002), in their evaluation of *Max* – a software agent for uncovering information and aimed at stimulating serendipitous insights – offer a more granular approach to the question of serendipitous findings and encountering: by dividing user results into six distinct categories, according to their possible outcomes:

*“category 1: already knows page – the suggestion has no value at all;*

*category 2: unknown page outside the user’s interests – the suggested page has little value ...;*

*category 3: unknown page inside the user’s interests – the suggestion has little value...;*

*category 4: unknown, unexpected page, slightly related to some domain of interest – the suggestion is valuable...;*

*category 5: unknown, unexpected page, that sparked a new area of interest – the suggestion is extremely valuable...;*

*category 6: the page established a new and unknown connection between two current*

*domains of interest – the suggestions are extremely valuable....”* (Campos & Figueiredo, 2002)

While categories 1 and 2 are not considered serendipitous, Campos and Figueiredo define category 3 as pseudo-serendipitous, and 4, 5 and 6 as truly serendipitous. By opening space for similar granularity in other approaches to digital interactions, we are able to expand and encompass a wide range of results that can be considered serendipitously valuable.

### **3.2 VALUE THROUGH EXPERIENCE**

Serendipitous value can also be found not only through the discovery of new and meaningful *information*, but also through an unexpected and meaningful *experience*, where one does not necessarily discover a particular bit of information that may or may not produce insight, but finds oneself the subject of a particular experience with unexpected and unsought results. One example is [Tuck] Leong et al.’s (2008) empirical studies with random-led listening to digital music. In his studies, participants were asked to listen to their personal music collections on shuffle and to record their listening experience daily, for 7 weeks. Findings reported that “the surrender to a random process coloured participants’ listening experience with unpredictability”. By experiencing music through this shuffle functionality, individual listener perception was increased for not only each track but also of for those that preceded and followed, creating the necessary conditions for “intense experiences such as serendipity”. Some examples of these experiences of serendipity (which Leong defines as “the meaningful experience of chance encounters”) could be observed with the listener having a desired track start to play randomly, at the right moment; when a track meaningfully resonates with a particular sentiment the listener was experiencing or simply as a freak coincidence, such as with the following example from one participant:

*“I was on Wikipedia, reading articles, clicking around and then I was reading about 60s and 70s music and that led me to Led Zeppelin. I thought about Stairway to Heaven and looked it up and was reading it. Then the song starts off slowly while I was reading, and I looked at*

*my iPod and that's weird, it's playing!!*" (Leong et al., 2008)

As Leong concludes, there is a great deal of value to be discovered if we explore alternative method of interaction (random and abdicating choice in this particular example), that are capable of creating meaningful experiences.

### 3.3 VALUE THROUGH UNFAMILIARITY

Familiarity with a particular designed artefact, as Dunne argues, can lead to a conditioning of the interactor to the specific design choices of that same artefact. Dunne offers as example the warning lights on camcorders that "flashes whenever there is a risk of 'spoiling' a picture, as if to remind the user that he or she is about to become creative and should immediately return to the norm" (Dunne, 2005, p. 22). With current mobile technologies, this normalisation of interaction has become more and more prevalent as, in order to reduce complexity and simplify the experience, control is being removed and replaced with presets that are usable by a majority. This is observable in popular mobile photography applications such as *Instagram*, which offers a fix number of *filters* that their users can apply to the photos. While the users are now capable of fine-tuning the result of these filters, that option is somewhat hidden, clearly privileging the default options instead. The act of photography – as with many in this world of ubiquitous computing – has become predictable and familiar, where we engage in these actions with banality and not much reflection on the process.

With this in mind, we argue that a serendipitous finding can also be a moment of *unfamiliarity*, in which the interactor is pulled away from automated actions and is required to acknowledge and reflect on the interaction itself. This can be done, as proposed by Dunne, through the *poeticisation* of these interactive systems.

*"In a world where practicality and functionality can be taken for granted, the aesthetics of the post-optimal object could provide new experiences of everyday life, new poetic dimensions."* (Dunne, 2005, p. 20)

The unfamiliarity of the experience can also be achieved through Viktor Shklovsky's concept of

*defamiliarisation* which, quite literally, means to make things unfamiliar. This concept, proposed as an artistic technique, describes the attempt by the artist to break with the "habitualisation" of our lives by making objects harder to perceive, increasing "the difficulty and length of perception" (Shklovsky, 1917). Only after this moment of unfamiliarity are we able to see these objects anew.

This moment of defamiliarised perception is a valuable, serendipitous finding in and of itself, and can be used in the design of interactive systems in order to explore new and surprising experiences, through the manipulation of the information being discovered (with, for example, the photographic filters in mobile applications as the aforementioned *Instagram*, as well as *Hipstamatic*, among others), the interface through which the interaction is being made (as in the Akira Rabelais's *Argeiphontes Lyre*), or through the overall experience of interacting with the system (Jörg Piringer's *gravity clock*, for example) (Melo & Carvalhais, 2016b).

### 3.4 VALUE AS UNEXPECTEDNESS

This breach of the habitualisation of the quotidian, leading to a serendipitous moment, can also occur by the introduction of the unexpected into the interaction. This unexpectedness does not, necessarily, need to be through creating an unfamiliar experience – as with Shklovsky's defamiliarisation – but by breaking with the normality of the interaction by introducing a strange element that is unexpected within the normal patterns of a particular interaction. Take, for instance, Mark Sheppard's *Serendipitor*, a navigation application designed for a smartphone. In *Serendipitor*, and as is the case in navigation software, the interactor is asked an origin location and a destination, and the software suggests a route. What differs *Serendipitor* from similar software is that it adds to the directions a series of suggestions that can range from the strange to the surreal, such as "Head east toward [street name] and then follow a cloud. If there are no clouds, make some."

In similar fashion, the Flash game *Unfair Mario* (2013) purposefully breaks with the video game mechanics made popular in platform games by *Super Mario Bros.* (1985), by lying to the player or through inconsistent or unpredictable game mechanics, resulting in often frustrating experiences but also in

moments of extreme satisfaction and delight in being able to overcome the game.

Through designing for unpredictability and the unexpected, we are able to provoke serendipitous experiences, interrupting the interactor's anaesthetised gaze of the quotidian life.

### 3.5 VALUE AS CREATIVITY

Serendipity, defined as a moment of discovery, ideation or breakthrough, is intrinsically connected with creativity. Boden's own definition of creativity – "the ability to come up with ideas or artefacts that are *new, surprising and valuable* (Boden, 2004, p. 1)" – is reminiscent of Merton's own serendipity pattern and, as we've seen, in many definitions of serendipity there is the expectancy of a creative outcome. In fact, we may even consider that, while not every creative moment is necessarily serendipitous, all serendipitous moments are creative ones (even if they are P-creative and not H-creative, to use Boden's terminology).

When we talk about a type of creative value in a serendipitous finding, we are referring to the utilisation – and expectation – of serendipity within the creative process, deployed knowingly and purposefully [5].

This particular intentionality can be observed in [Philip] Galanter's (2003) definition of generative art, in which artists use systems with a certain degree of autonomy to create a work of art. Through the use of autonomous or semi-autonomous systems (such as, for example, a particular algorithm), the artist knowingly expects to be serendipitously surprised by a particular result. While this is commonly done via randomisation process, it isn't a necessity: digital artist Murray McKeich uses the batch functionality of Adobe's *Photoshop* and *After Effects* to autonomously combine different images. While the process isn't random, but a series of sequential steps previously defined by McKeich which the computer executes, the resulting images can lead to surprising, creative and serendipitous occurrences.

Systems and creative tools could be designed in order to further explore accidents in the creative process in order to turn them into serendipitous moments, as Boden (2010, p. 171) suggests: "If knowledgeable agents were developed to help us

make the best of our mistakes (not just avoid them), they could lead to some real surprises".

## 4 | CONCLUSION AND FUTURE WORK

Planned or otherwise, serendipity can occur in different fashions in the Digital Medium. With the ever-increasing investment in machine-learning and context-aware systems that attempt at relevancy through catering and filtering of information, as well as in the continued reliance on design methodologies that approach interaction through the lens of optimisation, productivity and functionality, we need to recognise the space, role and value that serendipitous experiences can have in diversifying our interactions within the medium.

Through a theoretical understanding of serendipity in interactive systems, particularly through Boden's definition of serendipity, we have identified distinct occurrences of value that can be derived within the Digital Medium.

Through our analysis of these different manifestations of serendipitous value, we can start identifying the underlining principles present in each: Systems that promote relevancy and unexpected discovery of new information provide value as *encountering information*, while systems that promote novel interactions where the *feeling* of surprise is key are able to promote *serendipitous experiences*. By consciously and knowingly challenge familiar interactions and by evoking a sense of *strangeness*, systems are able to reclaim the attention of the interactor, providing the awareness necessary for serendipity. While by breaking with the established notions of interaction design, we are able to introduce *unexpectedness* to the interaction itself. Finally, through designing interactive systems that enable unpredictable results, we can contribute to *creative*, serendipitous experiences.

Future work consists of a necessary gathering of empirical data to validate our typology, and to apply the principles identified here into design guidelines for the design of serendipitous systems.

As we design with serendipity in mind, the field and spectrum of meaningful experiences possible in the medium will expand, beyond those concerned with efficiency and productivity, creating new and different

types of value in addition to those here described, contributing to an evolution of both the field and the medium.

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### ENDNOTES

[1] By digital artefact we consider Janet Murray's definition: "anything made of bits and processors, e.g. a website, a virtual reality environment, a wireless network, a mobile phone, the Internet as a whole, etc. (Murray, 2012)

[2] Digital Medium is, according to Murray, "[t]he medium that rests on the inscription and transmission of information by electronic bits, and the procedural, participatory, spatial, and encyclopaedic, representational affordances of computation." (Murray, 2012)

[3] By *convergent*, we refer to systems that privilege relevancy "by catering to the user's perceived intentions, interests and tastes", as opposed to *divergent* systems that "promote the exposure to different, unpredictable information, outside of the user's interests" (Melo & Carvalhais, 2016a).

[4] Coincidence which Boden defines as "a co-occurrence of events having independent causal histories, where one or more of the events is improbable and their (even less probable) co-occurrence leads directly or indirectly to some other, significant, event." (Boden, 2004, p. 235)

[5] In order to exemplify the distinction between the serendipitous value in the creative process and the one in an experience, we can consider algorithm-based music performance that relies in random and/or unpredictable processes: to the musician that uses such techniques, the serendipitous result to be found is valuable creatively (or take Boden's example of a jazz drummer suffering from a neurological disease incorporating random muscular tics in musical improvisations (Boden, 2004, p. 234)), while for the audience, the serendipitous value lies in the experience, in the unpredictability of what happens next and how the musician will utilise it in the performance.

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