

# Convergence and Divergence: A Conceptual Model for Digital Serendipitous Systems

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## Abstract

When we are completely free to choose what we want to read or watch, the question becomes: how do we know what we should be reading or watching.

With the transition from curation to user-initiated methods of discovery of digital information, such as search, came the necessity for information discovery methods that enable us to encounter new and surprising information that broadens our horizons and enriches our understanding of the world. In other words, systems that promote serendipity.

Interactive digital systems that answer this issue are currently being developed, many with the explicit purpose of introducing or engineering serendipity into our digital interactions. However, in our research on serendipitous systems, we discovered that interpretations of serendipity were varied and often contradictory. This led to a lack of definition of what a serendipitous system was exactly, necessitating constant qualification. As such, we propose a distinction of these serendipitous systems according not to their proposed goal – serendipity – but their methods: convergence or divergence. Through this classification we are able to identify both the systems' ideological pretensions as well as what methods and mechanics they employ to do so.

## Serendipity

Over the last few years we have witnessed a growing emphasis on the subject of serendipity in digital interactions. Some highlight the potential of the digital media (and the Web in particular) as a serendipitous machine while others alert to the fact that the current methods for discovering and interacting with digital information are destroying the potential for true serendipitous experiences.<sup>1</sup> Nonetheless, it is becoming increasingly obvious the value of serendipitous experiences in our interactions with digital information,

<sup>1</sup>An example of this debate can be found in a blog post of the author Nicholas Carr entitled "The serendipity machine is low on oil" [1], a reply to the blog post by author Steven Berlin Johnson with the title "Can We Please Kill This Meme Now" [2], which is, in itself, a reply to an op-ed by William McKeen on "The endangered joy of serendipity" [3], all authors with distinct positions on the impact of the web on serendipity.

be it in the discovery of new content [4] [5], social and professional interactions [6] or while interacting with personal digital media [7] [8].

To address this, a number of systems have been designed with the explicit goal of provoking serendipity when interacting with digital objects. However, the interpretations of what exactly serendipity is vary from system to system. To some, serendipity is "a trigger of exciting discoveries when we least expect it" [9], to others "a meaningful experience arising from chance encounters." [8], others still define serendipity as the making of "fortunate discoveries by accident" [10]. As the definition of serendipity varies, so do the methods to achieve it. In our research we identified two main distinctions in both the interpretation of what serendipity means and the methods to achieve it: one which we define as *convergent* and another which we define, by extension, as *divergent*.

We propose these two concepts as key differentiators in the classification of serendipitous systems based not in their ultimate goal (i.e. to design, engineer, encourage or provoke serendipity), but in a bottom-up fashion, through the methods they utilise to achieve their goal of serendipity. Through this, we are able to accommodate different interpretations of serendipity while, at the same time, differentiate these distinct systems, grouping them within similar ones and qualifying the discussion.

## Daily Me and Daily Us

In his 1995 book *Being Digital*, Nicholas Negroponte foresaw this divide between convergent and divergent systems through two examples of what could be the future of newspapers: *The Daily Me* and *The Daily Us*.

*What if a newspaper company were willing to put its entire staff at your beck and call for one edition? It would mix headline news with "less important" stories relating to acquaintances, people you will see tomorrow, and places you are about to go to or have just come from. It would report on companies you know. [...] Call it The Daily Me. [11]*

This *Daily Me* – a convergent system – would show only what it perceived to be relevant to a particular reader and would be one's sole source for news throughout the day, a way to keep up with only what would be of interest.

20 years later and we have the Daily Me, although not centralised in one singular platform, but distributed between several, such as social networks and news aggregators. In some – such as *Flipboard* or the RSS feed aggregator *Feedly* – we decide what our interests are and the systems pull content accordingly. In others – such as the social networks *Facebook* or *Twitter* – we define “whom” we’re interested in, and we let others become our curators of the world, while the platforms act as mediators (an active interface between user, network and information).

While the goal of relevance of convergent systems is of particular importance in commercial applications, authors such as Steven Johnson and Cass Sunstein highlighted the possible impact of a personalised, Daily Me-like news source [12] [13], as the increased positive feedback in one single direction – that of the user’s preferences – would result in an echo-chamber in which we would only listen to those who shared our beliefs [14], which raises the question of the role these systems can have in shaping the values and opinions of those who use and rely in them.

In the paragraph immediately following the description of the Daily Me, Negroponce describes the Daily Us, an example of a *divergent* system, to which one would resort to when wishing “to experience the news with much more serendipity, learning about things we never knew we were interested in” [11].

If the *Daily Me* is built upon personalisation, the *Daily Us* relies on heterogeneity, on the information that might not be directly relevant to the reader and that lies beyond her known interests. Information that the reader might not necessarily want but, nonetheless, might *need* to know. This is the essence of a divergent system: exposure to information beyond the perceivable interests of the user.

While we are able to see various examples of a *Daily Me* in practice and that take advantage of the possibilities of the digital medium, the same can’t be said for a truly serendipitous Daily Us.

Social networks such as *Facebook* and *Twitter* have the potential to be a divergent system, acting like a *Daily Us*, if one would take the initiative to add diverse voices to our network of connections, although we seldom do. As such, building upon our friends, and friends of friends, ends up contributing to our natural propensity for homophily, as those who we add to our inner circle of connections tend to share our interests and beliefs. Facebook itself is not a neutral party but acts in order to deliver information that it perceives are useful and relevant for us, hiding those which its algorithm perceives to be less relevant.

Crowd-curated news aggregators such as *Digg*, *Reddit* and *Slashdot* could also be a possible *Daily Us* example, as these platforms allow users to “upvote” or “downvote” (in the particular case of *Reddit*) specific content, creating a platform in which the content perceived to be the most interesting or commented upon

at a particular moment rises to the top. However, due to the particular demography of these platforms (mostly US males between the ages of 18 and 29) what ends getting up-voted the most is the type of content that fits to the interests to this particular demographic, consequently hiding other content that lies beyond their interest and preventing these from being true divergent systems.

While digital newspapers are perhaps, still, the best bet for a Daily Us/divergent, unpersonalised, source of information (particularly since they do not suffer from the constraints of the printed format), these tend to privilege local news, limiting their potential for truly broadening the horizons of the reader, while not truly exploring the full potential of the digital medium for the serendipitous discovery of information.

### The Mechanics of Convergent and Divergent systems

Convergent systems approach serendipity as the discovery of the right thing at the right time, by catering to the user’s perceived intentions, interests and tastes. To do so, they resort to user-profiling and machine-learning, gathering all possible information regarding the user and her patterns in order to more precisely cater content accordingly.

Perhaps the earliest example of a convergent system is *Fishwrap*, “an experimental electronic newspaper system”. This system, developed at MIT, would draw – from a pool of four thousand stories a day delivered via the Associated Press, Knight-Ridder, and Reuters wire services – stories regarding a student’s hometown, favourite sports teams and other topics of interest.

Another example of a convergent system is *Netflix*, the provider of on-demand Internet streaming media. When the user first creates an account on Netflix, she is asked to choose some of her favourite films or television series. Through those initial choices, the platform optimises the presented content accordingly. Furthermore, the platform constantly tracks the viewing habits of the user, adapting the graphical user interface accordingly. While navigating Netflix’s user interface (UI), we clearly see how our declared interests and viewing history affect the content that is being presented.

MIT’s *Serendipity* project [15] is an example of a convergent system aiming for serendipitous connections between people, by encouraging professional “synergies” that otherwise would remain unnoticed within professional environments. Users of the service would register in a match-making service, declaring their interests, skills and needs, while turning an “available” mode in a Bluetooth enabled mobile phone. This would allow for ad hoc, serendipitous connections between individuals with shared interests or complementary needs.

Perhaps the definitive example of a convergent system is *Google Search*. When using *Google Search*, the results

presented to the user are based on hundreds of (non-disclosed) signals that tailor the content accordingly.

While results presented in *Google Search* were initially ranked solely by Google's Page Rank algorithm—which looked at the websites themselves—such is no longer the case. Nowadays, the results are a combination of a variety of different factors, such as the Page Rank algorithm as well as a multitude of information regarding the user: search and click history, location, language, operating system, among others.

While convergent systems make use of data in order to cater towards the perceived interests of the users, divergent systems promote the exposure to different, unpredictable information, outside of the user's interests. To do this they rely on chance and randomness and while divergent systems can also use machine-learning and user profiling,<sup>2</sup> they do so in order to present what lies outside of the user's profile.

*Chatroulette.com* or *randomyoutube.net* are examples of divergent systems where randomness is a key mechanic. In the former, two users are randomly paired with each other for video-based interactions while in the latter, users can watch a random video from YouTube.

*Serendipitor*, by Max Sheppard, is an example of a divergent system which proposes to re-introduce serendipity, unpredictability and chance to our daily navigations of our cities. Questioning if we are becoming too reliant on applications to optimise our lives and experiences, Sheppard and his team created a navigation application for a smartphone inspired by Guy Debord's *dérive*, in which you state your current location, your desired destination, and it suggests possible routes you can take, while suggesting activities to do while you get there. Some of these suggestions can be rather surreal, such as "Head east toward [street name] and then follow a cloud. If there are no clouds, make some. Take a photo of them."

While divergent systems are often capable of presenting surprising and unexpected content, possibly leading to serendipity through unpredictability, they can generate more noise than signal, which could ultimately lead to a disinterest on the system itself from the user. Convergent systems, on the other hand, can offer highly relevant content directed to the user's known interests and values, however, intensive use of personalisation could lead to an echo-chamber, trapping the user in a feedback loop of positive reinforcement.

We need, however, to distinguish between Absolute Convergence and Divergence from Relative Convergence and Divergence.

In Absolute Convergent (A-Convergent for short) systems, all data leads to one representation of the user. This representation, while constantly improving, would be the canonical representation of the user's interests, such as with *Google Search* or, for example, *YouTube*.

Relative Convergent (R-Convergent) systems, on the other hand, create distinct representations of the user based on different entry points, which may not relate to each other. Going back to Netflix, certain recommendations are specifically based on things the user has previously seen. This can also be observed on online shopping platforms such as *Amazon*, which recommends certain items based on particular items the user has viewed or purchased before. The suggestions aren't being created on the whole of the user's actions, as in *Google Search*, but on specific actions.

Absolute Divergence (A-Divergence) would occur when the system would give a different result every single time, without limiting factors. If we return to the case of *randomyoutube.net*, while there is a chance one would see the same video twice, given the 2.907.475 random videos available to the platform (more if we consider the entirety of *YouTube*), this is highly unlikely, making it virtually A-Divergent.

Relative Divergent (R-Divergent) systems are those who diverge within specific parameters, for example, the shuffle mechanic in media players, when applied to an album or a specific playlist: the results are unpredictable but constrained to that same album or playlist.

## Conclusions and Future Work

As serendipity becomes an ever increasing concern in the design and development of digital interactive systems, so does the need for a rigorous terminology regarding the approaches these systems have in regards to serendipity.

In this paper we've explored the notions of both absolute and relative convergency as well as absolute and relative divergency as possibly useful concepts for systems that aim for serendipitous experiences, by describing their ideological claims as well as the methods they applied to do so.

We aim to further develop these ideas, as well as expand the discussion to the possible political and economical implications of convergent and divergent systems, as well as their respective influence on those who use them.

We also intend to further explore the notion of convergent and divergent systems, including the role curation can have in them, possibly expanding into a more broadened scale beyond this dichotomy, one that accommodates hybrid systems that use both convergent and divergent mechanics. We aim to test and observe the distinct mechanics these systems employ and measure their relative impact in the serendipitous discoveries of information.

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<sup>2</sup> Although they rarely do.

## References

1. Carr, Nicholas “The serendipity machine is low on oil (2011)”, Rough Type. Accessed March 31, 2016.  
<http://www.roughtype.com/?p=1558>
2. Johnson, Steven Berlin “Can We Please Kill This Meme Now (2006)”, [stevenberlinjohnson.com](http://www.stevenberlinjohnson.com). Accessed March 31, 2016.  
[http://www.stevenberlinjohnson.com/2006/05/can\\_we\\_please\\_k.html](http://www.stevenberlinjohnson.com/2006/05/can_we_please_k.html)
3. McKeen, William “The endangered joy of serendipity (2006)” Tampa Bay Times. Accessed March 31, 2016.  
[http://www.sptimes.com/2006/03/26/news\\_pf/Perspective/The\\_endangered\\_joy\\_of.shtml](http://www.sptimes.com/2006/03/26/news_pf/Perspective/The_endangered_joy_of.shtml)
4. Campos, José, and Antonio Dias de Figueiredo. 2002. “Programming for Serendipity.” Proc of the AAAI Fall Symposium on Chance.
5. André, Paul, m c schraefel, Jaime Teevan, and Susan T Dumais. 2009. “Discovery Is Never by Chance: Designing for (Un)Serendipity.” In *Proceedings of the seventh ACM conference on Creativity and cognition (C&C '09)*. ACM, New York, NY, USA.
6. Eagle, Nathan. 2004. “Can Serendipity Be Planned.” MIT Sloan Management Review.
7. Helmes, John, Kenton O’Hara, Nicolas Vilar, and Alex Taylor. 2011. “Meerkat and Tuba: Design Alternatives for Randomness, Surprise and Serendipity in Reminiscing.” In *Human-Computer Interaction – INTERACT 2011*, 6947:376–91. Lecture Notes in Computer Science. Berlin, Heidelberg: Springer Berlin Heidelberg.
8. Leong, Tuck Wah. 2009. *Understanding Serendipitous Experiences When Interacting with Personal Digital Content*. The University of Melbourne.
9. Thudt, Alice, Uta Hinrichs, and Sheelagh Carpendale. 2012. “The Bohemian Bookshelf: Supporting Serendipitous Book Discoveries Through Information Visualization.” In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '12)*. ACM, New York, NY, USA, 1461-1470.
10. Beale, Russell. 2007. “Supporting Serendipity: Using Ambient Intelligence to Augment User Exploration for Data Mining and Web Browsing.” *International Journal of Human-Computer Studies* 65 (5): 421–33.
11. Negroponte, Nicholas. 2015. *Being Digital*. Vintage.
12. Johnson, Steven. 2010. *Where Good Ideas Come From*. Penguin.
13. Sunstein, Cass R. 2002. *Republic.com*. Princeton University Press.
14. Pariser, E. 2011. *The Filter Bubble: How the New Personalized Web Is Changing What We Read and How We Think*. Penguin Group US.
15. Eagle, Nathan. 2004. “Can Serendipity Be Planned.” MIT Sloan Management Review.