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Evolving products: From intelligent design to self-organisation via Science Fiction Prototyping

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ABSTRACT

The paper sets out to use Science Fiction Prototyping (SFP) as a tool to explore how networked electronic products might evolve in the future digital economy. It highlights a number of trends already evident in the commercial environment (the increasing speed of new product launches and associated decision making, the growth of data available to decision makers, the ability to imbue devices with limited sensing and decision making faculties) and sets this against enduring issues around the limits and efficacy of human decision making. This is used as the basis for a vignette in which products increasingly carry the burden of decision making in terms of their form, function and interaction with consumers, a responsibility which has unexpected outcomes. It highlights the difficulties associated with forecasting discontinuities for practitioners, the value of SFP as a tool to address these challenges and the prospects for the widespread adoption of SFP as a forecasting methodology.

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1. Introduction

The idea of artificial intelligence and artificial sentience has long held the attention of science fiction writers, film makers and more recently, electronic game publishers. The benefits and threats of the evolution of ‘thinking’ machines have been debated in a variety of mediums, from Asimov’s *Robot* series, Clarke’s 2001, to more modern interpretations including *The Terminator* and *Matrix* film series and in video games such as *Halo* and *Mass Effect*.

In a similar vein the paper presents a brief vignette exploring issues around how such machine sentience might emerge and its consequences. It examines the implications for forecasters, management decision makers and society more broadly of a future scenario in which the burden of decision making in product management is increasingly shouldered by networked, electronic products themselves. This development is largely in response to trends and pressures already very evident in today’s corporate environment, specifically the need for ever faster

product launches and associated decision making, the growth of ‘big data’ and the emergence of technologies summarised as The internet of things, the ability to impart sensing, communication and partial decision making capabilities into products and devices. These trends play out against a background of enduring cognitive and social limits on the efficacy of human decision making and the emergence of a critical discontinuity.

The paper draws broadly on the methodology for Science Fiction Prototyping (SFP) advocated by Johnson [1], identifying particular areas of technological interest, projecting technological trends to a future point of inflection (the discontinuity) before assessing the implications for relevant constituencies.

The vignette was constructed through an iterative discussion between the author and an established UK science fiction writer who was presented with the findings of the review of key trends in the current business environment (see Section 3) and asked to extrapolate the implications of such trends 50 years into the future. The key dramatic turn of the vignette, the idea of a ‘smart’ networked electronic product achieving a level of sentience, was agreed jointly. The writer was then left to develop the vignette. The paper author then reviewed the vignette and assessed its implications for future society and more current constituencies including SPF advocates and forecasters.

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In taking existing developments and extrapolating them to perhaps surprising outcomes, the paper highlights the challenges of forecasting the ultimate impact of current developments in the context of future discontinuities and interrogates the challenges of understanding the behaviour of increasingly 'smart' artificial agents in the marketplace.

The paper takes a deliberately wide and diverse approach in its use of sources, drawing on academic literature from disciplines including decision making theory, economics, sociology, information systems and evolutionary theory. Further it draws on contemporary, practitioner orientated sources such as McKinsey Global Institute and research firm IDC to reflect very recent research on current technological trends. The paper uses the vignette as a tool to 'start a conversation about technology and our future' [1] not to predict the future, to highlight some issues that may emerge as we 'build our future' [1], and to question the degree to which society at large can be an active participant in designing its future digital economy.

2. Background to the paper

The paper adopts an SFP methodology to contribute to a number of key discourses in the areas of product management, technological forecasting and the role of technology in society. It uses as its starting point a vignette that questions how an increasing reliance on smart electronic agents may play out in the face of a major future discontinuity, specifically the potential emergence of 'product agency', products with sufficient sentience to identify options for their development beyond those instilled in them by their makers, to choose between them and to act on that choice. It highlights the continued challenges of forecasting future discontinuities, the potential benefits of using SFP to address these challenges, but also the inherent tensions that its use brings and the challenges to the widespread adoption of it as a forecasting methodology.

One of the key difficulties in forecasting the development of technology and the proliferation of products is the working of consumer choice; consumers are unpredictable and the apparently rational does not always dominate in decision making [2]. What have been more predictable and amenable to forecasters and product managers are supply side elements, e.g. the specification and supply of products and technologies. Products are designed to have certain characteristics and their 'behaviour' in the market space is tightly controlled by the firms supplying them (even if consumer use of them is not). Noting however that in even limited computational models of behaviour amongst artificial economic agents primitive social structures are quick to emerge given appropriate prompting [3], the vignette proposes a scenario in which the certainty of product characteristics and 'behaviour' is removed and becomes subject to emergent forces, that is the motivations of individual products and their 'social' interaction far beyond the control of suppliers.

The structure of the paper proceeds as follows. Part 3 of the paper outlines the drivers for the context of the vignette, that is those current trends that might lead to the circumstances in which the narrative of the vignette could conceivably come to pass. Part 4 introduces the vignette; part 5 is the vignette itself. Part 6 of the paper discusses the potential implications of the themes of the vignette for aspects of future society. Part 7 addresses current constituencies and discusses the use of SFP

as a method to deal with discontinuities in forecasting and the challenges for the widespread adoption of SFP as a forecasting methodology, before concluding comments in Section 8.

3. The trends

The logic for the vignette is based on the extrapolation of a number of trends already evident in certain (particularly electronic hardware and software) product markets. The dramatic impetus of the vignette derives from a scenario in which these trends play off against a more enduring characteristic of the human decision maker, that is our cognitively and socially limited ability to process information and make 'good' decisions on all occasions.

3.1. The limits of human decision making

Human decision making has been the subject of significant analysis by academics for centuries, with two broad perspectives emerging. Firstly, that decision making behaviour is best understood as a search for the rational, and investigated through the workings of overt structures and processes. The early examples of prescriptive decision guidelines produced by Bernoulli in 1738 [4] were based on the very rational expectation that the decision maker would seek to maximise the expected utility or value of the outcome of a decision. Hence, supporting Coleman [5] and Friedman & Hechter [6], Zey suggests that "all actors will choose and act rationally" [7].

The underlying premise, March suggests, that the decision maker has "knowledge of alternatives, ...consequences...a consistent preference ordering...[and] a decision rule used to select the alternative with the highest expected value" [8] was present in Bernoulli's prescriptions and remains at the very core of rational decision theory today. Given its long history "the durability of the model is impressive...not least because the simple rational choice models capture some truth" [8]. This truth he suggests includes the rational behaviour of consumers who lower their demand for products as their prices rise, or the fact that workers are more resistant to wage cuts than to wage rises. March also suggests that its longevity is at least partly due to the fact it reflects deeper "ideologies of the enlightenment... ideas of wilful, rational choice" [8].

Observers have however noted enormous behavioural differences between imagined, rational decision making and those decisions actually being taken in organisations, leading to the emergence of a more behaviourally orientated school of analysis. Such deviant behaviour has included available and valid decision making tools simply not being used by decision makers [9,10]; the limited search for options, alternatives and information [11]; that options are considered one at a time rather than choices being made amongst numerous relevant options at the same time [12]; that options are only evaluated in a limited way [13]; the deliberate restriction of useful information by participants in the decision process [14]; and that, particularly under time pressure, options are often chosen not to maximise utility but to achieve a merely satisfactory outcome in the short term [15].

In practical decision making situations there appears to be considerably more "muddling through" than there does the precise evaluation of crisply defined options that have clearly

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