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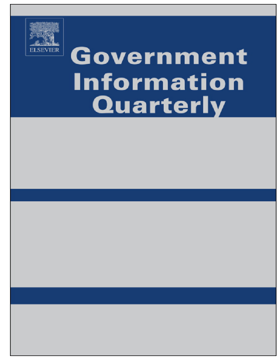

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The Future Ain't What It Used to Be: Forecasting the impact of ICT on the Public Sphere

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1. Introduction

"Books will soon be obsolete in the public schools. Scholars will be instructed through the eye. It is possible to teach every branch of human knowledge with the motion picture. Our school system will be completely changed inside of ten years."
Thomas Edison, July 1913[1].

Thomas Edison may have been a brilliant inventor, but his qualifications as a prophet are less evident. In this, he is far from alone. There is a Danish saying that prediction is difficult, especially when it is about the future. The history of technology in general, and information and communications technology (ICT) in particular, is replete with similar misjudgements made by well-informed and intelligent individuals and organisations.

The desire, and sometimes the necessity, to know what is going to happen next is deeply embedded in human culture. Shamans, seers and prophets were powerful, even revered, figures in early societies. Forecasting has always played an important role in human life. It takes numerous forms ranging from tomorrow's weather or the likelihood of an earthquake occurring in the next ten years, to the sub microsecond projections of movements in stock prices that are used in high-speed trading (Lewis, 2014). Today, while much forecasting is based on mathematical and/or computer models, some forms of forecasting continue to be based on a combination of generalised extrapolation, argument, personal opinion and, all too often, optimism and wishful thinking. Even mathematical model-based forecasting is grounded in assumptions, usually in terms of inputs as well as about the behaviour of humans and systems.

The focus in this paper is on one corner of this large field, namely socio-technical forecasting and specifically the predicted effects or impacts of ICT on government, governance and public administration. Socio-technical forecasting is defined here as forecasting the social impacts and consequences of new technologies on/for individuals, organisations and societies. Such forecasts do not necessarily include forecasting technological developments, i.e. it includes forecasting the societal impact of existing technologies (see section 2 for a further discussion of this point). Our focus is on the use of technology in the public sector. In this paper we will use the terms e-government and e-democracy though we acknowledge that other terms, such as digital government, are today widely used. Our primary focus is on the scholarly literature, but we also consider predictions made in the practitioner and political worlds. We stress at the outset that the problems we discuss in this paper are just one manifestation of a much more general phenomenon. The problems of ICT prediction in public administration mirror those found in many other contexts, although we will argue that e-government and e-democracy predictions have their own characteristics and their own specific sources of error. Secondly, this paper is about material forecasts by which we mean forecasts of significant social, structural, institutional or political change, typically, though not necessarily, over an extended time frame of several years or even a decade or more.

[1] Said in response to a question in an interview with the *New York Dramatic Mirror*, July 2013.

Forecasting errors can be expensive. They can mislead governments into making premature investments, losing opportunities by investing too late, investing in the wrong technology, going down technological cul-de-sacs and/or investing in technologies that never work. The literature on e-government failures contains numerous case studies of such failures dating over many decades (e.g. Margetts and Willcocks 1993; Heeks 2003; Purao and Desouza 2011; Van Cauter et al 2016). Although these failures have multiple causes, including inadequate project management, poor forecasting is often one of them and it typically takes the form of overestimating the capabilities or affordances of a new or emerging technology or misreading human reactions/responses to new technology. It is impossible to quantify the amount of money wasted as a result of inaccurate technology-related forecasting by governments and public administrations over the past 50 years, but it is probable that the figure is large. Good forecasting is therefore important and it is this importance that motivates this paper.

The remainder of this paper is divided into four main sections. First, we propose and develop a taxonomy of types of forecasting error. Second, we look at some examples of incorrect or inaccurate forecasts that have appeared in the (broadly defined) e-government/e-democracy literature over the past four decades. Next, we explore the reasons why such forecasts are often wrong. Fourth, we propose some guidelines for reducing the risk of making such errors. There is then a brief conclusion and reflections on the purposes of forecasting.

2. A Theoretical Framework

Before considering the problems associated with forecasting the impact of technology on government and public administration, we first propose a theoretical base within which to frame the discussion. This will be done in in general (i.e. not in e-government specific) terms. e-Government specific problems will be considered in section four.

2.1 A gap in the literature?

There is a large literature on technology forecasting and socio-technical forecasting methods, but no single coherent theory of socio-technical forecasting. It is a fissiparous field. There are many theories that seek to explain the social impacts of technology. For example, Sovalcool and Hess (2017) identify 96 theories across 22 disciplines. Of these, they consider 14 as "most relevant". This list ranges from Actor-Network theory to the Unified Theory of Acceptance and Use of Technology (UTAUT – see below). However, explanation and forecasting are not the same and, inasmuch as any of these theories are designed for forecasting (such as the UTAUT), the type of forecast they provide is limited in scope and time.

Whatever about theory, many approaches to technology and socio-technological forecasting have been developed and many are in routine use. These fall into two types. The first is comprised of what might be called active methods. These seek to develop forecasts using a range of tools such as opinion surveys, focus groups, expert panels and so on. There are several such techniques, some of which only apply only to the technology and do not attempt to forecast its impact. Others endeavour to forecast the effects of technologies, future, emergent or existing, on individuals, institutions and societies. A few endeavour to do both. Examples of active approaches include the Delphi method (Green et al., 2007; Rowe and Wright, 2001; Adler and Ziglio 1996), scenario building (Lehr et al., 2017; Bradfield et al., 2005; Ringland, 2010; Wright et al., 2013), influence diagrams (Detwarasiti and Shachter, 2005; Howard and Matheson, 1989), brainstorming (Trott et al., 2016; Isaksen, 1988) genius (Makridakis et al., 1998; Martino, 1983) and, more recently, crowdsourcing (Lang et al., 2016). Some of these methods are either judgemental and/or intuitive or depend in large part on judgement and/or intuition or a mix of this and statistical methods (Bunn and Wright, 1991). For a brief discussion of a number of these, see chapter 2 of National Research Council (2010) and Walonick (1993). The second category of methods uses observed or measured phenomena and examines trends to generate forecasts of future impact. Well-known examples included the Technology Acceptance Model (Davis, 1989; 1985; Venkatesh and Davis 2000), its variant UTAUT (Ventakesh et al., 2003), the Delone and Maclean Success Model (1992; 2003) and Rogers' (2003) diffusion theory. Each of these has a number of variants. A limitation of many of the these methods is that they only forecast adoption or success, both of which are only interim or partial steps in forecasting longer term and broader impacts of a technology. Many forecasts use a combination of both approaches.

The focus of this article, however, is not on forecasting methodologies *per se*, but on the accuracy of such forecasts and, in this context, it is remarkable that there is almost no research to be found which examines the accuracy of longer-term ICT related socio-technical forecasting in the public sector. A number of scholars and authors have addressed the topic in a broader context, most notably Tetlock (1999; 2005 – updated in 2017) whose work is discussed below. De Wilde (2000, p4), after noting several mispredictions, refers scathingly to:

"*cyber gurus, digirati (prophets of digital life), management consultants, and transhumanists – who specialize in selling bright futures.*"

There is also some literature on forecasting the impact of ICT on government, but none that we can find that directly addresses the question of problems with forecasting accuracy. Norris (2010) pointed refers to predictions of "simply incredible outcomes". A number of papers discuss the problem indirectly, by implication or in passing. For example, Kraemer and King (2012) note that for all of the forecasts of significant administrative transformation, evidence of major change has been elusive. Coursey and Norris (2008) are scathing about stage model forecasts. These commentaries are discussed in more detail below. However, such critical commentary is rare. Such criticism and commentary as there have been is discussed in more detail in section three.

2.2 A Typology of Socio-Technology Forecasting

By socio-technical forecasting we mean forecasting the impact of a given technology or combination of technologies on organisations or societies. Such forecasts can apply to any form of technology from the wheel to DNA screening. In this paper we concentrate on ICT. ICT based forecasting can be categorised in various ways. While not the only possibility, a useful distinction can be made between forecasts that start from:

- an existing technology, i.e. one that is already available and/or in place, and;
- projections which involve an emerging or future technology.

For the latter, the first component of any forecast necessarily relates to the technology itself and this in turn can in turn be categorised into a number of subcategories. Again, there are several ways this can be done. For convenience we will subdivide these as follows:

- Short term/incremental: This type of forecast typically relates to the release of a new product (such as Windows 95 or the 240 character version of Twitter) though it may also relate to other developments such as new legislation or regulations governing technology (the European Union's General Data Protection Regulation (EU) 2016/679 being a recent example). Such events are normally well flagged in advance and although delays can occur and new products or releases can disappoint, such projections are typically accurate.

- Evolutionary Pathways: This type of forecast is long term. Evolutionary forecasts typically extrapolate an existing product of trend over a decade or more. For example, the path from the Intel 1086 to the Intel iCore processor or the evolutionary path from Windows 95 to Windows 10. The most famous example of such a forecast is Moore's law. This comes in various versions and dates to 1965 when Gordon Moore predicted that the number of transistors on a chip will double at regular intervals into the indefinite future (Schaller 1997)[2].

- Development Project Forecasts: This type of forecast is about new products that are in development as opposed to upgrades of, or improvements on, existing products or technologies. Such projects can emerge from a theoretical development, a discovery of some nature or just an idea. For this type of forecast, critical questions include firstly whether it will work and secondly how long a product will take to become viable or affordable or to get to market. Examples include the relational database and voice recognition, both of which are technologies that progressed from theoretical concepts to usable products over an extended period of time.

- Blue sky forecasts. Blue sky forecasts are 'outside of the box' predictions of technologies that do not yet exist except perhaps in science fiction or in the imagination of the forecaster, but which seem plausible. For obvious reasons, such forecasts are not common in the academic literature, but are often found elsewhere including in science fiction[3]. Two examples are Gordon Clarke's prediction of satellite-based communication (Tweney 2011) and Ray Kurtzweil's forecast of the singularity (Kurzweil 2005).

It is possible to make finer distinctions, but the above broad classification is sufficient for the purposes of this discussion. The types of forecast which are of most interest in e-government are evolutionary forecasts and, to a lesser extent, development project forecasts.

2.3 A Typology of Socio-Technical Forecasting Errors

As noted, socio-technical forecasting is concerned with predicting what will happen when technology enters or is implemented in a social context. In any socio-technical forecast, the forecaster is faced with three questions:

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[2] Moore's law would appear to be finally running out of road (Waldrop 2016).

[3] For an amusing, though illuminating, view of this see https://entertainment.howstuffworks.com/10-star-trek-technologies.htm which looks at future technologies used in the TV series *Star Trek* which have since become realities.

1. What, technologically speaking, will happen?
2. When will it happen?
3. What will the impact(s) be if and when it does happen?

As noted in the preceding section, questions one and two are relevant only when speaking about emerging or future technologies. As most (though by no means all) forecasting relates to emerging or future technologies rather than established technologies, the first two questions normally need to be addressed. In order to be useful, a forecast needs to get the answer to all three of these questions correct. Even for successful and useful new technologies, it can be hard to judge just when acceptance of that technology will take off, how widespread uptake will be and what the wider consequences will be. When making forecasts of this nature, an awareness of the law of unintended consequences is essential. As Rogers (2003) shows, these things can be difficult to get right and can be affected by unforeseeable events.

Given the above, we observe that, when making predictions of this nature, any error can be categorised into one of three basic types, which we will label Types A , B and C:

Type A: Technology error;
Type B: Impact error;
Type C: Timing error.

Type A errors can be further classified into:

Type A1: Technology either never happens or doesn't work as expected;
Type A2: Overlooking technologies that do happen;

Type B errors can be classified further into:

Type B1: Forecast level of impact is overestimated;
Type B2: Forecast level of impact is underestimated;

Type C errors occur when the timescale, either for the technology or the impact is wrong. It is possible to divide this into two subclasses,

Type C1: Timing of technology is wrong;
Type C2: Timing of impact is wrong.

There are subtle variations within this categorisation. For example, B2 type errors include underestimating an anticipated impact and completely missing an unanticipated impact. Furthermore, these errors are not all mutually exclusive. As will be discussed, for ICT predictions in the public sector, some of these error types are important than others. Each type is now briefly discussed. Obviously, type A errors only occur to future or emerging technology forecasts and do not occur when the technology already exists and is proven to work.

<u>Type A1</u> (technology never happens (TNH)) errors are fairly common. The prediction by Thomas Edison cited at the top of this paper is a good example. Another well-known example is Marvin Minsky's prediction about artificial intelligence, made in 1970:

"In from three to eight years, we will have a machine with the general intelligence of an average human being. I mean a machine that will be able to read Shakespeare, grease a car, play office politics, tell a joke, have a fight. At that point, the machine will begin to educate itself with fantastic speed. In a few months, it will be at genius level, and a few months after that, its power will be incalculable".[4]

One might argue that both of these are type C (i.e. timing) errors and that visual only learning and artificial intelligence (AI) of this nature will happen at some point in the future (see also below). However, as Keynes (1923) said, in the long run we are all dead and being out by a half a century or more marks these out as type A1 errors (see also section four in the discussion of common explanations for failed forecasts).

Type A2 (Overlooking technologies that do happen or (OTH)) errors typically occur when forecasters misunderstand the underlying science or its implications. The difference between a type A2 error and a certain type of B2 error is sometimes moot. For a long time, IBM, the world's largest computer company in the mid 1970s, paid little or no attention to the microprocessor (Cringley 1996). At least IBM survived this misjudgement, though in so doing it enabled Microsoft to eventually overtake it in market value. By the early 1980s, Digital Equipment Corporation, which was founded in 1957, was the second largest computer company in the world. It made the same misjudgement as IBM, but, unlike IBM, it did not recover from it[5]. In the context of this paper, it might be argued that the failure, for a long time, of mainstream public administration academics to realise the significance of technology for public administration is another example of not paying close enough attention to what was going on (see below for a further discussion of this).

Of more significance in e-government and e-democracy, are type B errors.

Type B1 (level of impact is overestimated or (LIO)) errors can often be observed by following the Gartner Group Hype Cycle/curve, published in July/August of each year. Figure 1 shows the curve for August 2018. The Hype Cycle curve illustrates both A1 (TNH) and B1 (LIO) type errors. Comparison of curves over many years shows that some technologies never make it in to the later stages of the *Slope of Enlightenment* or the *Plateau of Productivity* while others take much longer than predicted to progress to these stages. The ICT industry is well known for its love of hyperbole and for so-called fads or fashions (see Computerworld (2007) for some examples). At almost any point in the past 60 years there has been one or more technologies that have created enormous excitement. Such hysteria reached its zenith in the dot.com era of the late 1990s, but smaller bubbles happen all of the time. At the time of writing, machine learning, big data and the Internet of things are some examples. Gartner's tracking of technology also shows that those technologies that do survive can take many years to progress from the *Technology Trigger* phase to the *Plateau of Productivity*.

As noted above, type B1 (LIO) errors are probably the most significant problem in public administration as many governments, scholars and consultants have consistently overrated the impact of technology over the past 50 years. Three examples of this phenomenon are discussed in section four.

[4] Minksky made this comment in response to a question by Brad Darrach during an interview for LIFE magazine in 1970.
[5] In 1998 it was acquired by Compaq, a company only founded in 1982.

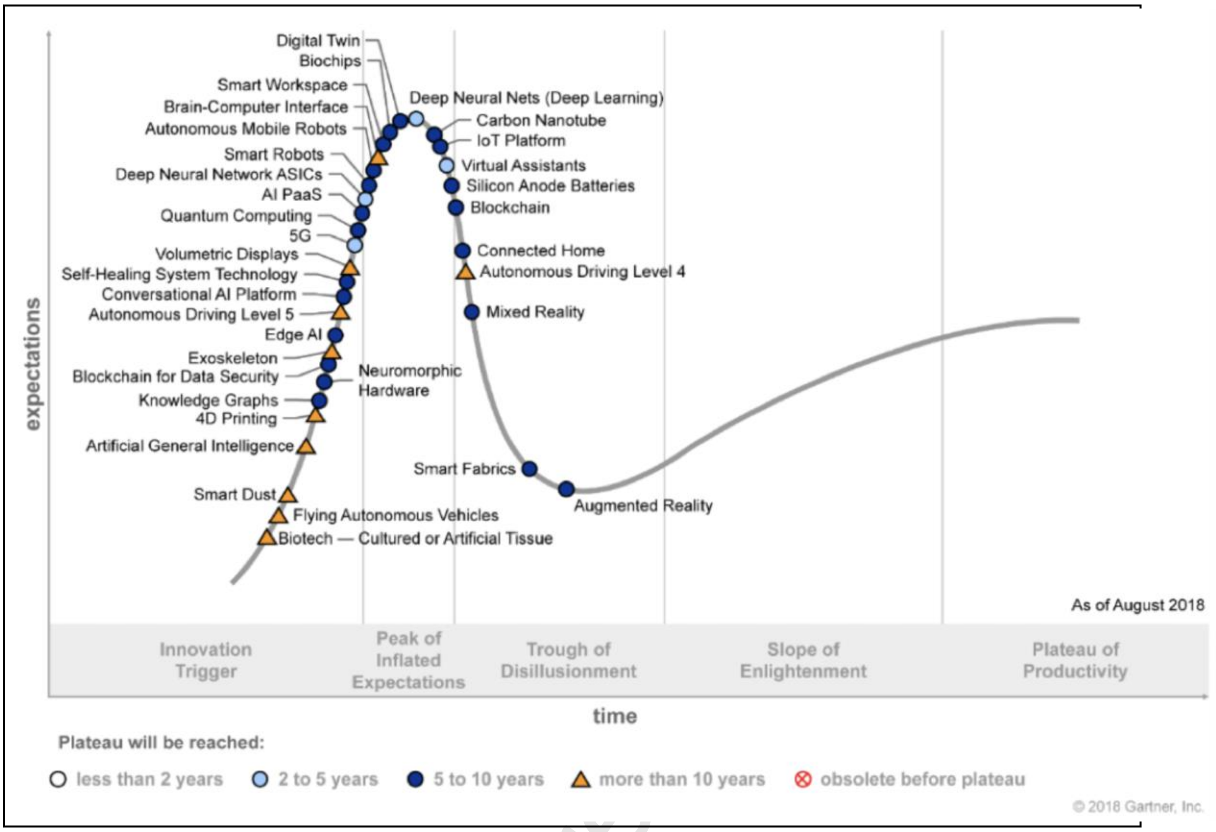

Figure 1 – Gartner Group Hype Cycle as of August 2018

Type B2 (level of impact is underestimated or (LIU)). The difference between A2 and B2 errors is that in the case of A2 type errors, the technology is not foreseen and comes as a bolt out of the blue. In the case of B2 type error, the technology not only exists, it also works, but its *importance* is overlooked or misunderstood. This can also be true of technologies that have been around for a while, but that are what one might call 'late developers' in that their importance is not initially appreciated (or its potential is not initially grasped by certain sectors). An example is the microprocessor which was initially dismissed by many experts as something for hobbyists (see Cringley 1996). An amusing example of a B2 (LIU) type error is the 2005 prediction by Sir Alan (now Lord) Sugar that "*Next Christmas the iPod will be dead, gone, kaput*"[6]. Sugar's high-handed dismissal of the iPod is one of many examples of people and organisations failing to understand the significance of a technology[7]. Misjudging the iPod probably did not do much damage to Sugar's business. A more significant example is Microsoft's failure to realise the full significance of the Internet - a technology that dated back to 1970s[8], as well as the significance of the Web, which dated from the late 1980s (Eichenwald 2013). Microsoft was not alone; many governments were slow to appreciate the potential and importance of the Internet and of computing more generally, as a number of e-government scholars have noted over the years (e.g. Sigler, cited by Bellamy and Taylor 1992; Meijer 2007). Microsoft has something of a track record in this regard. In 2007 the company's then CEO, Steve Balmer predicted that the iPhone had "*no chance*" of gaining significant market share[9].

[6] Said in an interview. See http://www.dailymail.co.uk/sciencetech/article-1093470/Next-Christmas-iPod-kaput-How-Sir-Alan-Sugar-got-wrong-174million-times--webs-worst-predictions.html

[7] Lord Sugar had the good grace to admit his error, as did Bill Gates.

[8] The first over network message was in sent in 1969.

[9] The full interview in which he said this can be viewed at:

Type C1 (technology timing is wrong or TTW) errors can run both ways - either the technology arrives much sooner than expected or (more commonly) it takes much longer than expected to become usable or reliable. The UK magazine, *Popular Mechanics*, forecast in 1949 that in the future we could expect to see computers that weighed less than 1.5 tons. Strictly speaking, this was correct of course, but it is unlikely that the smartphone was what they had in mind when they wrote this.

Type C2 (impact timing is wrong or ITW) errors can similarly run both ways. Numerous premature forecasts were made during the dot.com era. Often such timing errors occur because a technology needs to reach a certain critical mass of users before it starts to take off. An example of a C2 (ITW) type error is the statement, in October 1997, by Bill Gates that:

"In this 10-year time frame, I believe that we'll not only be using the keyboard and the mouse to interact, but during that time we will have perfected speech recognition and speech output well enough that those will become a standard part of the interface."

(Doan Chien Thang 2019). Gates may yet be right, but this did not happen by 2007; only in recent years has speech started to become part of the standard interface with the emergence of products like Alexa.

Type C errors can be particularly expensive. Business and governments have been caught by surprise by a number of ICTs and in some cases have been left scrambling to catch up. In other cases, they have invested prematurely and subsequently had to write off large sums of money. For example, in 2014 the UK public sector closed down 685 government websites and website domains, transferring many of them to a single site[10]. As noted above, government ICT projects fail for various reasons including excessive complexity, bad design and poor project management, but sometimes they fail because the capabilities of the technology are over estimated. A good example is the Irish government's Reach project (McGee, 2008). Going back in time, the notorious Operational Strategy of the UK government was due, *inter alia*, to the inability of the technology to support the ambitions of the project (Willcocks and Margetts, 1993).

That said, failure of the technology *per se* to deliver on what is expected of it is probably not the most common source of problems. For governments, as for business, failure to forecast the impact of technology accurately can be expensive, either in terms of lost opportunities and/or wasted expenditure. It can also lead to disruption, including for example, traffic problems (van Cauter et al 2014), people being unable to get a passport (National Audit Office 1999) or even to questions about government legitimacy (Dill and Castro 2008; Fitgers 2018). To improve accuracy, it is important to understand *why* forecasts are wrong. Are there underlying problems that can be addressed? We believe that the answer to this question is yes. Possible reasons why these forecasts were wrong are discussed in section four. First, we consider some examples of poor forecasting in the e-government field.

3. Getting it Wrong

3.1 Some Caveats

https://www.youtube.com/watch?v=eywi0h_Y5_U
[10] https://insidegovuk.blog.gov.uk/2014/12/19/300-websites-to-just-1-in-15-months/

e-Government, a term that will be used in a broad sense in what follows, is just as susceptible to poor forecasting as any other field of social science. Many forecast developments in e-government over the past 50 years have failed to materialise (or have failed to materialise so far). In this section we will consider a number of these, what was predicted and what actually happened (or, more to the point, what didn't happen).

Before doing this, a number of caveats are in order. As noted earlier, the focus of this paper is on major predictions or claims. Trivial forecasts are of limited interest and the same is true of predictions that are so vague as to be of little value. There have been many examples of fuzzy forecasts over the years, typically non-specific predictions of administrative reform or transformation. Some of these are so general that one questions their definition or usefulness as forecasts, however others are more specific and can be assessed for accuracy.

Secondly, it is acknowledged that some forecasts have been right (or reasonably so). We do not argue that every forecast is wrong.

Thirdly it is only possible to judge predictions on what has happened to date. One of the most extensive (and few) studies of this type of social-economic-political forecasting is that undertaken by Tetlock (2005)[11] who, building on the earlier work of Fischhoff and Beyth (1975), asked a wide variety of experts to make a forecast of some significant social, political or economic development or event within the next ten years. He then waited to see what happened and went back to those forecasters who had made incorrect predictions to ask them why their forecasts were wrong. Not everybody admitted that they had simply got it wrong. A variety of excuses or reasons for being off target were offered. Tetlock divides these into a number of categories one of the most popular of which was that the error was a matter of timing; the forecast was still right, but it had been premature. This is probably the oldest excuse in the history of forecasting. Many people have predicted the end of the world and, whilst it is it is certain that the world will end someday, this may not happen for many thousands of years. In the meantime, many people who have based and lived their lives on the assumption that it would happen in their lifetime will have died disappointed (or perhaps relieved). Consequently, we reject the "*it will happen sometime, but not just yet*" claim as a basis for arguing that a forecast was not wrong. Timing matters[12].

An interesting question arising from the various excuses identified by Tetlock is how does one know when a forecast is wrong? Most of the time it is obvious whether a prediction is wrong or not (see the three examples below), but occasionally there are circumstances where this may be debatable and a question of judgement. The US Supreme Court Justice Potter Stewart once observed, in defining obscenity, that he knew it when he saw it. Likewise, deciding whether a forecast is accurate or not may sometimes depend to one's perspective. Most of the time, however, the evidence of failure is clear though, as Tetlock demonstrates, that does not always prevent pundits and experts from trying to defend the indefensible.

3.2 Stage models

Three of the areas in the e-government literature which stand out as being particularly prone to poor prediction are stage models, e-democracy and administrative transformation or reform. We will start with stage models.

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[11] An updated version of this was published in 2017.

[12] It is worth noting that there has also been some analysis of forecasting errors in pure technology forecasting, see for example Farmer and Lafond (2016).

Many stage models exhibit B1 (LIO) type errors.

Stage models first emerged in the commercial sphere at the turn of the century (one of the earliest was Baum & Di Maio, 2000), but it was the publication of Layne and Lee's 2001 paper that kick-started this stream of research in academia. Stage models fall into a number of categories (DeBri and Bannister, 2015). Amongst other things, they can be descriptive, they can be normative or they can be predictive. Most models are descriptive for earlier stages and either normative and/or predictive for later stages. Many (possibly most) of these later stage predictions have been wrong. An early example is Hiller and Belanger (2001) where possible futures include participation and on-line voting. Windley (2002) forecasts a fourth stage of "*transformed government*" (whatever that means). A couple of years later, West (2004) forecast a fourth stage of "*interactive democracy*". The following year Siau and Long (2005) carried out a synthesis of work to date and proposed a five-stage model of which the first four stages were broadly descriptive and the fifth, e-democracy, was a prediction. Andersen and Henriksen (2006) predicted an era of data mobility and transfer of data ownership to customers. Almazan and Gil Garcia (2008) produced another synthesis with a sixth stage of political participation. Lee and Kwak (2012) forecast a stage of "*ubiquitous engagement*".

There are others, but the above is sufficient to illustrate the point. One immediately observation is that the various forecasts' later stages (transformed government, interactive democracy, participation, on-line voting, data mobility, ubiquitous engagement) differ. While there are overlaps and these developments are not mutually exclusive, these are different futures. While it is possible that they are all correct, intuitively this seems improbable and in practice there is little evidence so far for any of them being realised on any large scale, though isolated examples of some of these exist (e.g. *We the People*).

In their 2008 review of stage models up to that time, Coursey and Norris (2008, p253) were scathing about the basis for such predicted developments writing:

"Based on empirical examination, it appears that, for the most part, the descriptions in these models provide a reasonably accurate portrait of e-government in its early stages, from initial Web presence to information provision to interactivity. Beyond this, however, the models become both predictive and normative and their empirical accuracy declines precipitously."

Writing five years later, Norris and Reddick (2013, p166-167) found that nothing had changed:

"We do not cite empirical works that validate claims made in cyber-optimist writings because, after an extensive review of the e-government literature, we have not been able to find any".

Nor have we. One thing to note about these predictions (and others) is that they envisage a future in which technological affordances change human behaviour. There is nothing wrong with that as such; technology has always had the *capacity* to change human behaviour (one has only to look at smartphones). This risk is that this type of prediction deteriorates into a form of technological determinism (see section four). The real problem is that people, including experts, are not always good at predicting the nature of that change.

3.2 e-Democracy

A second field where there has been much misjudgement of the future is e-democracy. e-Democracy forecasting exhibits a mixture of A1, B1 and B2 type errors.

The e-democracy literature has generated a large number of ideas and predictions over the past few decades. Broadly speaking, with the possible exception of e-voting (see below), none of the predictions and expectations in this literature have come to pass in a sustained way or on a large scale. There are, to be sure, isolated examples of things like e-participation and discursive democracy, but there is no evidence of widespread, sustained and successful adoption of such practices. On the other hand, the use of technology in, and impact of technology on, politics has evolved in ways that were not foreseen by most scholars and commentators - a classic B2 type error.

There is insufficient space for a detailed analysis of this literature and its predictions (a brief discussion of it can be found in Bannister and Connolly (2018)). A relatively recent and illustrative example of inaccurate prediction is the outburst of enthusiasm for the impact of social media on democracy following the Arab spring (Howard et al 2011; Skinner 2011; Khondker 2011; Friedman 2011; Bellin 2012). To be fair, scholarly analysis of this phenomenon tends to be more measured than popular commentary. Friedman's announcement that the events of the Arab spring "*…says that we are just at the start of something huge…*" is journalism rather than scholarship. Nonetheless, there was a belief that we were witnessing a new vector of democracy and that this was a positive force. Subsequent events have shown this belief to have been optimistic.

As noted in the preceding section, many stage models have predicted a final or penultimate stage of either e-democracy or one with e-democratic trappings. In these models, e-democracy is often defined only in the most general terms. e-Democracy is less a single concept than a grab-bag of different ideas including:

- e-voting;
- on-line voting;
- e-participation;
- e-consultation;
- deliberative democracy;
- liquid democracy;
- electronically enabled direct democracy;
- transparent government.

As noted, it is hard to justify the enthusiasm that any of these have generated by pointing to real change. Even the most basic form of e-democracy, that of e-voting, continues to suffer from practical and political problems. This is, in part, a type A1 error, i.e. overestimating the potential of a technology. As Wang *et al* (2017, p31) note:

"*E-voting technology has been developed for more than 30 years. However it is still a distance away from serious application.*"

More critically, even where e-voting has been successful it has not resulted in any fundamental change in governance such as leading to more frequent voting or more representative voting systems. It has only, to use an old expression in systems analysis, been used to pave the cow path.

A number of scholars have been critical of this excess of exuberance. Chadwick (2008) provides an insightful critique of thinking about e-democracy up to the mid noughties. Moss and Coleman (2014) have commented on the relative disappointment with e-democracy experiments in the UK, though they remain optimistic about the value of deliberative democracy. Excessive optimism is typical of B1/LIO type errors. Research in e-democracy continues, but events on the ground in recent years including hacking, fake social media accounts and the use of analytics to target voters increasingly suggest that, when it comes to democracy, technology may turn out to do more harm than good - a topic that a number of scholars have now started to examine (e.g. Nam, 2017; Maréchal, 2017; Sunstein, 2018).

3.3 Transformative Government

Over the past 50 years many predictions of technology-driven or technology-enabled administrative reform have been made. Predictions of transformation change in government typically fall into the type B2 (LIO) and possibly C (timing) error categories.

Many of these forecasts have centred around the distribution of power and/or decision making in public administration. Concepts such as *Reinventing Government* (Osborne and Gaebler, 1993; Osborne, 1993; Osborne and Plastrik, 1997), *Digital Era Governance* (Dunleavy et al., 2006) and *Government 2.0/open government* (Chun et al., 2010) have made bold claims for, *inter alia*, technology driven, newly entrepreneurial, participative and agile forms of government and governance.

Early writings on informatisation foresaw changes in the distribution of power. As far back as 1976, Kraemer and King (1976) discussed the impact of technology on power. In the mid 1970s, the mainframe computer was dominant; microcomputers were still only to be found in bedrooms and garages. One of the theories to emerge from this period was the reinforcement hypothesis – the idea that technology consolidated existing power structures. The reinforcement hypothesis was first put forward by Danziger in 1982. Much of the interest on the longer-term impact of ICT (though the 'C' came later) during this era in the US was on centralisation (e.g. Sitarski 1991).

It is during this latter part of this era that discussion of 'transformation' first emerges (Wolfe 1999). While much of the literature up to 2000 focused on understanding what was happening, some scholars did venture to offer visions of the future. Bekkers and Frissen (1991) discussed the impact of IT on organisations and claimed that most observers take the impact of IT as axiomatic and Frissen *et al.,* (1991) asserted that informatization both defined and redefined the structure and culture of public administration in several ways. Zuurmond (1996) foresaw the emergence of an 'infocracy'. In a later paper, Frissen (1998) took a post-modernist view, forecasting the emergence of the information polity whose basic characteristic would be that of a 'techno-culture' which would be fragmented, decentralised and non-hierarchical. It is not evident that any of these projections have come true in a significant way. In this context, Taylor and Williams (1990, p151) proposed a definition of an information polity that is worth citing:

"…a system of governance within which the development of innovative information systems is producing, and will continue to produce, new rationales for the restructuring and changing focus of government".

Bellamy and Taylor (1998) further developed this concept. It is a nice idea, but while there have been major technology-enabled improvements in government services and some areas of public administration, there is limited evidence that in terms of real politics and power, there has been much ICT driven change of focus or any radical restructuring of government in the past few decades. Such change as did take place was driven by forces other than ICT (notably by New Public Management (NPM)). Some believe that the main impact of ICT on democracy has in fact been negative (e.g. Sunstein, 2018; Seymour, 2019)

As already noted, one widely cited body of work in the 1990s was the work of Osbourne, Gaebler and Plasrick (Osborne & Gaebler 1993; Osborne 1993; Osborne and Plasrick 1997) who introduced the idea of re-inventing government. The ideas underlying reinventing government, including that government should become more entrepreneurial and that bureaucracy should be abolished, were not dissimilar to those underpinning NPM. Like NPM, these developments and the benefits foreseen from them have largely failed to materialise (see next section).

A problem with this type of forecast is an absence of good empirical research to underpin it. Nearly two decades ago, Danziger and Anderson (2002) noted that there were relatively few grounded, empirical studies of the impacts of IT on public administration. They assessed the impacts of information technology (IT) on public administration and the public sector by analyzing the empirical research on this issue published between 1987 and 2000. The higher incidences of negative impacts tend to involve the more subjective effects of IT on people in their roles as private citizens (e.g., on their privacy) or as public employees (e.g., on job satisfaction, discretion). There has been little or no such research since then either apart from isolated studies of specific initiatives such as that by Frisk et al (2015).

Again, rather than trying to survey a large field of transformative predictions, we will examine just one as an exemplar. Amongst the many recent conceptualisations of a polity transforming development is Dunleavy et al's (2006) concept of *Digital Era Governance* (DEG). These authors formally announced the death of New Public Management (NPM) and the dawn of the era of Digital Era Governance (DEG) which would invert certain core concepts of NPM, forecasting, *inter alia*, a move back to re-integration and "*needs-based holism*". DEG, they wrote:

"…*offers a perhaps unique opportunity to create self-sustaining change, in a broad range of closely connected technological, organizational, cultural, and social effects*." (ibid. p467)

In some ways, DEG would move public administration and governance back to the past (what might be called re-governmentalization), but many of its predictions were not new (radically squeezing production costs, one-stop provision, agile government services and so on – all aspirations of earlier evangelists). The authors, to give them credit, are modest, acknowledging that some of their predictions may "*partly misfire*". Nonetheless, they conclude that DEG:

"… *holds out the promise of a potential transition to a more genuinely integrated, agile, and holistic government, whose organizational operations are visible in detail both to the personnel operating in the fewer, broader public agencies and to citizens and civil society organizations*." (ibid. p489).

This forecast can be taken as a form of proxy for numerous forecasts of a similar nature made in the ten or so years preceding, and the years since, 2006. Since 2006, however, there has been little well researched empirical evidence of any major transformation in governance. Certainly, there have been major improvements in the way public services are delivered, in (some aspects of) transparency and in the integration of services, but fundamentally government and governance has not changed much except in those countries where NPM took hold in the 1990s where the primary impact was arguably fragmentation.

In 2013, Margetts and Dunleavy proclaimed a second wave of DEG and noted that:

"*The systematic study of organizational productivity growth in the government sector has only just begun to take off.*"

Margetts and Dunleavy (2013, p14). In an age where apparently business is done at the speed of thought (Gates 1999), this seems a long time for little to have happened. Nonetheless, the authors say:

"*Within two decades the push for 'inherently' or 'essentially' digital processes within government (with services and functions designed from the outset to be wholly digital in operation) may even begin to call into question some defining features of bureaucracy itself accepted since Weber's times, a debate already live for private sector organizations*."

Margetts and Dunleavy (2013, p14). We note the cautious use of the conditional tense in this prediction and that the authors are careful to consider other possible scenarios. Two decades is a long time. It is possible that within that timeframe other more significant or politically world-changing developments could derail this forecast. If Kurzweil is to be believed, the singularity might, by that stage, have changed the entire ball game.

What does the evidence say? The answer is not much, but two comments are worth citing. The first is the views of Osborne and Gaebler themselves. In a review entitled *Reinventing Government - 25 years on*, Buntin (2016) interviewed both authors. He summarises their views thus:

"*Both take enormous pride in Reinventing Government. Both believe it changed the way the public sector works. Yet both recognize that it did not achieve their larger goal*."

In the article, both authors offer explanations of why some of their more important predictions failed – putting the blame, *inter alia*, on politicians (see below).

An alternative view is provided by King and Kraemer (2012). In that year, Ig Snellen, Marcel Thaens and Wim van de Donk edited a book entitled "*Public Administration in the Information Age*" which looked back at "*Public Administration in an Information Age; A Handbook*" – compendium of contributions on informatisation that had been published in 1998. King and Kraemer were invited to write the final chapter of both books. It is worth quoting in full the abstract of King and Kraemer's contribution to the 2012 book:

"*The impact of ICT on public administration as illustrated in the previous chapters appears to be less than anticipated by the 1998 book. This does not mean that the cumulative impact is trivial. Over time the effects could be significant. There has been a great deal of change since 1998, but not in areas anticipated. This is a surprise, and this chapter comments on the* *nature of surprise and the lessons learned about ICT, civil society and public administration that might affect design."*

Since the emergence of the Internet into the wider public sphere in the 1990s, there has been a sizeable body of cyber optimism in the e-government literature. This optimism has taken a number of forms and prognostications including predictions of government that is seamless, participative, decentralised, devolved, transparent and open, not to mention e-governance – a concept that is usually ill-defined (Bannister and Connolly, 2012). Nobody is denying that there have not been substantial ICT-enabled advances or improvements in many aspects of government. But large scale and radical change in governance remains elusive. The future, as Yogi Berra once opined, "*ain't what it used to be*"[13].

There are other less visible areas in the e-government literature where predictions have proved turn out to be wrong or premature. There is insufficient space to go into this in more detail, but good accounts can be found in Garson (2004) and Norris (2010).

4. Why Are e-Government Predictions so Often Wrong?

In his study of expert judgement, Tetlock adopts Isiah Berlin's concept of the hedgehog and the fox (Berlin 1953). The hedgehog knows a lot of small things; the fox knows one big thing. Because foxes know one big thing, they base their forecasts of what will happen on this single piece of knowledge (often a pet theory), ignoring, or brushing aside, complexity, nuance and subtlety. Hedgehogs, living in a more complicated world, are more cautious. They are thus disinclined to make big bets on the future and as a consequence are less likely to get their predictions spectacularly wrong. Unfortunately, many people prefer the simplicity of the fox approach; it is a feature of human nature that people are attracted by the simplicity of big ideas[14]. Another well-known phenomenon is that people tend to associate expertise in one sphere with more general expertise[15] – an assumption that is often ill founded. For these reasons fox-type forecasts tend to be more popular, more visible and more frequently believed than their track record justifies.

A second danger is that forecasts serve certain interests or groups. This is not a public sector specific problem either, but forecasts are not always disinterested. De Wilde (2000, p6) complains that:

"*What bothers me, though, is the said naivety or lack of imagination – the superficiality and predictability of our public discourse about the future, in particular as fashioned in political and governmental circles. After all, such public inconsideration or lack of foresight has at least one very concrete implication: it paves the road for various techno-optimist narratives that are disguised as disinterested explorations of the future while, in reality, they serve the interests of specific commercial sectors*".

A third problem is when people who are authorities in one field feel or believe that this gives them insights into fields in which they are not expert. This phenomenon can be seen the e-

[13] There are various versions of this attributed to other people, including several predating Berra. However, Berra claimed in his 1998 book The Yogi Book, that he had used this particular expression.

[14] Or, as the British Politician Michael Gove (slightly taken out of context) put it" "*People are sick of experts*."

[15] This is why it is often believed that generals or successful businessmen or TV stars will make good political leaders.

government literature (and elsewhere) in the predictions of scholars who are authorities in, or are highly knowledgeable about, one field, but have a limited understanding of other relevant fields. One of the most common manifestations of this problem is in people who understand technology, but have a limited awareness of public administration or more broadly of fields such as organisational behaviour, culture or human psychology[16]. Below we list a number of areas where the knowledge base of e-government forecasters is often deficient.

4.1 Contextual Sources of Error

Contextual sources of error arise when forecasters either fail to take into account and/or are unfamiliar with broad societal or organisational influences on change. Three that are important are politics, power and culture.

4.1.1 Politics

Any aspiring forecaster of developments in public administration or society at large, needs to have a reasonable understanding of politics with both a small and a big "p". While political science is a discipline in its own right, political science and public administration are joined at the hip. A problem is that many (though not all) academics working in e-government have little or no experience of politics at the coalface. The realities of day-to-day politics are often at variance with the closeted world of the ivory tower or the laboratory. If professional politicians can sometimes lose touch with their constituents, it is easy to imagine how those with no direct experience of politics at all can misread the tealeaves.

For example, unless it affects them personally and materially, most people have neither the time nor the inclination to engage in politics, particularly if it requires them to get out of the house, commit substantial amounts of time and involves knocking on doors, marching in the streets or attending public meetings. People do tend to vote (when they have the option to do so). Turnout rates are quite a complicated topic and generalisation is problematic (Franklin, 2004), but by and large most countries have high turnouts (though the USA trails most of the democratic world in this respect – particularly in elections for the House of Representatives). There is some evidence that social networking is leading to increased online political engagement and that this can translate into street level activity (Bakker and De Vreese 2011; Christensen 2011). Unfortunately, other research suggests that such engagement is usually 'lightweight', i.e. it does not involve any solid form of civil engagement in real communities (Vitak et al 2011). There is even a term for this: *slacktivism*. Work by Coleman (2004) and others suggests that sustained, participative engagement makes considerable demands on participants and is challenging to sustain. There are continuing predictions that technology will change political behaviour, but so far, predictions of the nature of that change as, for example, in the Arab Spring, have been wide of the mark. Trends in political party membership globally are hard to assess, but in the UK, with the exception of a recent spike in Labour Party membership, trends have been downwards since the 1920s (Keen and Audicas, 2015) and there is some evidence of a wider European decline (Van Biezen and Poguntke, 2014; Mair, 2013; Van Biezen, Mair and Poguntke, 2012). However social media can impact voting. In a recent referendum in Ireland in relation to the same sex marriage, social media played a significant effect in both shaping the debate and mobilizing voters (McGee 2015). In other countries, such as India, recent research by Sharma and Parma (2017) and by Biswas et al (2014) shows that social media has a significant

[16] A modern variant of CP Snow's two cultures (Snow 1959).

influence on the voting decision of younger voters. These are just some examples of developments that need to be factored into forecasts of technology-driven changes in political behaviour or structures. It is not enough to say that technology will effect such change – it is necessary to demonstrate why this will happen. As Wolsfield et al (2013, p115), writing about the Arab spring, observe "… *one cannot understand the role of social media in collective action without first taking into account the political environment in which they operate*."

4.1.2 Power

Anybody who hopes to make an accurate forecast of significant or radical change, especially on a large scale such as a large organization or even an entire public administration system, needs a firm grasp of the nature of power in general and administrative power in particular. They need to understand what power is, how and why it is used and how its use to prevent change can be (if it can be) countered. Few people are prepared to cede power willingly. Few discussions of public administration reform or transformative government pay any attention whatsoever to this though there are some authors who have addressed it (e.g. Bannister, 2005). In particular, knowledge of the public sector change management literature is important (see Kuipers et al 2014).

Failure to understand power has, for example, led to excess optimism about the speed of abolition of silos and the advent of the one-stop-shop and seamless government. There has been much progress in this area, but progress has been slower and less extensive than expected (a good example of a C2/ITW type error). It is not that these things cannot or will not necessarily happen at some point, but the realities of power and so-called 'turf wars' can stall otherwise desirable developments for years, even decades.

This lack of understanding cuts both ways. Jansen (2012) points out that the visions and goals for the use of ICTs in the public sector are huge, but their realisation requires a broad range of means and measures and people with limited experience of the practicalities of such change quite often underestimate the complexity and work that would be involved. He questions whether managers really understand the many functions and roles of ICTs and how they should be governed. Examining ICT governance approaches in Norwegian government, Jansen finds that there is a mismatch between the functions implicit in the objectives that are stated for e-government and the way ICTs are actually governed. He attributes this mismatch to an inadequate understanding of ICTs and their many functions.

4.1.3 Culture

Studies of the impact of culture on e-government have been few; this is a topic about which there is yet much to be understood (Al Lamki 2018). Failure to understand culture can lead to predictions that extrapolate behaviour in one culture into a quite different culture, which in turn often causes a surprise when predicted outcomes do not occur. One of the commonest culture gaps is between ICT engineers and administrators, but there are often major cultural differences between organisations and countries.

There is a number of schools of thought in organisational culture. One of the most widely cited is the work of Hofstede (Hofstede et al., 1990; Hofstede, 2003; 2011). In his most recent work, Hofstede identifies six dimensions of national organisational culture two of which are *Uncertainty Avoidance* and *Long-Term Orientation*. Both of these influence willingness to accept change. Hofstede suggests that there are wide differences between countries. For example, *Uncertainty Avoidance* is low in China, the USA and most countries in the Anglosphere, but is high in much of Europe, South America and Russia[17]. Other dimensions, such as *Individualism* (as opposed to *Collectivism*) will also affect behaviour and the use made of technology. Hofstede proposes different dimensions of culture for organisations including whether they are internally or externally driven and whether they are open or closed. Work by Schein (1990; 2010) suggests that organisational culture and the nature of leadership can influence how a technology is adopted and used. To make good forecasts, these aspects of organisational and national behaviour need to be understood.

4.2 Misunderstanding Human Behaviour

Errors and oversights of this type arise from failure to take into account how individuals can react to change and from failure to understand the real needs of diverse groups.

4.2.1 Human psychology and Resistance to Change

A common error made by many people is that humans are rational decision makers. The idea of humans as rational decision makers has been thoroughly debunked over the past half century by Simon, Kahneman, Tversky, Fisher and others (e.g. Simon 1972; Kahneman and Egan 2011; Tversky and Kahneman 1974; Kahneman & Egan 2011). Nonetheless, various attempts to address the problem of human uptake of technology have been made in the IS literature, most famously (or notoriously) the Technology Acceptance Model (Davis 1985) and its numerous derivatives (e.g. Venkatesh at al 2003; Venkatesh and Davis 2000)[18] as well as the IS success models of Delone and Mclean (1992; 2003). The problem with these models is that that they mainly state the obvious, namely that if a system or product is useful and easy to use, people will tend to use it. As a basis for prediction, this works well for simple applications or specific technologies, such as well-designed and helpful government websites. Such models are not useful in more complicated situations such as technology-driven changes in forms of governance.

The assumption that people will accept technology because it is apparently rational to do so is not a sound one. Perhaps the most extensive study of this is the work of Rogers (2003) who investigated the factors that lead to innovations being adopted and shows that predicting the success of a technology or innovation is difficult. Gaps remain in our understanding of exactly how individuals evaluate the change related to adoption of a new innovation and then on the basis of that evaluation make the decision whether or not to adopt and continue to use it.

4.2.2 Not Knowing the Problem/Understanding the Human Need

As noted in section 4.1.1, we all, as human beings, have a tendency to think that all people think as we do and know (or should know) what we know and have the same priorities as we have. A little research will normally reduce or eliminate such misconceptions, but It is easy for people working in universities or think tanks have difficulty seeing, or even fail to see entirely, the problems and needs of other groups. Idealised futures can be interesting, but impractical or unrealisable in practice. To take just one example, liquid democracy (Paulin,

[17] See: https://geerthofstede.com/culture-geert-hofstede-gert-jan-hofstede/6d-model-of-national-culture/

[18] For those who like statistics, "Technology Acceptance Model" scores 2.9 million hits on Google Scholar. "Public Administration" scores only slightly more at 3.1 million.

2014) is fascinating as an abstract conceptualisation, but to project it as even a possible future is questionable, if only because most people want governments to run the country well, keep unemployment low, make the streets safe, the schools good, facilitate basic freedoms and so on. If these things are delivered, they are unlikely to be interested in engaging in endless on-line discussions of politics; they have better things to do with their lives.

4.2.3 Technological Determinism

A particular manifestation of this type of detachment is technological determinism. There is occasionally an element of implicit technological determinism[19] in forecasts and this can result in poor predictions. This is a complicated subject (for a discussion of this see Winner (1980; 2010)). One variant of technological determinism is sometimes colloquially described as "*build it and they will come*". Another is that technology in itself creates change. Hauer (2017) points to the need to differentiate between hard and soft determinism, the former being the view that technologies represent a prerequisite for changing society whilst the latter view regards technology only as a key factor that may or may not effect change. Whilst Hauer accepts that new media has enabled fundamental changes in the structure of society, he acknowledges that, as of this moment in time, technology of itself does not create change; change occurs if and when people start using the technology. It is understandable therefore that Winner (2010, pp. 9-10) regards the term "technological determinism" as too strong:

"(technological determinism is) the idea that technological innovation is the basic cause of changes in society and that human beings have little choice other than to sit back and watch this ineluctable process unfold. But the concept of determinism is much too strong, far too sweeping in its implications to provide an adequate theory."

This insight is one of which would be forecasters need to be aware.

4.3 Not Allowing for Cognitive Bias

We referred above to the debunking of the idea that humans are always, or even generally, rational decision makers. The term 'cognitive biases' is used to describe a number of specific types of irrationality in the way we think. When it comes to forecasting, two are particularly important: status quo bias and optimism bias. Others include dystopian bias and confirmation bias.

4.3.1 Status Quo Bias

Another source of forecasting error is failure to account for status quo bias, i.e. that user resistance to an innovation can be due to the bias or preference to stay with what is familiar even if it is less effective or efficient. Status quo bias explanations are considered to consist of three main categories (Samuelson and Zeckhauser, 1988). These are rational decision-making, cognitive misperceptions, and psychological commitment. The first, rational decision-making implies an assessment of relative costs and benefits of change. In the case where the costs of using the new technology appear to outweigh the benefits, status quo bias will result. These costs may comprise both transition costs (such as learning costs

[19] The term 'technological determinism' is thought to have been first used by Thorstein Veblen.

associated with using the new technology) and uncertainty costs which represent the perception of risk or psychological uncertainty associated with adoption of the new technology. The second factor with potential to result in status quo bias is cognitive misperceptions. Within this category, the impact of loss aversion cannot be underestimated. The literature had adequately demonstrated the impact of psychological principles such as loss aversion in relation to human decision-making (Kahneman et al 1982), showing that losses carry greater psychological weighting than gains in value perception. The final factor with potential to influence status quo bias is psychological commitment, which involves factors that are more nuanced and therefore more difficult to influence. For example, psychological commitment can be influenced by sunk costs, social norms and efforts to feel in control. The sunk costs such as previous time, effort and comfort associated with a particular way of doing things have potential to increase switching costs and reluctance to change to an alternative solution. Social norms will influence adoption of a technology through colleagues' opinions about whether they think it is a good idea to use the new technology. Efforts to feel in control relate to the desire to direct a situation. These issues relating to status quo bias merit consideration in relation to successful forecasting as they are likely to exert influence on innovation adoption outcomes.

4.3.2 Optimism and Other Biases

Optimism bias is a well-established cognitive phenomenon (Sharot 2011 – see also De Wilde (2000)). Optimism causes people to overlook or disregard problems and/or obstacles to their view of the future. Although this is an individual cognitive bias, humans tend to extend this to wider phenomenon often translating into a philosophy of "*it will be all right on the night*". This type of bias is readily visible everyday politics (for example in the Brexit debate in the UK or in the statement that trade wars are easy to win[20]). In the academic world, this type of wishful thinking is also common, for example in stage models, where the authors decide what *they* think would be a good development and then forecast that this will happen without any empirical evidence to support such a claim. Often such thinking is reinforced by confirmation bias where people see out evidence that supports their predictions and eschew evidence that might contradict them.

There are also dystopian biases such as pessimism bias (Chapin 2001) and narrative bias as cognitive dissonance. While common elsewhere (think of works such as *1984* (Orwell 1949)). Such negative views of the future are unusual in the e-government literature though the reinforcement hypothesis may be regarded by some as an example of dystopian forecasting.

4.4 Other Sources of Error

4.4.1 Changing the Future

Longer term predictions are sometime made redundant by short term changes from the same technology that are unforeseen, i.e. where the immediate effects of a technology can change the environment or behaviour or even the nature of the problem and, as a consequence, can alter the longer-term outcome. An example is provided by McCall and Dunn (2012) who examined the impact of GIS and office productivity tools on planners. The widespread adoption of these tools, while extremely useful for facilitating routine management tasks, diverted planners' attention from their traditional concern regarding how to help shape the future. Implementing planners' forecasting methods in a computer

[20] And good as well according to Donald Trump. See: https://www.cnbc.com/2018/03/02/trump-trade-wars-are-good-and-easy-to-win.html

does not make planning any less political or an unknown future any more certain. Technologies such as public participation GIS, which uses GIS and the Internet to inform the public and collect citizen inputs, provide no assurance that the public's role in public policymaking will climb above the lowest rungs of Arnstein's participation ladder (Arnstein 1969). This fact has been directly or indirectly referenced in the work of many GIS researchers including Radil and Anderson, 2018; Corbett et al., 2016; Thompson, 2016; Kingston and Cauvain, 2009; Ghose and Elwood, 2003).

4.4.2 Overconfidence and the Unforeseeable

A number of other factors can contribute to poor forecasting. The statistician George Box famously remarked that all models are wrong, but some are useful (Box 1979). A common source of forecasting error is overconfidence in models and computer models in particular. Another is events that could not have reasonably been foreseen such as a radical change in government or a major terrorist act. The events of 9/11 resulted in a number of changes (for example in the area of surveillance and privacy rights) that might not otherwise have occurred (or might have occurred much later). Currently a variety of developments in the world of social media (problems with fake news, psychological profiling, privacy, pornography, identity theft, bullying and so on) are leading to some rethinking about the impact of such technologies (particularly Facebook and Google). It is important to differentiate such events from things that should or might have been foreseen in hindsight. Fortunately, such developments are rare.

Table 1 summarises these potential sources of error:

Contextual oversights	Politics
	Power
	Culture
Misunderstanding behaviour	Resistance to Change
	Understanding the Problem
	Technological Determinism
Cognitive Biases	Status Quo Bias
	Optimism Bias
Other factors	Changing the Future
	Overconfidence in Models
	The Unforeseeable

Table 1: Potential sources of forecasting error

Most of the factors in Table 1 are not independent. There are complicated interrelationships between them (power and culture to take but one example). An exploration of these relationships is beyond the scope of this paper, but is a subject worthy of further research.

5 Towards Better Prediction of the Impact of ICT on the Public Sector

The previous discussion leads to the question: can predictions be made more accurate and, if so, how? In 2015, Tetlock set up a company to try to do just that, using lessons learned from his own research. Another possible approach being sponsored by the US Intelligence

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Community is hybrid (human and machine) forecasting[21] . This is not a new concept, the idea being to combine the different capabilities of humans and machines.

More prosaically there is no yellow brick road to better forecasting, but notwithstanding that fact, there are steps which can be taken to reduce the probability of error and which merit serious consideration by those seeking to increase the likelihood of their forecasts being more accurate. Five areas that need to be well understood before embarking on the types of forecast discussed in this paper are now proposed.

5.1 Technology

First, forecasters need to have a reasonable understanding of the technology that they are forecasting or upon which they are basing their forecasts. In some cases, this may include understanding the underlying science. Of particular importance is to be aware of the relationship of the time horizon to depth of knowledge of the problem. This includes, for any technology, the delivery timeline from concept to laboratory, from laboratory to prototype, from prototype to usable product and from usable product to market. The wildly inaccurate forecast made by Minsky, a highly respected authority on AI (cited above), arose because he underestimated the complexities involved and the limitations of the technology of his time or its likely speed of development.

Where relevant, it is also important to understand the problems of scaling up, producing, rolling out and putting in place a support structure for a new technology. The failure of so many predictions about the impact of innovations such as AI is often due to lack of awareness of the effort and time necessary to do these things correctly. Often this is because, by their nature, these are first time projects and consequently it is not possible to draw on experience. All too often optimism bias (see below) causes people to underestimate the barriers. A primary consideration that will influence prediction accuracy regarding technology uptake and impact is the need to understand the technology under consideration, specifically its potential and limitations, and the challenge involved in speeding it to market successfully.

Forecasters should always understand the affordances of the technologies underlying their predictions and should have a good grasp of the timescales that new technologies require to become practical in terms of things like reliability, support and critical mass.

5.2 Public Organisations and Society

Second, good forecasting of any technology's social or political impacts requires a firm grasp of the behaviour of groups and, where relevant, societies and polities.

There is a number of factors to take into account which were discussed in the preceding section. Probably the first phenomenon to understand is inertia. This manifests itself in several ways. Status quo bias is one manifestation. Culture, and in particular short-term focus and resistance to change is another. Power is a third factor, as people will tend to resist change that threatens their status or authority or, more generally, their power base. When so threatened, they will use a variety of strategies to resist change including deliberately withholding information and creating new obstacles[22]. Social norms are hugely influential as they can slow up change or divert it in unanticipated directions. The literature

[21] https://www.hybridforecasting.com. The first competition will be in September 2018.

[22] Including, in many cases, moving the goal posts.

shows that within an organisation, the individual's social network provides not only information, but has strong adaptive qualities that indicate what is considered acceptable (Cialdini, 1993; Cialdini et al., 1998). This information can be communicated through descriptive norms that describe what others do as well as through injunctive norms that describe what behaviour others approve or disapprove of. These norms have particular influence in a situation of uncertainty, such as would be the case with adoption of innovation as in such a scenario, people rely increasingly on the extant social reality and look towards the actions of others to provide them with guidelines for behaviour (Festinger 1954). For this reason, individuals are particularly likely to follow the lead of others and replicate behaviour when the environment is uncertain (Cialdini and Trost 1998). Consideration of the influence of normative behaviour on innovation adoption or resistance can be further complicated by the fact that normative behaviour can vary considerably within any one organisation (Cooke & Rousseau 1988) and that organisations vary in terms of climate as well as culture, where climate encompasses the unique characteristics of the organisation and the individual concerned. Such issues and their influence need to be taken into account by those seeking to forecast the social or political impact of technology.

Forecasters need to be familiar with the processes by which innovation spreads, and within that context, the role of leadership can be critical (see Schein cited above and McKenney et al (1997)). The key work in this field is that of Rogers (2003). Rogers emphasises consideration of several important concepts including the role of leaders, influencers, mavens and context (social, political, organisational, economic, etc.). Other important concepts include tipping points (Gladwell 2006) and S-curves that analyse the impact of an innovation over time. Finally, there is the role of fashion and fads. In public administration and government contexts this can take the form of a current theory or political climate. NPM is perhaps the outstanding example of our time as it is regarded by many as having failed to achieve what its proponents expected (Hood and Dixon 2015), but nonetheless, for quite a long period it was widely seen by many as the way of the future. Other theories of public administration have gone in and out of fashion (some mentioned above). Forecasters need to be wary of following a herd mentality and always to be critical.

5.3 Human Psychology

The third component is to understand people and the factors that affect or govern individual behaviour. The various adoption and diffusion models developed over the past 40 years are instructive in relation to this. Studies have repeatedly shown that a person's perception of their own ability to use a product successfully affects their evaluative and behavioural response to the product, whilst the level of satisfaction experienced with an existing behaviour increases resistance to adoption of an alternative innovation (Ellen et al., 1991). Thus, the influence of individual factors such as self-efficacy (Bandura 1977) and performance satisfaction on consumer adoption decisions merit consideration. Similarly, it is necessary to consider not only issues such as usefulness, ease of use, learning curves, social norms, peer influence and voluntariness, but also, as we have argued, the nature of power and control as well as creativity and status.

Forecasters need to study human behaviour, especially organizational, group and social behaviour and have a good understanding of cognitive biases and the roles that they play in their own thinking as well as in that of others.

5.4 Politics and Public Administration

Fourth, without a good foundation and understanding of how real politics and real public administration work, forecasts are likely to misfire. Thomas Emerson wasn't quite right when he said that if you build a better mousetrap, the world will beat a path to your door. A whole range of factors come into play including not just whether there is a clear strategic vision, but trends and moment in politics and public administration, the ability to execute change in the existing environment, a clear understanding of need, not just theory, and how this will benefit real people. Part of the problem, and a criticism of NPM, was that it imposed ideas from one sphere into another and was ideological and driven by needs as perceived through the lens of theory rather than practicality. In politics and public administration, as in business, it is critical to be able to distinguish hyperbole from reality.

Forecasters with limited (or an absence of) knowledge of politics or political sciences should consult with a range of people who are familiar with this area including practitioners and scholars. They should seek a diverse range of opinion, including from those who hold contrarian views.

5.5 History

Finally and briefly, any good forecaster should be aware of the history of his field and in particular of previous forecasts. George Santayana once said that those who do not learn from history are condemned to relive it. A lemma to this might be that those who do not learn from the history of bad forecasts are condemned to make more bad forecasts.

Aspiring forecasters should study the history of socio-technical forecasting in the public sector and be aware of where previous forecasts have been both right and wrong. In both cases they should seek to understand why before making their own forecasts.

5.6 Other approaches?

One of the few papers on this problem in the public sphere is that of Cairns et al., (2004). The approach outlines by Cairns et al., is, at a conceptual level, not dissimilar to that described in this paper, although they use different tools as opposed to different perspectives. Cairns et al. propose the use of scenario planning and compare it to a variety of other approaches to forecasting (such as the Delphi method and trend impact analysis). Their paper is practitioner-orientated, but the broad concept of bringing diverse fields of expertise to bear upon planning for future aligns with the approach suggested in this paper. There is an old saying, "*to him who has only a hammer, the whole world appears as a nail'*. A translation of this in the current context might be that to him (or her) who only understands technology, the future appears as what technology can do. This is something good scholars should seek to avoid.

Another approach is that proposed by de Wilde (2000) who argues that, *inter alia*, predictions of the future are often made with the objective of helping to bring that future about. He proposes (2000, p21) that forecasters should use the following four steps:

1. Begin with a rhetorical analysis of the central concepts and arguments that speakers use to support what they consider a likely or desirable future.
2. Try to make the underlying normative choices explicit.
3. Try to identify incongruities or paradoxes in discourses about concrete futures.

4. Move beyond the level of the language and analyse the actual practices in which concrete futures will be situated.

A discussion of de Wilde's ideas is beyond the scope of this paper, but the proposals above are not incompatible with the approach we propose.

6. Conclusion: The Way of the Hedgehog

It is not a subtext of this paper to argue that scholars should avoid discussing the shape or direction of public administration in the future. Ideas and creative, even provocative, thinking are important. However, the value of such discussions is dependent on the depth of understanding as to what is necessary in order to realise that future.

It is also worth noting that views of the future, be they of ICT in public administration or any other aspect of social science, can serve different purposes other than simply being roadmaps for action. They can also serve as visions or idealised views of a possible future. A vision of a future public administration that is fluid, transparent, flexible, participative, integrated, seamless, consultative, transformative and so on is fine, as is an envisioned future of (say) liquid democracy or co-productive e-governance. Idealised futures can provide food for thought and for discussion/debate as to whether they are desirable as well as whether they are achievable and, if so, how they can be realised. Such visions can be inspiring. Utopian worlds are often interesting and provocative and can stimulate thought and debate, even if they are unrealistic or unattainable in practice.

Predicted futures are a different matter. These are designed to influence policy and action and, as is well established at this stage, errors can be costly. Although prediction is sometimes couched in probabilistic terms (Dunleavy et al's work on DEG being a case in point), often it is not; it is presented as a given. From Marxism to history's last man (Fukuyama 2006) to Kurzweil's singularity such forecasts present a future that is ineluctable – an inevitable consequence of history or, in this context, developments in technology. Unfortunately, in the case of Marx and Fukuyama, the future has not obliged. The jury is still out on Kurzweil.

Early writing on e-government and e-democracy was often infected by, in the famous expression of Alan Greenspan, irrational exuberance. We argue that serious scholars should engage in this type of forecasting with caution. In forecasting the future, scholars should adopt (to adapt Berlin) the way of the hedgehog, ensuring that they consider the direction of events taking into account all of its dimensions including not just technology, but power, politics, psychology and even such basics as cost and logistics. The future will one day be history and history, as we all know, is always complicated.

Forecasting is important. It is also exceedingly difficult to get right once one goes much beyond the short term. Poor forecasting is expensive leading to wasted resources and/or missed opportunities and can impose a variety of other non-monetary costs. In this paper we have sought to explore some of the reasons why forecasts are so frequently wrong and suggested a number of ways of reducing the likelihood of such errors. The 6th century Chinese poet, philosopher and founder of Taoism, Lao Tzu, once wrote:

Those who have knowledge, don't predict. Those who predict, don't have knowledge.[23]

This is, perhaps, going a bit too far, but it is certainly a thought worth bearing in mind.

[23] https://www.brainyquote.com/quotes/lao_tzu_130286

References

Adler, M & Ziglio, E. (1996) *Gazing Into the Oracle: The Delphi Method and Its Application to Social Policy and Public Health*, London: Jessica Kingsley Publishers.

Al Lamki, Z. (2018) *The Influence of Culture on the Successful Implementation of ICT Projects in Omani E-government,* Unpublished PhD dissertation, Trinity College, Dublin.

Almazan, R. S., & Gil-García, J. R. (2008). E-Government portals in Mexico. In *Electronic Government: Concepts, Methodologies, Tools, and Applications* (pp. 1726-1734). IGI Global.

Andersen, K. V., & Henriksen, H. Z. (2006). E-government maturity models: Extension of the Layne and Lee model. *Government information quarterly*, *23*(2), 236-248.

Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of planners*, *35*(4), 216-224.

Bakker, T. P., & De Vreese, C. H. (2011). Good news for the future? Young people, Internet use, and political participation. *Communication research*, *38*(4), 451-470.

Bandura, A. (1986). The Explanatory and Predictive Scope of Self-Efficacy Theory, *Journal of Social and Clinical Psychology* 4 (3): 249–255.

Bannister, F. (2005). E-government and administrative power: the one-stop-shop meets the turf war. *Electronic Government, an International Journal*, *2*(2), 160-176.

Bannister, F., & Connolly, R. (2012). Defining e-governance. *e-Service Journal: A Journal of Electronic Services in the Public and Private Sectors*, *8*(2), 3-25.

Bannister, F., & Connolly, R. (2018) The fourth power: ICT and the role of the administrative state in protecting democracy. *Information Polity*, Details, 23(2), 1-17.

Baum, C., & Di Maio, A. (2000). Gartner's four phases of e-government model. *Gartner Group*, *12*.

Bekkers, V. and P. Frissen (1991) "Informatization and Administrative Modernisation: A Comparative Analysis", in Frissen, P., V. Bekkers, B. Brussaard, I. Snellen and M Wolters (Editors), European Public Administration and Informatization, IOS Press, Amsterdam, pp 479-489.

Bellamy, C., & Taylor, J. (1992). Informatisation and new public management: an alternative agenda for public administration. *Public Policy and Administration*, *7*(3), 29-41.

Bellamy, C. and J. Taylor (1998) *Governing in the Information Age*, Buckingham, UK, Open University Press.

Bellin, E. (2012). Reconsidering the robustness of authoritarianism in the Middle East: Lessons from the Arab Spring. *Comparative Politics*, *44*(2), 127-149.

Berlin, I. (1953) The Hedgehog and the Fox: An essay on Tolstoy's view of history, London, Weidenfield and Nicholson.

Biswas, A, Ingle, N and Rou, M. (2014) Influence of Social Media on Voting Behavior, *Journal of Power., Politics & Governance,* 2(2) 127-155.

Box, G. E. (1979). Robustness in the strategy of scientific model building. In *Robustness in statistics* (pp. 201-236). Academic Press.

Bradfield, R., Wright, G., Burt, G., Cairns, G., Van der Heijden, K. (2005). The origins and evolution of scenario techniques in long range business planning. *Futures*. *37*(8), 795–812.

Bunn, D and Wright, G. (1991) Interaction of Judgemental and Statistical Forecasting Methods: Issues and Analysis, *Management Science, 37*(5), 501-518.

Buntin, J. (2016) 25 Years Later, What Happened to 'Reinventing Government?", Governing, September 2016. Accessed 15 June 2018 at:
http://www.governing.com/topics/mgmt/gov-reinventing-government-book.html

Cairns, G., Wright, G., Bradfield, R., van der Heijden, K., & Burt, G. (2004). Exploring e-government futures through the application of scenario planning. *Technological Forecasting and Social Change*, *71*(3), 217-238.

Chadwick, A. (2008). Web 2.0: New challenges for the study of e-democracy in an era of informational exuberance. *Isjlp*, *5*, 9.

Chapin, J. (2001). Self-protective pessimism: Optimistic bias in reverse. *North American Journal of Psychology*, *3*(2), 253.

Christensen, H. S. (2011). Political activities on the Internet: Slacktivism or political participation by other means? *First Monday*, *16*(2).

Chun, S., Shulman, S., Sandoval, R., & Hovy, E. (2010). Government 2.0: Making connections between citizens, data and government. *Information Polity*, *15*(1, 2), 1-9.

Cialdini, R B. (1993). *Influence: Science and Practice* (3rd ed.). New York: Harper Collins.

Cialdini, R.B. & Trost, M. R. (1998). Social influence: Social norms, conformity, and compliance. In D. Gilbert, S. Fiske, & G. Lindzey (Eds.), *The Handbook of Social Psychology* (4th ed., 151-192). New York: McGraw-Hill.

Coleman, S. (2004). Connecting parliament to the public via the Internet: Two case studies of online consultations. *Information, Communication & Society*, *7*(1), 1-22.

Computerworld (2007) Don't Believe the Hype: The 21 Biggest Technology Flops. April 4th, 2007. Available at:
https://www.computerworld.com/article/2543763/computer-hardware/don-t-believe-the-hype--the-21-biggest-technology-flops.html

Cooke, R. A., & Rousseau, D. M. (1988). Behavioral norms and expectations: A quantitative approach to the assessment of organizational culture. *Group and Organization Studies*, 13(3), 245-273.

Corbett, Jon & Cochrane, Logan & Gil, Mark. (2016). Powering Up: Revisiting Participatory GIS and Empowerment. *The Cartographic Journal,* 53. 335-340.

Coursey, D., & Norris, D. F. (2008). Models of e-government: Are they correct? An empirical assessment. *Public administration review*, *68*(3), 523-536.

Cringely, R. X. (1996). *Accidental empires*. New York: Harper Business.

Danziger, J. N., & Andersen, K. V. (2002). The impacts of information technology on public administration: An analysis of empirical research from the "golden age" of transformation. *International Journal of Public Administration*, 25(5), 591–627.

Davis, F. D. (1989), Perceived usefulness, perceived ease of use, and user acceptance of information technology, *MIS Quarterly*, *13*(3), 319–340.

Davis, F. D. (1985). *A technology acceptance model for empirically testing new end-user information systems: Theory and results* (Doctoral dissertation, Massachusetts Institute of Technology).

Debri, F., & Bannister, F. (2015, January). E-government stage models: A contextual critique. In *System Sciences (HICSS), 2015 48th Hawaii International Conference on* (pp. 2222-2231). IEEE.

DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information systems research*, *3*(1), 60-95.

Delone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: a ten-year update. *Journal of management information systems*, *19*(4), 9-30.

Detwarasiti, A.; Shachter, R.D. (2005). Influence diagrams for team decision analysis, *Decision Analysis, 2*(4), 207–228

De Wilde, R. (2000). De voorspellers: een kritiek op de toekomstindustrie.Amsterdam, de Balie. Partially available in English (The Digirati: A Critique of the Futures Industry) at: http://fasos.maastrichtuniversity.nl/profiles/de%20Wilde/English%20translation%20of%20two%20chapters%20of%20De%20Voorspellers.pdf

Dill, D. L., & Castro, D. (2008). Point/counterpoint the us should ban paperless electronic voting machines. *Communications of the ACM*, *51*(10), 29-33.

Doan Chien Thang (2019) Bill Gates' predictions about speech recognition: a historical overview. Available at: https://doanchienthangenglish.wordpress.com/2006/05/05/6/

Dunleavy, P., Margetts, H., Tinkler, J., & Bastow, S. (2006). *Digital era governance: IT corporations, the state, and e-government*. Oxford University Press.

Eichenwald, K. (2012) *Microsoft's Lost Decade*, Vanity Fair Hive, August 2012. Available at: https://www.vanityfair.com/news/business/2012/08/microsoft-lost-mojo-steve-ballmer

Ellen, P.S., Bearden, W.O. & Sharma, S. (1991) 19: 297. Resistance to technological innovations: An examination of the role of self-efficacy and performance satisfaction. *Journal of Academy of Marketing Science,* 4, 297-307.

Farmer, J. D., & Lafond, F. (2016). How predictable is technological progress?. *Research Policy*, *45*(3), 647-665.

Festinger, L. (1954). A theory of social comparison processes. *Human Relations*, 7, 117-140.

Fischhoff, B., & Beyth, R. (1975). 'I knew it would happen'--Remembered probabilities of once-future things . **Organizational Behavior and Human Performance**, 13, 1-16.

Fitgers, B. (2018) Are U.S. Elections Legitimate? The history of electronic voting. Free Press. Available at: https://freepress.org/article/are-us-elections-legitimate-history-electronic-voting-0

Franklin, M. N. (2004). *Voter turnout and the dynamics of electoral competition in established democracies since 1945*. Cambridge University Press.

Friedman, T (2011) This is Just the Start, New York Times, March 1st, 2011.

Frisk, J. E., Bannister, F., & Lindgren, R. (2015). Evaluation of information system investments: a value dials approach to closing the theory-practice gap. *Journal of Information Technology*, *30*(3), 276-292.

Frissen, P. (1998) "Public Administration in Cyberspace" From Bureaucracy to Infocracy: Are Democratic Institutions Lagging Behind?" in Snellen, I.T.M. and W. van de Donk (Editors), *Public Administration in An Information Age*, IOS Press, Amsterdam, pp 31-46.

Frissen, P., B. Brussaard, I. Snellen and M. Wolters (1991) "Introduction", in Frissen, P., V. Bekkers, B. Brussaard, I. Snellen and M Wolters (Editors), *European Public Administration and Informatization*, IOS Press, Amsterdam, pp 479-489.

Fukuyama, F. (2006). *The end of history and the last man*. New York, Simon and Schuster.

Garson, G. D. (2008). The promise of digital government. In *Electronic Government: Concepts, Methodologies, Tools, and Applications* (pp. 3786-3798). IGI Global.

Gates, W. (1999) Business at the speed of thought, New York, Grand Central Publishing

Ghose, R. and Elwood, S. (2003) Public Participation GIS and Local Political Context: Propositions and Research Directions, *URISA Journal.* 15, APA II, 1-24

Gladwell, M. (2006). *The tipping point: How little things can make a big difference*. Little, Brown.

Green, K. C., Armstrong, J. S. and Graefe, A. (2007): Methods to Elicit Forecasts from Groups: Delphi and Prediction Markets Compared. Foresight: *The International Journal of Applied Forecasting, 8,* 17-20.

Hauer, P. (2017) Technological determinism and new media, International Journal of English, Literature and Social Science 2(2), 1-4.

Heeks, R. (2003). *Most e-government-for-development projects fail: How can risks be reduced?* (Vol. 14). Manchester: Institute for Development Policy and Management, University of Manchester.

Hiller, J. S., & Bélanger, F. (2001). Privacy strategies for electronic government. *E-government*, *200*, 162-198.

Hofstede, G. (2003). *Culture's consequences: Comparing values, behaviors, institutions and organizations across nations*. Sage publications.

Hofstede, G. (2011). Dimensionalizing cultures: The Hofstede model in context. *Online readings in psychology and culture*, *2*(1), 8.

Hofstede, G., Neuijen, B., Ohayv, D. D., & Sanders, G. (1990). Measuring organizational cultures: A qualitative and quantitative study across twenty cases. *Administrative science quarterly*, 286-316.

Hood, C., & Dixon, R. (2015). What we have to show for 30 years of new public management: Higher costs, more complaints. *Governance*, *28*(3), 265-267.

Howard, P. N., Duffy, A., Freelon, D., Hussain, M. M., Mari, W., & Maziad, M. (2011). Opening closed regimes: what was the role of social media during the Arab Spring?

Howard, R.A. and J.E. Matheson, (1989) Influence diagrams, in *Readings on the Principles and Applications of Decision Analysis*, eds. R.A. Howard and J.E. Matheson, Vol. II., Menlo Park CA: Strategic Decisions Group.

Isaksen, S. (1988). *A Review of Brainstorming Research: Six Critical Issues for Inquiry.* Creative Problem Solving Group Buffalo.

Jansen, A. (2012). The understanding of ICTs in public sector and its impact on governance. In *International Conference on Electronic Government* (pp. 174-186). Springer, Berlin, Heidelberg.

Kahneman, D., Slovic, S. P., Slovic, P., & Tversky, A. (Eds.). (1982). *Judgment under uncertainty: Heuristics and biases*. Cambridge university press.

Kahneman, D., & Egan, P. (2011). *Thinking, fast and slow* (Vol. 1). New York: Farrar, Straus and Giroux.

Keen, R., & Audickas, L. (2015). Membership of UK political parties.

Keynes, J. M. (2018). *A tract on monetary reform*. Pickle Partners Publishing.

Khondker, H. H. (2011). Role of the new media in the Arab Spring. *Globalizations*, *8*(5), 675-679.

Kingston, R. & Cauvain, J. (2009). The Role of Public Participation GIS in Local Service Delivery. In *Strategies for Local E-Government Adoption and Implementation: Comparative Studies,* Chapter: 32, Publisher: IGI Global, Editors: Chris Reddick, 611-630.

Kraemer, K. and J.L King (2006) Computers, Power and Urban Management: What Every Local Executive Should Know, *Administrative and Policy Study Series*, Sage Publications, California.

Kramer, K. and J.L. King (2012) "Too early to tell?", in Snellen, I. , M. Thaens and W. van de Donk (Eds), *Public Administration in an Information Age: Revisited*, Amsterdam, IOS Press, 281- 295.

Kuipers, B. S., Higgs, M., Kickert, W., Tummers, L., Grandia, J., & Van der Voet, J. (2014). The management of change in public organizations: A literature review. *Public administration*, *92*(1), 1-20.

Kurzweil, R. (2005) *The Singularity is Near*, New York, Penguin Books.

Lang, M., Bharadwaj, N., Di Benedetto, A. (2016) How crowdsourcing improves prediction of market-oriented outcomes, *Journal of Business Research, 69*(10), 4168-4176.

Layne, K., & Lee, J. (2001). Developing fully functional E-government: A four stage model. *Government information quarterly*, *18*(2), 122-136.

Lee, G., & Kwak, Y. H. (2012). An open government maturity model for social media-based public engagement. *Government information quarterly*, *29*(4), 492-503.

Lehr, T.,Lorenz, U., Willert, M., Rohrbeck, R. (2017). Scenario-based strategizing: Advancing the applicability in strategists' teams. *Technological Forecasting and Social Change*. *124,* 214–224.

Lewis, M. (2014) Flash Boys, New York, W.W. Norton.

Mair, P. (2013). *Ruling the void: The hollowing of Western democracy*. Verso Books

Makridakis, S., Wheelwright, S. C., Hyndman, R. (1998). *Forecasting; Methods and Applications.* (3rd ed.). John Wiley.

Maréchal, N. (2017). Networked authoritarianism and the geopolitics of information: Understanding Russian Internet policy. *Media and Communication*, *5*(1), 29-41.

Margetts, H. and Dunleavy, P. (2013) The second wave of digital-era governance: a quasi-paradigm for government on the Web. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences.* [Accessed 23rd January 2019.] Available at: https://royalsocietypublishing.org/doi/full/10.1098/rsta.2012.0382

Margetts, H., & Willcocks, L. (1993). Information technology in public services: disaster faster? *Public Money & Management*, *13*(2), 49-56.

Martino, J. (1983). *Technological Forecasting for Decision Making* (2nd ed.). North-Holland.

McCall, M. K., & Dunn, C. E. (2012). Geo-information tools for participatory spatial planning: Fulfilling the criteria for 'good' governance?. *Geoforum*, *43*(1), 81-94.

McGee, H. (2015) Social media plays major role in Irish poll for first time. *The Irish Times* May 22nd 2015. Accessed 23rd January 2018. Available at https://www.irishtimes.com/news/politics/social-media-plays-major-role-in-irish-poll-for-first-time-1.2222859

McGee, H. (2008) Failure of €37m e-government Reach project criticised by Labour, The Irish Times, 16th December 2008.

McKenney, J. L., Mason, R. O., & Copeland, D. G. (1997). Bank of America: The crest and trough of technological leadership. *MIS Quarterly*, 321-353.

Meijer, A. (2007). Why don't they listen to us? Reasserting the role of ICT in Public Administration. *Information Polity*, *12*(4), 233-242.

Moss, G., & Coleman, S. (2014). Deliberative manoeuvres in the digital darkness: e-democracy policy in the UK. *The British Journal of Politics and International Relations*, *16*(3), 410-427.

Nam, T. (2017). A tool for liberty or oppression? A cross-national study of the internet's influence on democracy. *Telematics and Informatics*, *34*(5), 538-549.

National Research Council (USA) (2010) Persistent Forecasting of Disruptive Technologies: Consensus Study Report. Available at: https://www.nap.edu/catalog/12557/persistent-forecasting-of-disruptive-technologies

Norris, D. F. (2010). E-Government 2020: Plus ça change, plus c'est la même chose. *Public Administration Review*, *70*(S1), S180.

Norris, D. F., & Reddick, C. G. (2013). Local e-government in the United States: Transformation or incremental change?. *Public Administration Review*, *73*(1), 165-175.

Orwell, G. (1949) 1984. Penguin Books

Osborne, D., & Gaebler, T. (1993). *Reinventing Government*, New York, Penguin Books/PLUME.

Osborne, D. (1993). Reinventing government. *Public productivity & management Review*, 349-356.

Osborne, D., & Plastrik, P. (1997). *Banishing Bureaucracy: The Five Strategies for Reinventing Government*. Addison-Wesley Publishing Company, Inc., 1 Jacob Way, Reading, MA 01867.

Paulin, A. (2014, May). Through liquid democracy to sustainable non-bureaucratic government. In *Proc. Int. Conf. for E-Democracy and Open Government*, 205-217.

Purao, S., & Desouza, K. (2011, January). Looking for clues to failures in large-scale, public sector projects: A case study. In *System Sciences (HICSS), 2011 44th Hawaii International Conference on* (pp. 1-10). IEEE.

Radil, S. M. and Anderson, M. B. (2018). Rethinking PGIS: Participatory or (post) political GIS? Progress in Human Geography. Working Paper.

Ringland, G. (2010). The role of scenarios in strategic foresight. *Technological Forecasting and Social Change*, *77*(9), 1493–1498.

Rogers, E. (2003) The Diffusion of Innovation, New York, The Free Press.

Rowe G. and Wright, G. (2001) Expert Opinions in Forecasting. Role of the Delphi Technique. In: Armstrong (Ed.): *Principles of Forecasting: A Handbook of Researchers and Practitioners*, Boston: Kluwer Academic Publishers.

Samuelson, W., & Zeckhauser, R. (1988). Status quo bias in decision making. *Journal of risk and uncertainty*, *1*(1), 7-59.

Schaller, R. R. (1997). Moore's law: past, present and future. *IEEE spectrum*, *34*(6), 52-59.

Schein, E. H. (1990). *Organizational culture* (Vol. 45, No. 2, p. 109). American Psychological Association.

Schein, E. H. (2010). *Organizational culture and leadership* (Vol. 2). John Wiley & Sons.

Seymour, R. (2019) The Twittering Machine, London, The Indigo Press

Sharma, B. & Parma, S. (2017). Impact of Social Media on Voter's Behaviour-a Descriptive Study of Gwalior, Madhya Pradesh. International Journal of Research in Computer Science and Management, 4(1), 5-8.

Siau, K., & Long, Y. (2005). Synthesizing e-government stage models–a meta-synthesis based on meta-ethnography approach. *Industrial Management & Data Systems*, *105*(4), 443-458.

Sitarski, C. (1991) “Conceptual issues in the study of centralization and information technology”, *Canadian Public Administration*, 34, 4, pp 641-663.

Sharot, T. (2011). The optimism bias. *Current biology*, *21*(23), R941-R945.

Simon, H. A. (1972). Theories of bounded rationality. *Decision and organization*, *1*(1), 161-176.

Skinner, J. (2011). Social media and revolution: The Arab spring and the occupy movement as seen through three information studies paradigms. *Working Papers on Information Systems*, *11*(169), 2-26.

Snow, C. P. (1959). *The Two Cultures and the Scientific Revolution.(Repr.)*. Cambridge [Eng.]: University Press.

Sovacool, B. K., & Hess, D. J. (2017). Ordering theories: Typologies and conceptual frameworks for sociotechnical change. *Social studies of science*, *47*(5), 703-750.

Sunstein, C. R. (2018). *# Republic: Divided democracy in the age of social media*. Princeton University Press.

Taylor, J. and H. Williams (1990), "Themes and Issues in an Information Polity", *Journal of Information Technology*, 5, pp 151-160.

Tetlock, P. E. (1999). Theory-driven reasoning about plausible pasts and probable futures in world politics: are we prisoners of our preconceptions? *American Journal of Political Science*, 335-366.

Tetlock, P. E. (2005). *Expert political judgment: How good is it? How can we know?* Princeton University Press.

The National Audit Office (1999) The United Kingdom Passport Agency: The Passport Delays of Summer 1999, National Audit Office. Available at: https://www.nao.org.uk/wp-content/uploads/1999/10/9899812.pdf

Thompson, M. (2016). Upside-Down GIS: The Future of Citizen Science and Community Participation. The Cartographic Journal. 53. 1-9.

Trott, P., Hartmann, D., Van der Duin, P., Scholten, V., Ortt, R. (2016). *Managing Technology Entrepreneurship and Innovation.* Oxon: Routledge.

Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *science*, *185*(4157), 1124-1131.

Tweney, D. (2011) May 25, 1945: Sci-Fi Author Predicts Future by Inventing It, *Wired Magazine*. Accessed 15th July 2018 at: https://www.wired.com/2011/05/0525arthur-c-clarke-proposes-geostationary-satellites/.

Van Biezen, I., Mair, P., & Poguntke, T. (2012). Going, going,... gone? The decline of party membership in contemporary Europe. *European journal of political research*, *51*(1), 24-56.

Van Biezen, I. V., & Poguntke, T. (2014). The decline of membership-based politics. *Party Politics*, *20*(2), 205-216.

Van Cauter, L., Snoeck, M., & Crompvoets, J. (2014) PA Meets IS Research: Analysing Failure of Intergovernmental Information Systems via IS Adoption and Success Models. In *International Conference on Electronic Government* (pp. 72-83). Springer, Berlin, Heidelberg.

Van Cauter, L, Bannister, F., Crompvoets, J., & Snoeck, M. (2016). When Innovation Stumbles: Applying Sauer's Failure Model to the Flemish Road Sign Database Project. *International Journal of Public Administration in the Digital Age (IJPADA)*, *3*(1), 1-18.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management science*, *46*(2), 186-204.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.