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Opinion Paper

The role of IS in the covid-19 pandemic: A liquid-modern perspective

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ARTICLE INFO

Keywords:

Change
 Covid-19
 Liquid modernity
 Information systems
 Order

ABSTRACT

History shows that pandemics can catalyse enormous change, fundamentally transforming the way people make sense of the world. Technologies can also be catalysts of change. While digital technologies are playing a vital role in tackling the covid-19 pandemic, the pandemic also presents a significant opportunity for digital technologies. Some experts believe the pandemic may permanently normalise the comprehensive societal use of digital technologies. This article casts a critical eye over the potential implications of this opportunity in the context of information systems (IS) research and development. We introduce and outline selected principles of Zygmunt Bauman's theory of liquid modernity. We then apply the liquid-modern principles to illustrative examples drawn from the covid-19 literature by focussing on three areas of established information systems interest: control, big data and information privacy. We show that traditional conceptualisations of scientific and societal order and control need to be reassessed; that big data alone cannot order clear and safe paths out of the current crisis and that information privacy regulations are irrelevant when undermined or circumvented by public and private actors. We conclude by making four recommendations for IS pandemic researchers and five practical recommendations in the context of the pandemic.

1. Introduction: the pandemic, technology and the future

Technology is playing a vital role in tackling the covid-19 pandemic. Technologies are enhancing diagnoses of covid-19, shaping spatio-temporal visualisations of virus transmission (Ting, Carin, Dzau, & Wong, 2020; Zhou et al., 2020), providing real-time information updates (e.g.: www.worldometers.info/coronavirus) and facilitating personal, communal, administrative and professional communication during lockdown (Chen, Lerman, & Ferrara, 2020). The pandemic also presents 'a great opportunity for digital technology' (Ting et al., 2020; our *italics*) and may 'permanently normalise the use of digital technologies for socialising, business, education, healthcare, religious worship and government' (Griffin & Denholm, 2020). Consulting firm McKinsey & Company phrase it thus: 'As physical doors close, new digital doors swing open' (McKinsey1, May 2020). The overarching objective of this article is to critically examine the future multi-level implications entangled *with* this opportunity beneath a liquid-modern lens.

The covid-19 pandemic is a complex, intensified, unpredictable instance of change. Agile theorisations (Conboy, 2009) or forms of complexity theory (Guo, Vogel, Zhou, Zhang, & Chen, 2009; Hung & Tu,

2014) are undermined by methodological objectives that aim to handle, tame, steer or otherwise order change (Benbya, Nan, Tanriverdi, & Yoo, 2020; McKelvey, 2004; Sekara, Stopczynski, & Lehmann, 2016). These concepts may well be too rigid for the present conditions. A core premise of Zygmunt Bauman's theory of liquid modernity (Bauman, 2000, 2004, 2007, 2011¹) is that change cannot be rationalised (Sheptycki, 2017) ordered or controlled. Theories and concepts based on an ability to do so are fundamentally flawed.

Our review of emergent pandemic-related literature in the IS and popular domains suggests that the pandemic is relevant to almost every strand and sub-strand of the IS discipline. We argue that three strands are of particular relevance:

- **Control** (Maruping, Viswanath, & Agarwal, 2009): Control in this article will refer both to the predominating epistemologies underpinning IS research, as well as IS research objectives themselves, and to political and organisational measures that aim to mitigate and control the impacts of the pandemic. For example, a research objective for controlling pandemic fake news (Depoux et al., 2020) is shown to be entangled with socio-political tensions and fundamentally misguided from the liquid-modern perspective (see subsection

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¹ The liquid-modern texts cited here are representative, not exhaustive. Bauman published prolifically in an academic and writing career spanning seven decades (Palmer, Brzeziński, Campbell, 2020).

3.8).

- **Big data** (Abbasi, Sarker, & Chiang, 2016; Agarwal & Dhar, 2014): The epistemological and practical implications of big data will be examined in the context of the pandemic. The holistic efficacy of automated diagnostic systems (Alimadadi et al., 2020), for example, must be established in the context of big data itself being intrinsically erratic (see subsection 3.3) and not in isolation from the human beings that the systems are diagnosing (see subsections 3.4 and 4.2.4).
- **Information privacy** (Bélanger & Crossler, 2011; Smith, Dinev & Xu, 2011): Information privacy concerns will be examined in the context of the pandemic. For example, privacy concerns can seem irrelevant when regulations are now so fluidly circumvented (see subsections 3.5 and 4.2.1).

References to technology in Section 3 of this article will refer the reader to one or more of these areas.

We need to assess how technologies are helping the pandemic response. Perhaps more importantly, we will need to assess how they could have helped more. We argue that this analysis should not be conducted using theories built for a pre-covid-19 way of thinking. Liquid modernity, characterised by uncertainty and turbulence, is a theory built for this analysis. Section 2 of the article introduces the theory of liquid modernity (Bauman, 2000) and briefly outlines a selection of liquid-modern principles. Section 3 applies those principles to illustrative examples primarily selected from the covid-19-related academic and popular literature. In this way, subsection 3.1 is informed by subsection 2.1, subsection 3.2 by 2.2 and so on. Section 4 subsequently makes four research recommendations and five practical recommendations in the context of the pandemic response.

2. The liquid-modern world: uncertain, unstable and unfair

'Nothing is built on stone; all is built on sand, but we must build as if the sand were stone.'

—Jorge Luis Borges, *'The Book of Sand'*(Borges, 1975)

Ten liquid-modern principles (Doyle & Conboy, 2020) are now selected, sequentially presented and briefly outlined for consideration in the context of information systems research and development.

2.1. Technological innovation initiates and supports liquid modernity

The volatile conditions of liquid modernity are initiated by technological innovation through the modernising processes of *order-building*, *economic progress* and *globalisation* (Bauman, 2004). Initially facilitating the increased speed and organisation of innovation, our computerised, networked era not only emerges *with* liquid modernity, it is now a driving force *of* liquid modernity. The point is not to challenge technological innovation *per se* but 'the capitalist organisation of mobility' through 'digital capitalism' (Fuchs, 2017).

2.2. Dominant modernist epistemologies must be reassessed and updated

At the mutable core of liquid-modern theory are the epistemological and ethical impacts of complex, postmodern change as it relates to our modernist, human need for rationalistic order and control. In the preceding 'solid' phase of modernity (Bauman, 2000), change was habitually seen to facilitate a grander design, as if change was but a temporary detour to the same collective destination. In liquid modernity change is effectively our only permanence (Bauman, 2011), critically undermining our theoretical and practical conceptualisations of destination - and objective - altogether.

2.3. All solid objectives are necessarily undermined by liquid conditions

The multi-level maximising of readiness for mobile adaption, irrespective of the ability to do so, best meets the liquid-modern criteria for "success" and simultaneously creates its 'aqueous foundations' (Lee, 2005). Liquid modernity prioritises mobility over rootedness, flexibility over rigidity, adaptability over endurance, ephemerality over durability and responsiveness over restraint. Innovation creates the liquid space for further innovation, while concomitantly downgrading or rejecting the original theory, structure, objective, technology or person. However, we remain solidly predisposed to the imposition of order and control upon conditions that are now necessarily liquid and mutable.

2.4. Uncontrollable time produces ethical adiaphorization

The past and the future hold little meaning in the context of unremitting mutability. In liquid modernity time is effectively unrestricted and can no longer be unilaterally disciplined, enclosed, divided and controlled as it was in solid modernity (Till, 2011). Ethical adiaphorization occurs when the past and the future are sacrificed to the demands of the present (Campbell, 2013) and 'systems and processes become split off from any consideration of morality' (Bauman & Lyon, 2013).

2.5. Exterritorial power resists regulation and reinforces inequalities

Power in liquid modernity is separated from political agency and exists primarily in the exterritoriality of electronic networks, where it can be transferred, manipulated or undermined instantaneously (Bauman, 2000). The exterritorial power principle highlights how regulations and guidelines are habitually circumvented. Liquid modernity's most *immobile* are trapped not only by the limits imposed by provided technologies but by broader, entangled institutional factors that can constrain opportunity (Andrade & Urquhart, 2012).

2.6. Private individualism undermines public agency and citizenship

The traditional public space is contracted and delegitimised by the agency of fragmented, inward-oriented liquid-modern individuals (Bauman, 2000). No aspect of citizenship can now be taken for granted (Ellison, 2013). The privatisation of liquid-modern individualism will not reliably support coherence or synchronicity. A liquid-modern lens can expose the unintended human disconnections and the erosion of mutual interest now intensified by sociotechnical integrations.

2.7. Emancipated identity is commodified, requiring perpetual reconstruction

With societal members engaged as consumers, *not* producers, consumptive freedom promotes self-construction of identity that must be solid enough for effective identification but liquid enough to allow for continual re-construction. Increased freedom is not a simple result of this 'paradigm shift' (Baldwin & Von Hippel, 2020). Should the upgraded identity not satisfy individual expectations there is now no one to blame but the individual self. The results are counterproductive homophilisation, hyper-competitiveness, uncertainty (see subsection 2.8) and further human division.

2.8. Uncertainty is generated and required in liquid modernity

Instability creates the conditions for innovation; innovation creates uncertainty; uncertainty creates instability. Continual technological upgrades are associated with an endemic feeling of insecurity (Sheptycki, 2017). This is precisely the state that liquid modernity requires. Mitigating uncertainty by solidifying individual options counters the liquid-modern instinct by restricting both freedom *and* the

space for innovation. Uncertainty, rather than being dominated or controlled, steered or tamed, must now be absorbed, lived with and even manipulated.

2.9. Liquid modernity creates paradoxical conditions

The paradoxical device reveals problematic elements in logical reasoning (Dietrich, 2020). Hence, the solution to intensified technological complexity is *enhanced* technological innovation (Davis, 2013) and the paradoxical ‘Frame Problem’ (Dennett, 1978; Fodor, 1987; McCarthy & Hayes, 1969) is both an intractable philosophical dilemma and one that scientists can continue to work around (Dietrich, 2020). The paradoxical principle can reveal emergent tensions and sensitise IS researchers, developers and practitioners to the fact that technological solutions are not always the cure for conditions that technologies have helped to create and intensify (Davis, 2013).

2.10. Uneven liquid differentiation generates wicked problems

Degrees of solidity and liquidity are best conceived as being interlocked within the modernising processes of order-building, economic progress and globalisation, with liquidity now continually undermining solidity. The stage of modern development within an organisation, sector or region can characterise the degree of solidity and liquidity. Modernising, capitalist-motivated, technocentric IS efforts to solidly order, control and manage are in continual tension with the complex, fluctuating and liquidly differentiated (Turner, 2003) end-user sites for their systems and technologies.

3. A liquid-modern perspective of the covid-19 pandemic

The liquid-modern principles briefly outlined in Section 2 will inform the perspective applied to the covid-19-related academic and popular literature cited in each of the following subsections. References to technology will refer to control, big data and information privacy (see Section 1).

3.1. Technological innovation initiates and supports liquid modernity

Economic progress is facilitated by technologies during the pandemic. ICTs facilitate the transition from office-work to work-in-the-home. Social media enable communication during lockdown (Chen et al., 2020). Video conferencing app Zoom, with 10 million ‘daily meeting participants’ in December 2019, reports 300 million daily participants in May 2020 (theverge.com). Financial institutions that invested heavily in digitisation following the 2007–2008 financial crisis have the infrastructures in place to maintain flows of capital and append new clients (Arner et al., 2020). *The Economist*, referencing British electrical power cuts and television stations shutting down early during the 1970s miners’ strike, captures the present contrast succinctly: ‘The pandemic has not turned the lights off’ (The Economist1, 2020).

Neither has the pandemic ‘killed globalisation’ (The Economist2, 2020). The global economy faces the worst recession since the Great Depression (World Economic Outlook, 2020) but between 18 March 2020 and 19 May 2020 the combined wealth of the top five US billionaires increases by 19 % and the combined wealth of Amazon CEO Jeff Bezos and Facebook CEO Mark Zuckerberg increases by 14 % (Americans for Tax Fairness, 2020). The wheels of ‘software capitalism’ (Bauman, 2000) continue to turn during lockdown: ‘the very richest of the tech billionaires... dominate the highest ranks of the [Forbes] list. Nine of the twenty wealthiest people in the world are tech tycoons’ (Forbes1, March 2020).

Order-building is evident in the global aggregation of covid-19 big data. One study employs the ‘Linguistic Inquiry and Word Count’ tool to extract content from social media posts ‘because the words and linguistic patterns people use in their text could reveal their emotions,

perceptions, and their needs for affiliation, power, achievement, and so on’ (Li et al., 2020). The research motivation is cited verbatim, not only because each liquid-modern principle subsequently presented could challenge the motivation, but because the general application of machine learning to social media content for the purposes of ‘extracting relevant entities, their semantic relationship as well as the emotional sentiment they express’ (Del Vicario, Zollo, Caldarelli, Scala, & Quattrociocchi, 2017) is order-building science that may well upgrade the technological artefact more than its social object. We now trust meta-data but not meta-theories (Anderson, 2008); we prioritise machine learning over human comprehension. During the pandemic we must prioritise people, not technology (Klein, 2020). Utopian visions of global village sociotechnical interconnection are undermined by their technocentric ontology, as well as capitalist ideals, which generalise and isolate the experience of individual people and places: ‘Most hospitals are overcrowded, nearing collapse, while medications, mechanical ventilators, oxygen, and personal protective equipment are not available... We have been in quarantine since March 10. Unfortunately, the outside world seems unaware that in Bergamo, this outbreak is out of control (Nacoti et al., 21 March 2020; our italics).

3.2. Dominant modernist epistemologies must be reassessed and updated

The pandemic is a crisis situation where the speed of response is justifiably vital. It may also be the catalyst for ‘an *even faster* adoption of activities relying on digital’ (Arner et al., 2020; our italics). For example, ‘the scale of the change and the speed at which it is happening is shining a bright light on the fact that companies are facing a once-in-a-generation shift’ (McKinsey1, May 2020). It is, however, the intense focus of that light – and its comprehensible identification of a singular catalyst – that presently concentrates the collective attention on a rate of change that was in untameable liquid flow long before the light was switched on. What is increasingly evident is that people are more conditioned to change than perhaps was realised. Early empirical evidence shows that 78 % of 7,241 island-of-Ireland-based surveyed workers who never worked remotely before the crisis began – and 83 % in total – would like to continue working remotely when the crisis is over (McCarthy, Ahearne, Bohle Carbonell, Ó Siocháin, & Frost, 2020). How quickly people have adapted to lockdown is not ‘remarkable’ (The Economist1, May 2020); people, unconsciously or otherwise, have been habituated to change, not least through rapid technological innovation.

Our habituation to change is undermined by our modern inclination to order and control. Pandemic control measures can be undermined by the very criteria used to define the measure. Inherently mutable covid-19 case definitions (Bedford et al., 2020; Tsang et al., 2020) frequently reorder the course of action demanded of the people the definitions are designed to protect. Similarly, the common practice of ordering pandemic priorities is not necessarily desirable because ‘changing conditions lead to changing priorities’ (Williams & Dawson, 2020). Implementation of control measures to combat virus spread are defined and imposed on a nation-by-nation basis (Nanni et al., 2020). Sweden is, arguably, the most prominent example of the “liquid” control approach (Qi, Karlsson, Sallmen, & Wyss, 2020), with China, arguably, the most prominent “solid” controller. In fluctuating, *wicked* environments both solid and liquid control strategies present complex problems. Decentralised, liquid control measures (Nanni et al., 2020) increase instability (see 3.3). Centralised control approaches (Li et al., 2020) are fraught with ethical risk (see 3.5). In the associated context of big data, decision-makers must remember that the data is but a narrowed, solid snapshot of a wider, liquid process, with the data itself momentarily shaped not only by the technology, but by the data ontology employed and its regulatory environment (Kitchin, 2014). The Surgisphere covid-19 big data scandal is a case in point (Piller, 2020; see 4.1.2). In this light, the indeterminate global spread of technologies might be unflatteringly compared to the untamed spread of a virus. Our over-arching efforts to control the multi-level, *wicked* and mutable impacts of

technological spread can now seem epistemologically, as well as practically, outdated.

3.3. All solid objectives are necessarily undermined by liquid conditions

Pandemic control measures spark multiple national and international debates around, for example, the necessity of lockdowns, the duration of lockdowns, the timing of lockdowns, the efficacy of specific drugs, the benefits or otherwise of facemask and glove-wearing and the precise distance for social distancing. Technologies can now instantaneously connect these sparks, creating fires, or viral online stories. In the case of covid-19, fake news is seen to spread faster than the virus itself (Depoux et al., 2020; see 3.8). The liquid-modern mobility of information undermines institutional efforts to stabilise public understanding during the pandemic.

In the context of big data, some experts are proposing the integrated, centralised and global collection of covid-19 patient and citizen big data (Alimadadi et al., 2020; Depoux et al., 2020). Solid, centralised, big data patterns are inevitably undermined by the continuous, mutable flow of the data itself; by small, liquid input errors that can result in magnified research inaccuracies and implementations (Ienca & Vayena, 2020) and by scientific and jurisdictional differences that must either be homogenised, creating anaemic, untrustworthy data pictures, or will require the order-creating and counterproductive origin-categorisation of the continuously incoming data. What will be undermined by automated diagnostic systems (Alimadadi et al., 2020)? Society, and science for that matter, can simply not provide a coherent, multi-level big data snapshot of itself. There is no simple solution for stakeholders. Deepening human concerns about the ‘robustness of fundamental digital infrastructures’ (Arner et al., 2020) ignore the fact that the digital infrastructure must never be *too* robust if it is to support continual innovation. Robustness is a feature of solidity, not liquidity.

In the contexts of information privacy *and* control, there are calls for the European Commission to mitigate concerns of social control by issuing legislative commitments to delete any collected data at the end of the crisis (Knight, 2020). The European Commission should act in a centralised manner because, it is suggested, legislative measures developed nationally by individual member states could ‘ultimately compromise the fragile Schengen area’ (Barbieri & Darnis, 2020). A solid, traditionally sound, centralising proposal, which fails to recognise that the Schengen area now necessarily depends upon its fragility to foster innovation and maximise globalised potentiality and economic progress.

3.4. Uncontrollable time produces ethical adiaphorization

The spread of the virus, incubation periods, self-isolation periods, lockdown durations, “flattening the curve”, relaxing restriction phases, measuring the R-nought, the race for a vaccine: the language of the pandemic is shaped by space and time. In turn, technology-enabled maps, graphs and curves shape our temporal awareness by ordering our understanding of covid-19’s progress *through* space and time. Before the crisis, many adults spoke of having “no time”. Time was “managed” in perceivable, episodic chunks, rather than uncertain, extended lengths. During lockdown there is an “excess” of time and a seemingly extended, intensified duration of uncertainty. The solid, time-based routines that we rigidly imposed upon our liquid lives, as well as the solid routines that were imposed *upon* us, have effectively been made redundant, with potential now for further long-term change (see subsection 4.2.3).

The long-term is of little perceivable interest in liquid modernity. To mitigate adiaphorization decision-makers must consider the long-term impacts of control measures under significant pressures of real-time implementation and scrutiny, with ‘the most ethically contentious’ measures in pandemic-response typically those that require people to change their behaviour (Williams & Dawson, 2020). A liquid-modern lens expects that those least able to contribute to liquid-modern

priorities will fall further outside the scope of collective care during the crisis: in the context of control, it is ironically those groups perhaps *least* spatiotemporally impacted by pandemic control measures – the chronically poor (UNICEF press release, May 2020), the homeless (WIRED, April 2020), asylum seekers (World Economic Forum, April 2020) and nursing home residents (The Economist3, May 2020) – who suffer most during lockdown. The plight of nursing home residents in many jurisdictions is particularly egregious, not least because they are the constituency deemed most vulnerable to the virus. Not recording the deaths of nursing home residents in data reports (Comas-Herrera et al., 2020) is not only a corruption of the data but one of the gravest ethical calamities of the pandemic. Decision-makers will claim that the pandemic presented a situation of unprecedented uncertainty. The reality is that these complex, uncertain conditions have been developing for some time. Beth Galetti, senior vice president at Amazon: “We are frequently doing things that have never been done before... there is often no playbook to teach nor experts to follow, so we empower people to try new things and learn along the way” (McKinsey2, February 2020). When the past and the future are subsumed by the present and ‘systems and processes become split off from any consideration of morality’ (Bauman & Lyon, 2013) our modernising project becomes a perpetual series of short-termist, disconnected Sisyphean tasks.

3.5. Exterritorial power resists regulation and reinforces inequalities

Exterritorial power resists regulation on multiple levels. Big data is collected at speed, continuously, in vast quantities and, in a very liquid-modern way, ‘more often than not, without a specific purpose in mind’ (Müller, Junglas, vom Brocke, & Debortoli, 2016). One pandemic study has collected more than 50 million covid-19-related tweets and will continue collection ‘uninterruptedly for the foreseeable future’ (Chen et al., 2020). With big data also an ‘informatics of domination’ (Haraway, 1991) enabling new concentrations of power (Crawford, Miltner, & Gray, 2014), the responsibilities of technology developers (Ienca & Vayena, 2020) with respect to the secondary, tertiary and opaque uses of our personal information must now be highlighted, expanded and variegated. As it stands, technologies continue to be rapidly upgraded and deployed while our social responsibilities seem to often rest upon liquid aspiration and jargon. Twitter, for instance, grants real-time access to its complete stream of tweets to select partners only (Boyd & Crawford, 2012) but such regulations are easily, *liquidity* circumvented with technological tools like the Hydrator (Chen et al., 2020). Regulations and guidelines are also politically circumvented. The Global System for Mobile Communications (GSMA), an organisation representing more than 750 mobile operators worldwide, published guidelines for the protection of information privacy during the 2014–2016 Ebola outbreak (GSMA, 2014). Including anonymisation of phone numbers; not identifying individuals; not transferring data beyond the individual operating system and not sharing data with third parties, China Mobile, China Telecom and China Unicom, three state-owned Chinese telecommunication companies, are signed-up members of the GSMA. During the current crisis, major concerns (The Guardian1, April, 2020) have already been raised about the Alibaba-developed, Chinese-state-supported, ‘Alipay Health Code’ app, which spatiotemporally and publicly tracks citizens (Barbieri & Darnis, 2020) and breaks each of the GSMA guidelines. There are suggestions that collected data are being shared with state police (Ienca & Vayena, 2020) and reports that Beijing is censoring criticism, scrubbing the internet and detaining people for spreading “rumours” (The New York Times, January 2020).

Hungary, a member of the “fragile” Schengen area, passed emergency covid-19 legislation allowing Prime Minister Victor Orbán to rule by decree indefinitely (Vijaya et al., 2020). Five days later Prime Minister Orbán suspended ‘the individual data subject’s rights pursuant to... European GDPR’ (privacy-ticker.com, May 2020). Hungarian lockdown measures are being relaxed since 4 May 2020

(hungarytoday.hu, May 2020) but, as of the time of writing, information privacy restrictions have not changed. When exterritorial liquid-modern power can be so easily circumvented, appropriated, manipulated and undermined, frequent IS and technology developer calls to give the “power” to the end-users (Nanni et al., 2020) can seem not only disingenuous but an atomistic abdication of social responsibility, akin to blaming the person pulling the trigger and not the gun itself. A global trading system with ‘an unstable web of national controls’ will not be more humane or safer (The Economist2, May 2020).

3.6. Private individualism undermines public agency and citizenship

Müller et al. (2016) note that the authors of many high-impact big data studies are affiliated with companies like Google (Ginsberg et al., 2009; Michel et al., 2011) and Facebook (Kramer, Guillory, & Hancock, 2014). As Kitchin (2014) points out, big data is not ‘free from ‘the regulating force of philosophy’ (Berry, 2011). The philosophies underlying big data production are informed by order-building, economic progress and globalization. The Goldman Sachs-coined ‘FAAMG Stocks’, identifying Facebook, Amazon, Apple, Microsoft and Google (investopedia.com, 2020), make up 21 % of the S&P 500’s market value during the first quarter of 2020, approximately equal to the combined stock market value of the financial, industrial and energy sectors, with “no physical contact and lockdowns [meaning] this is a crisis that almost works in technology’s favour” (CNN Business, May 2020; our *italics*).

The privatisation of information is ‘the result of the powerful normative effect exerted by technology’ (Lucchi, 2007) but information privacy is rarely studied as a multi-level concept with multi-level impacts (Smith et al., 2011). Calls for the European Commission to act in a centralised manner in relation to data collection (Barbieri & Darnis, 2020) might seem to present a window of controlling opportunity to the public sector in the EU, where private concern now habitually supersedes public agency. However, the public sector, with its own vested interests for maintaining the region’s fragile instability (subsection 3.3), is now increasingly susceptible to undermining itself. The official 19 March 2020 statement issued by the European Data Protection Board (EDPB) is, in this context, revealing. Highlighting transparency, accessibility, security and confidentiality, each EDPB data processing ‘core principle’ for European employers refers the employer *back* to national legislation (EDPB, 2020).

The corporate, political and individual motivations of privatism contract the traditional public space and threaten the efficacy of democratic agency by, firstly, fragmenting the interests of a “public” that is now effectively “private” and, secondly, by blatantly enabling attacks on the democratic ideal through scandals like Cambridge Analytica. The 520-mile roundtrip by Dominic Cummings (chief advisor to UK prime minister Boris Johnson) during lockdown is no less blatant an illustration of private incentive undermining public duty. In the context of control, it is suggested that ‘only by collaborating with concerned communities... can we ensure the efficacy of quarantine orders’ (Depoux et al., 2020; our *italics*). There is no way that the efficacy of quarantine orders can be ensured but there is a burden of responsibility on those proposing or developing technologies to be precise in language, lest the technologically deterministic myth of a technological solution for every social problem (Forbes2, 2019) be further perpetuated. The European ‘personal data store’ approach (Nanni et al., 2020), where citizens voluntarily – or *liquidly* – share spatiotemporal information during lockdown, as well as *all* proposals requiring voluntary downloading of contact tracing apps, will be critically undermined by the unstable reliability of privatised citizenry acting voluntarily and unilaterally. The ideal of the Platonic citizen, with incumbent civic responsibilities and a communal meeting place in the *agora*, is liquified in contemporary modernity by a rampant, privatised individualism that erodes genuine mutual interest.

3.7. Emancipated identity is commodified, requiring perpetual reconstruction

Does emancipated, mutable identity enforce or erode ethical responsibility? Alibaba’s first quarter revenue in 2020 rises 22 % year over year (Forbes3). Amazon’s net sales are up more than \$10 billion from first quarter 2019 (The Irish Times, May 2020). Ethical considerations for the individual purchaser during the pandemic (Steele, 2020), particularly before purchasing a “non-essential” item, might include: Is my purchase putting the health of workers at risk? Does not purchasing put their livelihoods at risk? Beneath a liquid-modern lens, and seemingly supported by cited sales figures, the ethical indifference of the distantiated, isolated mouse-click for a non-essential online purchase emerges as an ephemeral symbol of pure pandemic adia-phorization. Whatever the purchase may imply about me in the instant of the purchase can be forgotten instantaneously and will certainly not apply when the purchased item is delivered, as possession of the item itself will define my identity differently.

The identity on the other side of the mouse-click is also mutable. If Henry Ford and the Fordist factory (Gramsci, 1934) were the prototypical symbols of solid modernity and industry, Jeff Bezos and Amazon may be the prototypical symbols of liquid modernity and technology. Amazon updates daily its covid-19 blog of positive company implementations for Amazon employees, customers and the wider community (blog.aboutamazon.com, 2020). In contrast, a coalition of thirteen US state attorneys general have signed an open letter to Amazon, stating dismay with inadequate health and safety measures at warehouses, noting company retaliation against employees raising health concerns and requesting that data concerning infected employees, which is being withheld, be disclosed (Mass.gov, May 2020). In relation to the data, when questioned during an interview on CBS’s ‘60 Minutes’, Amazon’s senior vice president of worldwide operations, Dave Clark, says: “I don’t have the number right on me at this moment because it’s not a particularly useful number” (The Seattle Times, May 2020). Should this aspect of Amazon’s identity amend the Australian and Canadian governments’ decision to contract with Amazon for storage of covid-19 data (Klein, 2020)? Or can this aspect be easily – *liquidly* – set aside?

3.8. Uncertainty is generated and required in liquid modernity

To apply the liquid-modern uncertainty principle, we turn to the area of fake news (Conroy, Rubin, & Chen, 2015), which is now considered one of the main threats to twenty-first century global society (Del Vicario et al., 2017). In the context of the pandemic the WHO Director General says: “we’re not just battling the virus, we’re also battling the trolls and conspiracy theories that undermine our response” (BBC News, 2020). Defining fake news and effectively distinguishing it from similar constructs, such as misinformation and disinformation, is challenging. Where each of the constructs have been inconsistently characterised by an *intention* to knowingly disseminate false information (Lazer et al., 2018), only fake news is consistently associated with anti-establishment, marginalised actors of nefarious threat to mainstream society: ‘trolls’ and conspiracy theorists (BBC News, 2020), ‘political activists, scammers, alternative news media and hostile governments’ (Bernard, Dennis, Khan, & Webster, 2019). However, when all logical extensions of control to stop fake news end in forms of solid censorship, fake news itself becomes quintessentially liquid-modern and democratic. Firstly, the right to distribute fake news speaks to emancipated, privatised individualism by, in theory, providing all WWW users with platforms for their privatised voices to be made “public”. Secondly, the act of disseminating fake news can be seen as a demonstration of unanchored liquid-modern “control”, where control in itself becomes a form of disruption. Thirdly, the liquefaction of institutional credibility by fake news (Lazer et al., 2018) necessarily creates the liquid-modern space for counterpoint information. Fourthly,

the counterpoint information creates the space for counter-counterpoint information and so on. This process is inherently innovative: the uncertainty (anxiety, frustration or anger (liquidity)) generated by fake news motivates the need for enhanced certainty (solidity) which motivates in turn the propagation of further information (liquidity). A liquid-modern lens frames the exponential rise of fake news and attendant uncertainties as being both inevitable *and* required in the current conditions. Consequently, it is now 'almost impossible' to determine whether a news item is false or accurate based upon the news item itself (Laato, Islam, Islam, & Whelan, 2020).

Fake news will not and should not be controlled. In the context of control, global platforms to combat the real-time spread of covid-19 rumour may do more harm than good, in spite of research that aims to enable stakeholders with 'proactive and engaging' response-narratives (Depoux et al., 2020). Will algorithms make the subtle socio-political distinction between rumour and concern within and between jurisdictions? Will algorithms, like so many technology researchers and developers, seem to assume stakeholder integrity? On 30 January 2020 should a concerned, uncertain American citizen be assuaged and act accordingly when US head of state Donald Trump says: "We only have five people, we pretty much shut it down coming from China" (The Guardian2, April 2020)? On 12 March 2020 should a concerned, uncertain British citizen be assuaged and act accordingly when Prime Minister Boris Johnson *seems* to announce the country's initial herd immunity approach to the pandemic (The Atlantic, March 2020)? Was news that the Trump administration tried to buy a future vaccine fake news (Die Welt, March 2020)? Was news that the Trump administration *didn't* try to buy a future vaccine fake news (Politico, 2020)? If data has been withheld are our data stories fake news? Fake news is not simply a tool for the disenfranchised, the dissatisfied, the misguided and the marginalised; fake news represents us all and the old aphorism may still well apply: just as we usually get the politicians that we deserve, in liquid modernity we may now get the news that we deserve. Fake news is an innovative function of the liquid-modern world. Fake news will be disseminated and absorbed or rejected regardless of external control measures. Fake news is an ephemeral solidification of our liquid-modern values. We must learn how to *live* in these uncertain times, not try and try again to control the uncontrollable.

3.9. Liquid modernity creates paradoxical conditions

Our efforts to stabilise everything are making everything less stable. In the context of data analysis, one study will present solid findings around homophilous behaviour on social media platforms (Del Vicario et al., 2017), while another states that up to 15 % of Twitter accounts are automated social bots, with any success at detecting bots likely inspiring liquid 'countermeasures by bot producers' (Lazer et al., 2018). How reliable can IS research on human group dynamics be when we cannot even be sure that all of the group members are human? The patterns found within data sets are neither 'inherently meaningful nor reliable' and interpreting them as such can 'produce serious ecological fallacies' (Kitchin, 2014). Did our pandemic data patterns include nursing home residents? And if not, why not? The point is not to deny the importance of analytics in the pandemic response but rather to highlight that, in liquid modernity, with data patterns themselves inherently mutable, it is not the case for analytics that is under severe threat, but the case for accumulated human intuition (see 4.1.1).

In the context of big data, 'Cognitive Load Theory' has been shown to undermine trust between people (Samson & Kostyszyn, 2015) and also the trust of people toward AI systems (Zhou et al., 2020). Laato et al. (2020) note that humans experiencing information overload are likely to make careless decisions (Samson & Kostyszyn, 2015). The paradoxicalities of liquid modernity see information exposure increasing exponentially, which drives the motivation to order the information, which increases the information load, which increases the instability, which increases the uncertainty, which furthers the collapse

of trust and increases the potentiality for dangerous decision-making: 'in a world of communication, the problem is noise' (Bauman, 1987). Hence, it is the individual's *choice* that now limits exposure to ideologically diverse news and opinion more than algorithmic filtering (Bakshy, Messing, & Adamic, 2015) and while these human, identity-making choices may increase harmony *within* social sub-groups they decrease harmony *between* sub-groups (Settle, 2018). A liquid-modern lens anticipates that individuals will not embrace the emancipatory power of social media (Castells, 2007) but rather choose to ease consumptive-choice anxiety in the familiarity of routinised internet pathways and in newsfeeds that support rather than challenge the subjective worldview. Users want a semblance of solidity as much as the IS researcher, developer or practitioner. In this light, IS findings that social media paradoxically support both emancipation *and* hegemony (Miranda, Young, & Yetgin, 2016) are not surprising. Homophily and polarisation are a very solid, human response to liquid uncertainty.

3.10. Uneven liquid differentiation generates wicked problems

If the spread of covid-19 is partly a result of digital and technological change in the past century (Keesara, Jonas, & Schulman, 2020) it might, in the present context, be considered a 'liquid' pandemic. In this light, the Pandemic Influenza of 1918, which spread more slowly and accounted for the majority of its victims in its second wave (Barro, Ursua, & Weng, 2020), might be considered a 'solid' pandemic. In the centennial interim the modernising project has established global, if liquidly differentiated, spread (Bauman, 2004).

It is suggested that technologies hold global solutions for local problems (weforum.org, 2018) but local solutions cannot necessarily be scaled globally (Turchin, Denkenberger, & Green, 2019). Liquid modernity's uneven spread, particularly between developed and developing sectors and regions, implies that the emergent task for policymakers now is, in fact, to find *local solutions for global problems* (Bauman, 2004; our *italics*). The pandemic highlights this situation quite clearly when, for example, control measures reasonably suggested in one region are inappropriate for another or when vaccine research customarily assumes 'the conditions of a liberal western democracy' because the 'overwhelming majority' of pandemic vaccine literature originates in Europe and North America (Williams & Dawson, 2020). Liquid differentiation (Turner, 2003) intensifies the scaling complexity associated with all technological interventions and highlights regional differences in the rate of *assumed* modern progress, where developing nations maintain greater reliance on solid infrastructures, with developed nations evidently more liquid. Liquid stratification is not only nationally differentiated: when pandemic research notes that social media users from developed cities 'attract more social capital which will enlarge their influence upon others' (Li et al., 2020), what regional disparities might big data research propagate through the socio-political interventions that the studies inform?

Finally, there are also concerns around the emergence of a 'data divide' (Marton, Avital, & Jensen, 2013). With companies like Google (Ginsberg et al., 2009; Michel et al., 2011), Facebook (Kramer et al., 2014) and Twitter (Boyd & Crawford, 2012) attempting to place solid controls around their data, the 'haves and the have nots' (Trauth, 2017) include those with and without access to information. During the pandemic Amazon has been identified (The Seattle Times, May 2020) and China is widely suspected of withholding important data (Scissors, 2020). Susceptible, differentiated data pictures, with data not 'simply [speaking] for themselves, free of human bias or framing' (Kitchin, 2014).

4. Recommendations

4.1. Recommendations for IS pandemic research

4.1.1.

The Black Death pandemic in fourteenth century Europe ‘catalysed enormous societal, economic, artistic and cultural reforms’ and provoked ‘fundamental shifts in peoples’ interactions and experience with religion, philosophy and politics’ (Griffin & Denholm, 2020). Wickedly entangled with technological change, the covid-19 pandemic has the potential to be even more impactful because technology too is bringing the very real possibility of a paradigmatic shift in our approach to making sense of the world (Gregor & Klein, 2014; Kitchin, 2014). ‘Out with every theory of human behaviour, from linguistics to sociology... there’s no reason to cling to our old ways’ (Anderson, 2008). The language is reminiscent of solid modernist Henry Ford, speaking in 1916: “History is... bunk. We don’t want tradition. We want to live in the present and the only history that is worth a... damn is the history we make today” (Butterfield, 1965): solid modernity, it seems, is being reborn in cyberspace. A shift towards positivism must be resisted. If we are near ‘the end of theory’ (Anderson, 2008), then the wisdom and intuition accumulated through millennia of human experience and interaction is under severe threat. Many twentieth-century human skills are already redundant (Dede, 2009), with little inspiring evidence of countermanding human upskilling. In the context of pandemic research, the overarching application of a positivistic research lens would be ethically and pragmatically disastrous.

4.1.2.

The scientific method is underpinned by the desire to order. Order itself, however, and any attendant truth-claims, are fundamentally mutable in liquid modernity. The covid-19 Surgisphere data scandal (Piller, 2020) and the ‘Study 329’ Paxil scandal (Lane, 2015) are just two cases of liquid-modern misconduct that involve researchers, data, a medical analytics company, pharmaceutical companies, politicians, the media and the general public. We must examine why the results of ‘flawed studies’ are still ‘treated as if they were breaking news’ (Lane, 2020). Additionally, order-building pandemic research objectives informed by the need to assist ‘concerned authorities... sense the mood of the public [and] the information gaps between the authority and the public’ (Li et al., 2020) are potentially compromised by the research being funded by multiple Chinese state organisations. Constructive dialogue must be initiated around the unilateral efficacy of the scientific method. In liquid-modern conditions we must now relax – or make more *liquid* – the autarchic need for establishing scientific “order”. Mutable, data-supported empirical snapshots can be enhanced by filtering less traditionally rigorous – or *solid* – research approaches. Can it be the case that, in the context of this article, liquid-modern perspectives are of no practical use at all unless empirically measurable? Eighty-three percent today may be 93 % or 43 % six months from now (McCarthy et al., 2020; see 3.3).

4.1.3.

Bauman’s decision to prioritise ethics over ontology (Campbell & Till, 2010) positions liquid modernity as an alternative to pre-dominating technocentric IS theories (Sahay, Sein, & Urquhart, 2017) imbued with an informational capitalist agenda that can intensify societal inequalities (Trauth & Howcroft, 2006). In that spirit, the responsibility for meaningful human interconnection must rest with humans, not technologies. Technologies may facilitate interconnection, but they should not drive and define it. To that end, IS research should be reflective of the people that IS ultimately serve, and not a subset of people predisposed to particular ontologies, methods and worldviews. The perspective of those at the coalface of IS research must be expanded. Conversely, but in the same spirit, independent researchers should be afforded the same access to data as researchers affiliated with

technology companies.

4.1.4.

Liquid modernity is not a technophobic thesis. Neither is it a theory for sociology, or for philosophy, a line of argument that contributes to the solid siloing of academic interest and intent, ignores the *wicked* nature of the problems outlined in Sections 2 and 3 and puts researchers and developers at continual risk of making *un*-reflexive, inaccurate assumptions about the integration of people and technologies. Open, constructive, cross-disciplinary assimilation of divergent worldviews is urgently required in IS. Explored and applied by IS scholars (including Boland, 1991; Myers, 1995; Butler, 1998), the relative novelty of the hermeneutical approach in mainstream IS research, for example, does presentsignificant challenges (Cole & Avison, 2007) but may also present a collaborative way forward. In Bauman’s approach to hermeneutics, ‘by spotting the general in the particular’ (Bauman, 1978) our understanding becomes circuitous and everything remains necessarily open to reinterpretation (Davis, 2020). Even empirical data can be re-illuminated by the hermeneutic method (Smith, 2007). Any consensus of understanding - however temporary or localised - that a dialectical hermeneutical approach informed by liquid-modern principles might illuminate between *all* stakeholders in targeted stages of the IS development process, might be the most stable thing that we can hope for in liquid modernity.

4.2. Recommendations for practice in the context of the covid-19 pandemic

4.2.1.

In the context of the pandemic, we must make distinctions between what we *must try* to control, and what we should *not even try* to control. The common pre-vaccine prioritisation of groups for vaccine access, for example, can be fatally counterproductive as conditions change (Williams & Dawson, 2020). With our temporal horizon effectively “framed” by the present, postponing pandemic mitigations based on *any* prioritisation criteria is fraught with danger. The developing situation in Brazil (The Guardian3, June 2020) is a case in point. Clearly we must try to control the spread of the virus. On the other hand, trying to control the spread of pandemic fake news is misguided. Similarly, we must question the efficacy of official regulations and guidelines that are easily, liquidly circumvented. If the guidelines or regulations can be circumvented, creating them becomes an exercise in jargon-production and a waste of resources. This is not defeatism. A clear, honest acknowledgment of the present conditions may inspire new research approaches, increase societal trust and free up resources that can be better applied.

4.2.2.

As social inequalities are rapidly intensified during pandemics (Ahmed, Ahmed, Pissarides, & Stiglitz, 2020), it may be helpful for decision-makers to multi-level conceptualise solidity and liquidity when designing pandemic interventions. All control measures, while potentially stimulating benefit in one area, will necessarily destabilise another. Country of residence, for example, will likely become ‘a significant contributing factor’ determining access to vaccine (Williams & Dawson, 2020). If solid interventions, structures and systems are designed with the knowledge that they *are* being undermined, conceptualisations of the optimal balance between solidity and liquidity may be inspired. In organisations, for example, it is noted that ‘entrenched systems that... supported businesses for years – tech stacks, reporting lines, processes – have been no match for the dynamic *fluidity* of the current crisis (McKinsey1, May 2020; our *italics*). The crisis intensifies our awareness of fluidity but the eventual passing of the crisis will not see fluidity solidified, only more widely differentiated in ways that diminish the current awareness. We must take advantage of our current awareness and not continue to think as we did in a bygone age, imposing the same solid objectives on conditions that are now - and

have been for some time - fundamentally different.

4.2.3.

Liquid modernity recasts traditional conceptualisations of management. Twitter has announced that staff are permitted to work from home 'forever' (siliconrepublic.com, May 2020). Organisations big, medium and small that wish to get ahead of the curve will follow suit. IS will facilitate this transition but systems must be designed with the individual, societal and organisational dangers this transition presents to the forefront of the design process. When the creation of wealth now 'coincides with the whole time of life' (Terranova, 2006) such a radical shift is fraught with risk. Working from home, however, is also inherently liquid-modern. Stretched to its logical conclusion, liquid modernity undermines the traditional need for management entirely. Managers and decision-makers can no longer even be sure who is actually *in* control, when it is now more likely that the assumed controller/s and the real controller/s in any situation are not even in the same room, building or time-zone.

4.2.4.

Pandemic decision-makers must not be unduly impressed by the magnitude of big data. A library that is bigger is not necessarily better (Borges, 1944). Contrastingly, but in support of the same point, 'the underdetermination of scientific theory' is a philosophical argument that suggests that the evidence (or data) available to us at any particular time may be inadequate for determining what beliefs we should hold in response to that evidence (Stanford, 2017). Decision-makers must not be excessively guided by data patterns that are themselves mutable, corruptible and incomplete. However, holistically inclusive decision-making processes must be more than superficially collaborative. The plight of nursing home residents may have been mitigated by a decision-making framework that limited adiabaticization, which subsequently begs the question: can big data be ethical? The safest route into the future for all, and one that may facilitate the transition from 'technology-centred development toward human-centred design' (Crang & Graham, 2007), is the route that simply puts people first in decision-making processes. In the context of information privacy, IS research is habitually conducted in isolation from the actual users of the privacy tools (Bélangier & Crossler, 2011). Contact-tracing app development provides pandemic researchers with an immediate opportunity to centre people and pragmatically address this concern. The guiding principle must not be what we *can* do, but rather what we *should* do.

4.2.5.

The pandemic *does* present 'a great opportunity for digital technologies' (Ting et al., 2020). However, if digital transformation is the 'elixir of the twenty-first century' (Datta, Walker, & Amarilli, 2020) we would be well advised to be prudent in our language and cautious in our approach to rapid transformation that is happening regardless of collective intent. The United States' health system may indeed require a comprehensive 'digital revolution', 'unleashing the power of digital technologies' (Keesara et al., 2020). However, when those delivering public digital transformation solutions are, in some digital quarters, unironically dubbed "missionaries" (Datta et al., 2020), the reality of digital evangelism is made explicit. The pandemic response is better conceived as 'a largescale social experiment' (Arner et al., 2020), wherein underlying conditions of critical liquid-modern mutability - conditions already present before the virus began to spread - may now be more clearly perceived, understood and acted upon.

5. Conclusions & future research direction

In liquid modernity there is no longer any playbook. Where progress and innovation will bring us next, no one knows. Neither does anyone know when or where the next pandemic - the next crisis - will come from. As of 19:19 h on 12 June 2020, the 'Worldometer' records

2,099,910 covid-19 cases and counting in the United States, with 116,273 deaths (www.worldometers.info/coronavirus/us). Fresh outbreaks of the virus have raised fears of a second wave, with officials in Texas saying they are 'approaching the precipice of disaster' (Financial Review, June 2010). However, with 'Black Lives Matter' protests escalating and spreading, (www.blacklivesmatter.com), it is unclear which crisis is now being prioritised in the minds of the people and the minds of the authorities.

In the context of this article, the real opportunity presented by the covid-19 pandemic is the opportunity for those who research, develop and use digital technologies to fundamentally reflect and reorientate (Sein, 2020). Incredible work is being done in IS and this is a very exciting time for the field. However, those who research and develop technologies must be adequately conscious of, and exposed to, the negative impacts of those technologies (Chiasson et al., 2018). Liquid modernity is, by nature, a fluid theory, with interdependencies between concepts and many layers of complexity. Nevertheless, for our future research direction we believe that liquid-modern theoretical principles, appropriately presented, can provide the IS field with an alternative, important and very timely critical lens. Our collective hopes and aspirations, however liquefied they may be and however they may be collectivised, must not remain in perpetual, hopeless pursuit of technological innovation.

Acknowledgments

This work was supported with the financial support of the Science Foundation Ireland grant 13/RC/2094 and co-funded under the European Regional Development Fund through the Southern & Eastern Regional Operational Programme to Lero - the Science Foundation Ireland Research Centre for Software (www.lero.ie)

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