Financialization and information technology: themes, issues and critical debates – part I

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Since the mid-1980s, the growth of computerization in financial markets has been significant. Technological advances have changed the economics of finance and banking. The extant literature shows how the trading process has become increasingly automated, from order entry to trading venue to the back office (Kirilenko and Lo, 2013). Despite vast technological changes over several decades, there are relatively few studies in information systems and management scholarship on the transformation of financial trading and markets which embrace wider issues of the positive and negative aspects of financialized economies (Starkey, 2015). Studies published prior to the financial crisis of 2008 examine topics including, information technology and time-based competition in financial markets (Dewan and Mendelson, 1998), artefacts used in electronic trading and banking (Barrett and Walsham, 1999; Clemons and Weber, 1996) and asymmetric information and insider trading (Marsden and Tung, 1999). Following the financial meltdown, research has considered investor competence and trading (Graham et al., 2009), experimentation in financial markets (Massa and Simonov, 2009), financial objects in investment banking (Muniesa et al., 2011) and regulatory compliance (Bamberger, 2009; Gozman and Currie, 2014).

This special issue on financialization and information technology is organized in two parts, with the first introducing themes, issues and critical debates, and the second, discussing the importance of multi-paradigmatic approaches to finance and IT. The issue has three objectives. First, it combines scholarship from social science disciplines (finance, information systems, political economy) on complex theoretical, empirical and practical issues and debates within financialization, in which multiple actors interact via different levels and units of analysis (Krippner, 2005). Second, it situates financialization in the context of financial innovation and technology. More specifically, it considers how technology mediates and shapes financial markets in periods of stability and crisis. Third, it recommends more multidisciplinary theoretical and empirical work to distinguish accounts which treat financialization as a descriptive variable or as a causal variable with wider implications for markets, firms and investors (Casey, 2012; Lapavitsas, 2011).

Part I begins with an examination of themes, issues and critical debates in the financialization literature. It then gives examples of how scholars have identified information technology as playing an important role in financial markets and in financialization. This section distinguishes financial innovation from technological innovation – two terms often conflated in the social sciences. A brief overview is then given on methodological considerations to note that correlation and causality require greater transparency in financialization studies which sometimes confuse outcomes as being the direct result of policy decisions or technological change. The editorial continues with a brief discussion on the criticality of problematizing financialization as a phenomenon which requires more refined definitions and disciplinary integration. Finally, a brief overview is given of each of the five papers featured in this issue.

Financialization: themes, issues and critical debates

The financialization thesis spans several social science disciplines with a variety of definitions. The common thread is the pervasive financialization of global economies (Epstein, 2005) and the increasing importance of financial markets, financial motives, financial institutions, and financial elites in the
operation of the economy and its governing institutions, both at the national and international levels’ (Epstein, 2002, p. 2). Financialization examines how individuals, firms and economies are mediated by changing relationships in financial markets (Montgomery and Williams, 2009, p. 100), how economic activity is influenced by the logics and imperatives of interest-bearing capital (Fine, 2010, p. 99), and how regulation is imposed on financial firms with implications across multiple legal and regulatory jurisdictions (Krippner, 2005).

Financialization fuels public policy concerns at macroeconomic and microeconomic levels (Palley, 2007, p. 3) since it is the mechanism through which individuals interact with complex and deregulated global capital markets (Casey, 2012, p. 13). The effects of financialization are considered to be wide ranging despite the concept remaining ‘raw and undeveloped’ (Lapavitsas, 2011, p. 611). In politics, economics and sociology, financialization occupies centre stage in critical debates. Neoliberal financialization, for example, is viewed as the cause of a secular trend in rising social inequality (Piketty, 2014). This body of work goes beyond correlating financialization with increasing economic and social problems towards causal explanations (Palley, 2007). In this politically charged debate, the financialization links inequality with two competing positions – that financialization causes inequality (Lazonick, 2010) or inequality causes financialization (Saith, 2011).

Similarly in classical Marxist political economy, financialization is seen as a driver for the systematic transformation of mature capitalist economies (Lapavitsas, 2011, p. 611). Financialization as a process interacts with financial markets, financial institutions and financial elites to acquire greater influence over policy and outcomes. Process accounts identify three distinct conduits as financialization changes the structure and operation of financial markets, modifies the behaviour of nonfinancial corporations and shapes macro-and microeconomic policy (Palley, 2007, p. 2).

The expanding body of work on financialization recognizes the importance of information technology in shaping the future direction of finance and financial markets (Lapavitsas, 2011). How and why information technology changes the ‘mix of labour skills deployed by financial intermediaries’, however, is not well understood or articulated (Lapavitsas and Dos Santos, 2008). This is a missed opportunity in studies from political economy and sociology, as relentless technological change over several decades has transformed the financial sector, with the displacement of ‘humans’ on the trading floor, replaced by ‘robo’ or ‘algorithmic’ trading (Mackenzie, 2015). Labour inequality as an illustration of financialization features more widely in other social sciences disciplines. An opportunity exists for information systems researchers to contribute to financialization debates by examining the mediating role of information technology between markets, regulators, firms and investors.

**Financialization and information technology**

The relationship between financialization and information technology is underplayed in the broader financialization literature, yet recognized as a significant factor in the development of global financial markets and institutions (Freedman, 2006). Financialization studies from economics and political science situate information technology more commonly under the theme of global outsourcing to illustrate an example of globalization. Here, outsourcing is presented as a policy decision of firms that seek to cut labour costs by relocating their information technology assets in countries with cheap labour and less regulation (Milberg and Winkler, 2009). Dore suggests, ‘Financialization is a bit like “globalization”—a convenient word for a bundle of more or less discrete structural changes in the economies of the industrialized world’ (Dore, 2008, p. 1097). Other literatures on the ‘hegemony of financialization’ from spatial geography locate the origins of the 2008 crisis under four distinct spaces. The role of information technology is implied in this work which considers how competition operates in international financial centres (such as London and New York), the ‘insularity’ of day-to-day ‘geographies of money’, ‘structural dependencies’ (between China and the USA) and the ‘growing power of the financial media’ (French, Leyshon and Thrift, 2009).

Unlike the financialization literature which remains relatively silent on the artefacts, mechanisms and complexities of information technology on global financial systems, firms and markets, the information systems literature situates information technology at centre stage of research enquiry. Information systems scholars examine a variety of topics given lip service by financialization scholars, with examples of computerization in financial markets (Kauffman et al., 2015; Gozman and Currie, 2014), developing countries (Averou, 2008) health and social care (Braa et al., 2007) and global outsourcing (Lacity et al., 2011). In many ways, financialization and technological changes represent two sides of the same coin. Financialization, looking through the telescope, observes the big picture of how financialization has shifted industrial capitalism to financial capitalism, with technology playing a large part in this process (Lapavitsas, 2011). Many studies ‘interrogate how an increasingly autonomous realm of global finance has altered the underlying logics of the industrial economy and the inner workings of democratic society’ (Van der Zwan, 2014, pp. 99–100). Information systems scholars more commonly look through the microscope to observe the social and organizational landscape to examine the adoption and deployment of information technology (Avion, 1995). The majority of this work, however, does not penetrate the macro-social phenomena to describe or explain the extent to which technology mediates regulatory, market and firm practices.

The pervasive effects of information technology on numerous industrial sectors (finance, healthcare, education, housing) over several decades provide an even stronger case for multidisciplinary academic research which links themes, issues and critical debates. Combined with the financialization literature, a multi-level (macro, meso and micro) approach offers a deeper analysis of how policy making at the societal level (i.e. financial/technological regulations, taxes, sanction) impacts financial markets, institutions, organizations and individuals, with technology playing a mediating role.

The shortage of academic scholarship on the relationship between financialization and information technology offers an opportunity for researchers to consider a number of questions. For example, What role did information technology play in the global financial crisis? How is information technology used to develop new financial products and services? Does information technology change the nature of financial markets/trading? To what extent is financial trading being
Financial innovation: the collateralized debt obligation (CDO)

In recent years, scholars have considered emerging financial innovations, and more crucially, their impact (both positive and negative) on financial markets and firms (Styhre, 2015). One example is the collateralized debt obligation (CDO) which is singled out as having a deleterious effect on the economy and society at large (Litan, 2010). A CDO is a structured financial product that combines cash flow-generating assets that are repackaged into discrete tranches and sold to investors. Technology has played an important part in the CDO market, not only by facilitating interconnectivity across banks, but also by concealing the hidden complexities and constituent risks from regulators and investors (DeBenedictus, 2008).

Prior to the crisis, a single bank could pool together 5000 different mortgages into a CDO. An investor who purchased the CDO was paid the interest owed by the 5000 borrowers whose mortgages made up the CDO, but faced the risk that some borrowers may default on their loans. The pooled assets (i.e. mortgages, bonds and loans) become debt obligations that made up the collateral for the CDO. The tranches in a CDO varied in their risk profile, with senior tranches having first priority on the collateral in the event of default. The senior tranches of a CDO generally have a higher credit rating with lower coupon rates compared with junior tranches that offer higher coupon rates to compensate for their higher default risk (Investopedia, 2017). CDOs were created and sold by most major banks (e.g. Goldman Sachs, Bank of America) over the counter, i.e. they were not traded on an exchange but were bought directly from the bank.

Leading up to the crisis, the financial industry faced meltdown as banks had acquired a trillion dollars in worthless assets with about half this figure (US$503 billion) in CDOs (SIFMA, 2010). As many banks experienced huge losses, the interbank lending market stagnated, as no bank would lend to another bank holding CDOs. The banking crisis witnessed Citigroup losing $34 billion on mortgage CDOs and Merrill Lynch losing $26 billion. The insurer AIG was seriously damaged due to selling $500 billion worth of Credit Default Swaps to insure against defaults on CDOs, since it was unable to meet such payments.

Technological innovation: high-frequency trading

A major technological innovation in financial services in recent years has been high-frequency trading (HFT). HFT is a subset of algorithmic trading which uses proprietary algorithms. Typically, trading follows two forms. First, execution trading typically involves a large order executed via a computerized algorithm using a program designed to secure the best price (Brogaard et al., 2014). The order may be split into smaller pieces (tranches) and executed at different times. Second, rather than executing a set order, HFT algorithms search for small trading opportunities in the market. It is estimated that 50 per cent of stock trading in the USA is driven by HFT (Nasdaq, 2016).

A growing body HFT literature considers the impact of ‘speed technology’ on financial trading and market liquidity (Currie and Seddon, 2016; Pagnotta and Philippon, 2016). HFT is a highly controversial topic. The trillion-dollar stock market ‘Flash Crash’ of 2010 lasted for 36 min and saw stock indexes, (i.e. the S&P 500, Dow Jones Industrial Average and Nasdaq Composite) collapsing and rebounding back (Kirilenko et al., 2017). Coupled with this event, the publication of Michael Lewis’ (2014) best-selling book Flashboys which claims the (financial) markets are ‘rigged’ was short on empirical data (as HFTs were not interviewed) yet attracted a lot of media publicity as an illustration of the pathologies of contemporary financial markets.

So far, there is limited academic research on HFT which uses real data as opposed to simulated theoretical models of how speed affects market liquidity. Recent empirical studies offer more nuanced results in the debate about HFT’s positive or negative market effects. One study found that increasing the speed of market-making participants has positive benefits to market liquidity. (Brogaard et al., 2015). Another study identified clusters of extremely high and extremely low limit-order cancellation activity, observing that HFTs bring efficiency to the market without the need to have executions at intermediate prices (Blocher et al., 2016).

Financialization as a descriptive or causal variable

The relationship between financialization and information technology is complex since there are mediating processes between the two that need to be empirically examined if the concept of financialization is to go beyond descriptive accounts towards a causal explanation of financial market events. The above examples of financial and technological innovation raise important questions about whether a two-tiered financial market exists caused by ‘asymmetric information, potential volatility, “noise” and informational distortions, out of control algorithms, and “flash crashes”’ (Bell, 2013, p. 1). HFTs in tier 1 benefit from access to fast technologies and lower latency which is the speed of trade
execution. Low-frequency traders operating in tier 2 do not have these advantages, but the extent to which they are damaged by HFTs continues to be the subject of much debate (see paper 4 in this issue by Cooper et al.).

Indeed, the effects and processes of financialization mediated by technology need to distinguish between descriptive and causal variables. Financialization as a *state-of-affairs* describes how accounts for a larger percentage of economic activity than in previous decades, leading some authors to go from description to causation irrespective of considering the empirical linkages (Casey, 2012). The body of work on ‘the insidious power of excessive financialization’ (Denning, 2014), for example, is replete with examples of the economic and social problems stemming from financialization, including rising income inequality (Piketty, 2014), banks too big to fail (Brewer and Jagtiani, 2013), perverse financial market designs (Budish et al., 2015) and unfair financial trading practices (Dolgopolov, 2014) to name just a few. In fact, many descriptive accounts of the effects and processes of financialization are treated as *causal* accounts, although they present arguments that are more *correlative*. Whilst policy-mak- ers, academics and practitioners seek answers to questions which pursue more *causal* explanations, it is vitally important that researchers desist from jumping on the bandwagon of politically charged debates surrounding financialization by presenting correlation as causation (Ait-Sahalia and Saglam, 2013; Hoffman, 2014).

**Financial market and flash crashes**

Prior to the financial crisis of 2008, the financial markets were coming under increasing scrutiny by academics, regulators, investors and the media. Financial innovations such as derivatives were described as ‘financial weapons of mass destruction, carrying dangers that, while now latent, are potentially lethal’ (Buffet, 2002). Following the crash, questions were raised about financial market fragmentation and deregulation, the role of rating agencies in assessing risk from CDOs and the impact of HFTs in changing market microstructure. The Flash Crash of 2010 focused attention on whether HFT directly caused market instability and volatility or was simply correlated with this adverse event (Kirilenko et al., 2014).

Isolating the variables for financial market and flash crashes is challenging. For academic researchers, obtaining commercially sensitive quantitative and qualitative data on financial market trading, especially is problematic, not least because of the high cost of obtaining large datasets and the reluctance of financial technology (FinTech) companies, such as HFTs to allow third party scrutiny of their data. These challenges make it difficult for researchers to ‘dig deep’ into the strategies and practices of computerized high-frequency and algorithmic trading firms to determine how and why human and/or computer interventions are implicated in adverse market events.

**Problematizing financialization**

In this special issue, we seek to problematize the intersection of finance and information technology. We encourage more work which goes beyond describing how technology impacts financial markets, towards a deeper analysis of the economic and social consequences of financialized economies which deploy financial and technological innovations with mixed outcomes. Financialization scholars suggest the problems built up in the financial system over many decades are multi-faceted. Neoliberal ideology which advocates free markets, deregulation and fragmentation of financial markets leads to structural and operational changes (Casey, 2012) with easy access to credit and burgeoning household debt which impacts macroeconomic outcomes and business cycles (Paley, 2007, p. 16).

Critics of financialization argue that finance is disconnected from the real economy. Finance is primarily concerned to play an intermediary role by channelling resources into productive investments (Shiller, 2012). Deregulation and fragmentation of financial markets has enabled banks to focus on arbitrage within secondary markets by creating exotic and complex financial instruments to extract profits by exploiting volatility and asymmetrical information. CDOs and HFT are just two examples which have come under heavy criticism in recent years for their real and perceived negative effects on markets and investors.

Problematizing financialization, however, often breaks down on conceptual and empirical grounds. Conceptually, the argument presented often falls on ‘a distinction between socially beneficial versus socially detrimental investment’ which is an ‘intellectually fraught and value-laden exercise’ (Casey, 2012, p. 8). Empirical data linking variables in the causal chain (i.e. flash crashes) is demonstrated, with the ‘connection between them inferred from their concurrence in time’ (Casey, 2012, p. 14). Here, the case being made is often correlative rather than causal. Financialization scholars need to consider the robustness and consistency of their data sources to support the purported causal connections.

Other writers discuss problems in analysing financialization due to difficulties in identifying the mediations through which production output is linked to finance. A theory of financialization needs to embed the changes in the ‘behavior of industrial enterprises, banks and workers, while being aware of transformation in the structures of the international financial system’ (Lapavitsas, 2011, p. 618). Financialization has attracted less favourable comments as institutions and individuals prioritize ‘making money out of money’ (Denning, 2014) rather than operating within the realm of ‘socially productive finance’ (Litan, 2010).

An extensive review of the financialization literature is beyond the scope of this editorial. However, Part II presents a more detailed exposition of a multidisciplinary and multi-paradigmatic approach to financialization in the context of information systems research.

**Special issue papers**

In the first paper of this special issue ‘Crossing The Next Frontier: The Role Of ICT In Driving The Financialization of Credit’, Daniel Drummer and colleagues develop a general framework to help better understand the relationship between information and communications technology (ICT) and financialization. Following the unprecedented shift from industrial to financial capitalization, they concentrate their work on the direct market access that has been enabled by electronic trading. They focus on one class of asset — consumer credit, and through structured interviews develop their model using the theme of how ICT enabled
financial actors can invest directly in household credit. Investors are now able to gain direct access to equity, rather than through stock brokers. Whilst the market structure has been changed by the financial–economic environment and regulations, ICT is presented as the fundamental lever in reducing transaction costs. The new lending model which has allowed prospective borrowers to publish loan requests on an online platform, allowing individuals or institutions to decide if they want to lend to them, is developed. The advantages of disintermediation have spread from peer-to-peer lending to an industry dominated by professional investors. Potential downsides are presented, such as how borrowers make less rational choices if they know their loans are not held by a bank, leading to excessive debt. This work identifies marketplace lending as an area where ICT is expected to significantly fuel financialization now and in the near future. The credit business is currently undergoing a shift away from banks towards online market lending, and this offers rapid transaction execution and lower costs.

The second paper ‘Social Machines: How recent technological advances have aided financialization’ by Tiejun Ma and Frank McGroaty has borrowed the concept of ‘Social Machines’ (Smart et al., 2014) to present a single concept that provides a holistic framework to capture an ensemble view of financial systems. They present an important question on how finance Social Machines such as high-frequency trading, sentiment analysis and smart mobile devices impact on the financial system. They used an inductive (theory building) approach because these subjects are still going through many dynamic and evolutionary changes. Three qualitative case studies are presented, one on each area. The first looks at how automated trading makes sense of the market financialization process (such as consumer confidence) and may amplify speculative behaviour. The second case study looked at social network information diffusion and sentiment analysis. Internet technology has played an important part as it shares information from social networks. In the financial markets, methodologies that use social media extract content through the wisdom of the crowd. The third case studies the mobile internet involving factors such as individual preference, culture and social context.

The third paper ‘A Taxonomy of Financial Market Manipulations: Establishing Trust And Market Integrity In The Financialized Economy Through Automated Fraud Detection’, by Michael Siering and colleagues presents a detailed account of all of the currently known methods behind market manipulation. The growth of financialization cannot be allowed to continue without the necessary checks on trading activity so as to monitor and aid in the detection of fraudulent activity. Such weak regulation and control, they argue, contributed to the 2007 financial crisis. Confusing terminology is prevalent in the financial markets with respect to different manipulation techniques and their characteristics which hampers efficient fraud detection. Collecting their research data from the SEC’s litigation press releases, EU benchmark regulation and a structured literature review, current abusive techniques have been identified. Using structured cluster analysis, they are able to categorize twenty-five different manipulation techniques into four categories of fraudulent activity. These are accounting fraud; investment fraud; insider trading and financial instrument manipulation. Their work suggests how each can be identified and the differences that each exhibits. They suggest that if their work is integrated into a decision support system it could help with fraud detection.

In the fourth paper ‘High Frequency Trading and Conflict In The Financial Markets’, Rick Cooper, Jon Seddon and Ben Van Vliet argue that HFT is a new form of financialization, driven by the use of computers in financial trading. They call this new behaviour algorithmization, characterized by profit-seeking programmable procedures. They argue that the role of HFT is to keep the markets liquid and informationally efficient. Having looked in detail at how HFT behave, they contrast these activities with those of the broker-dealers who have traditionally been involved in helping investors to trade, the low-frequency trader (LFT). Interviewing in both the USA and UK, they have built up a picture of the evolution of HFT, and from the perspective of the end investor, examined how orders are executed. They examine the conflict between LFT and HFT, describing how the market had fundamentally changed, and the high costs which are now necessary to compete for profits. They conclude by looking at how regulation needs to be reviewed. Those issues identified in the taxonomy of paper 3 must be prevented, but they argue that excessive regulation is both slow to implement and expensive to conduct and may encourage additional manipulation.

The final paper ‘High-Frequency Trading and Its Role In Fragmented Markets’ is by Martin Haferkorn and colleagues. This is the second paper which looks more closely at HFT activities. Whilst the fourth paper looked at the differences between HFT and LFT, this paper examines the effect of market efficiency across fragmented markets. In an attempt to analyse whether there are any positive spill-offs for market participants who do not invest in IT, these authors analyse how IT affects the European securities market. IT, as has been argued in earlier papers, is a key driver for financialization. This paper explores whether the reduced costs for electronic markets (Malone et al., 1987) hold true for securities markets. Their empirical research focused on two markets: Euronext in Paris; Bats Chi-X Europe in London. This enabled them to show that HFT decreased the mean price, supporting predictions made by Gerig (2012) that HFT makes prices more accurate. They also discuss the concern that regulation can decrease market efficiency. The paper looks at the upcoming MiFID II which is heavily focused on HFT. They debate the need for more evidence on HFT’s activities, especially since their work has shown that HFT increases market efficiency as it transmits price information between separate markets.

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