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The evolution of consolidation accounting: an application of chaos and memetic evolution theory

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[1] Centre for Research into Accounting and Finance in Context.
[2] African Accounting and Finance Association.
[3] 11 Accounting History International Conference.
[4] Asia-Pacific Interdisciplinary Research in Accounting.

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I: Abstract

Many researchers have explored the evolution of accounting either as a technical and quasi-scientific discipline or as a social construct that both influences and is influenced by history. Some researchers have considered the role played by agency costs, economic pressures, regulation and the complexity of modern business. Other researchers have focused on political lobbying, the socialisation of accountants and the agency they have when applying accounting prescriptions as key evolution factors. The impact of power struggles and acts of resistance have also received much attention. This thesis builds on these earlier works by proposing a novel framework of accounting evolution inspired by two non-accounting theories: Darwin's theory of evolution by natural selection and chaos theory. Using the case of consolidation accounting, 30 detailed interviews with local and international financial reporting experts illustrate how accounting theory and practice evolve at the macro- and micro-level. In doing so, the thesis helps to reflect how different perspectives highlighted by the prior literature can function concurrently under the proposed framework.

The application of chaos theory suggests that consolidation accounting's macro evolution is characterised by five observations. Firstly, consolidation accounting's evolution is intertwined with and influenced by other systems, including business practice, taxation regulations, social norms and economic pressures. Secondly, accounting's future state is highly dependent on its current state. This creates a path-dependency where its trajectory up to a specific point constrains its trajectory after that point. Thirdly, consolidation accounting remains relatively unchanged (stable) until it is disturbed. The presence of feedback loops may amplify or dampen disturbances leading to the possibility of disproportional change.

Fourthly, consolidation accounting's evolution indicates the presence of fractals, where the evolutionary pattern observed at one level resembles that of another. Fifthly, the accounting "rules-of-thumb" that develop over time may more accurately be described as strange attractors that pull accountants towards specific techniques, concepts and disclosures. In doing so, they create a sense or order because they limit the countless possibilities about how transactions and events might be treated.

The application of Darwin's theory of natural selection to non-biological systems is called memetic evolution. Considering memetic evolution of consolidation accounting at the micro-level reflects five core observations. Firstly, memetic evolution explains why accounting's future state is

dependent on its current state. No “new” consolidation accounting technique, concept or disclosure (meme) is truly original but is a modification or recombination of one or more existing memes. Accordingly, consolidation accounting’s future state is dependent on its current state. Secondly, memetics shed additional light on how and what constitute disturbances under chaos theory. Disturbances can arise from changes to related systems, inaccurate inheritance processes, through the active modification of existing memes or the degradation of memes in accountants’ memory.

Thirdly, memetic evolution enhances our understanding of feedback loops identified by chaos theory and why radical changes are often rejected in favour of marginal change. Fourthly, memetic evolution exhibits that consolidation accounting’s evolution is about the selfish replication of accounting memes. Consequently, researchers should not assume that currently accepted theory and practice represents the “best” or most “desirable” accounting prescriptions. Supporting chaos theory’s path-dependency, memes use different strategies to “win” the accounting meme selection game and become more prolific. Consequently, the criticism that accounting incentives short-term profit seeking behaviour may not represent a shortcoming of the accounting community but rather the power of evolution by natural selection. Finally, related systems co-evolve creating a complex and chaotic dynamic evolutionary environment.

While the focus of the thesis is consolidation accounting, the findings are broadly applicable to accounting evolution in general. For example, the findings suggest that the accounting standard setters may serve the profession better by developing short- to medium-term accounting standards as opposed to striving to set more permanent standards. The findings form the foundation of a new research agenda into the chaotic and memetic evolution of accounting. However, there are limitations to the current study. Only purposive sampling 30 interviews were conducted to ensure participants had the qualifications and experience to provide meaningful insights, introducing an inherent bias potential.

Keywords: accounting evolution; IFRS; memetic evolution; chaos theory; accounting history; consolidation accounting.

Table 1: List of abbreviations	
Description	**Abbreviation**
Accounting evolutionary game	AEG
Accounting Principles Board	APB
Agenda papers	AP
Capital Asset Pricing Model	CAPM
Discussion paper	DP
Efficient Market Hypothesis	EMH
European Financial Reporting Advisory Group	EFRAG
Exposure draft	ED
Financial Accounting Standards Board	FASB
Generally accepted accounting practice	GAAP
Global Financial Crisis	GFC
International Accounting Standards	IAS
International Accounting Standards Board	IASB
International Accounting Standards Committee	IASC
International Financial Reporting Standards	IFRS
Positive accounting theory	PAT
Securities Exchange Commission	SEC
Standard Interpretations Committee	SIC

1: Introduction

Accounting plays an important role in the functioning of our global economy (Hoogervorst, 2012). It is a complex (Haswell, 2006), social discipline (see Baker and Bettner, 1997) with no objective "truth" or law against which its practices can be tested for accuracy, consistency and validity (see Ravenscroft and Williams, 2009). Consequently, gaining a thorough understanding of its evolution is important.

1.1: Research background and context

Numerous papers deal with specific factors affecting accounting's development. For example, Berle and Means (1991) and Jensen and Meckling (1976) discuss technical and rational progression as driving forces of accounting's evolution. As part of this, the information provided by financial statements must equal or exceed the cost to obtain and present it. Agency theory predicts that different stakeholders will advocate different accounting proposals, depending on their impact on monitored metrics and the respective organisation's life-stage (Jensen and Meckling, 1976; Watts and Zimmerman, 1979; Botzem and Quack, 2005; Ravenscroft and Williams, 2009). From a different perspective, Schipper (2003) presents how rules- versus principles-based standards impact accounting systems and thinking while Nobes and Stadler (2013) highlight how standards are, ultimately, arbitrary judgements made by those writing the standards. They argue that the decision to select one standard over another can have a great impact on the evaluation and understanding of accounting. Similarly, Tweedie (2004) and Haswell (2006) note the complexity of modern business and the effect on financial reporting. Hoogervorst (2012) takes the position that anti-abuse provisions should be built into reporting frameworks to limit opportunities to manipulate reported figures to increase credibility.

From a social constructivist perspective, many researchers identify the significant effect which political forces have on determining accepted accounting prescriptions (Zeff, 2002; Sacho and Oberholster, 2008; Zeff, 2012; Deegan, 2014). This is further complicated by the effect different cultures have on both the acceptability and implementation of accounting standards (McKinnon, 1984; MacArthur, 1996; Meeks and Swann, 2009; Baker et al., 2010; Macve, 2015). Suchman (1995), Carruthers (1995) and Mennicken and Miller (2012) provide a more detailed basis for understanding the social construction of accounting and legitimacy considerations which affect its development. Linked to this, Bhimani (2008) and Hoogervorst (2012) discuss the effects of crises

on accounting and DiMaggio and Powell (1991) and Maroun and van Zijl (2016) reflect on the interaction between legitimacy, isomorphic pressures and the individuals interpreting and applying accounting prescriptions in real-life settings. Hopwood (1987), Bryer (2000a) and Deegan (2014) provide detailed accounts of how accounting is reflective of changing societal expectations and, at the same time, changes society.

The collection of prior research highlights the pluralism of accounting's development. What the literature does *not* provide is an understanding of how different factors work concurrently to shape the "accounting craft" or why some factors appear to be more important in some contexts (see Hopwood, 1987, p. 207; Deegan, 2014 Ch 1). This thesis narrows the "gap" in the prior literature by drawing on concepts from two non-accounting disciplines (chaos and evolutionary game theory) to provide a fresh and more comprehensive perspective of accounting's development cognisant of the plurality of accounting.

Chaos theory is s subset of Mathematics and focuses on complex non-linear but deterministic systems. It has been utilised in management accounting investigating systems to manage the business (see Dolan and Garcia, 2002), although it has not been used directly in financial accounting. Evolutionary game theory deals with the biological evolution of organisms. It builds on the work of Charls Darwin and Gregor Mendel. The phrase "evolution of accounting" has been discussed in the prior literature but the concept has been used loosely to describe the process of progression and the idea that the best accounting prescriptions survive (see Napier, 2001; Deegan, 2014, p. 8-9). A more nuanced application of evolution theory is missing. Game theory has been utilised from an auditing perspective when evaluating auditor judgements (see Wilks and Zimbelman, 2004) but, similar to financial reporting, it has not been utilised directly to evaluate accounting's development. This research is, to the researcher's best knowledge, the first to apply concepts from all three theories[5] to develop a framework aimed at explaining how accounting evolves at the macro- and micro-levels, conscious of the plurality of factors already identified, more comprehensively.

As an in-depth investigation into the history, development and impact of all accounting practices is beyond the scope of a single PhD (Hopwood, 1987), this research focuses on consolidation accounting practices under and before the development of International Financial Reporting

[5] Chaos, evolution and game theories.

Standards (IFRS). The research deals specifically with IFRS because it has been voluntarily adopted by over 166 countries (International Accounting Standards Board (IASB), 2017). This ensures that findings are applicable to a global audience. Moreover, the findings should be useful to understand developments in other accounting frameworks, too.

1.2: Research objective

In keeping with the exploratory and qualitative nature of this thesis, hypotheses are not defined. There is also no attempt to prove the generalisability of an existing theory or to test assertions in a positivist sense. The thesis is anchored in the interpretive tradition (see Parker and Roffey, 1997; Strauss and Corbin, 2008). The research:

> uses a general qualitative approach (Caelli et al., 2003) drawing on concepts from chaos and evolutionary game theory to propose a framework that explains accounting's evolution using the case of accounting consolidation practice.

1.3: Contribution

The thesis makes, at least, four key contributions. Firstly, in keeping with an interpretive tradition, it provides an innovative theoretical analysis and nuanced perspective of accounting's evolution. By studying the qualitative properties of chaos and evolutionary game theory the thesis answers the call for a more refined framework explaining the development of consolidation accounting practice (Hopper et al., 1987; Napier, 2001; Llewelyn, 2003; Deegan, 2014).

Secondly, the thesis responds to the demand for more critical and interpretative research in accounting, specifically historical accountancy research, which does not assume that accounting's development is based purely on technical rational progression (Hopwood, 1987; Hopper and Macintosh, 1993; Napier, 2001; Brown et al., 2015). More specifically, Botzem and Quack (2005) highlight how international accounting standards are developed, interpreted and implemented by actors with different backgrounds, strategies, interests and resources. By conducting interviews with accounting experts, the thesis provides primary evidence on the operationalisation of accounting prescriptions at the micro and macro levels. This entails how standard setting bodies develop consolidation accounting proposals and how those proposals are

interpreted and accepted or rejected by companies and the individuals implementing them. In this respect, this thesis departs from traditional positivist accounting research which uses remote inferential testing of financial reporting (Deegan, 2014, Ch 7 & 10). By relaxing some assumptions of the rational economic imperative, a key feature of positivist research, the thesis provides an alternate view on the development and application of the "accounting craft" (see Hopwood, 1987, p. 209).

Thirdly, the thesis makes an empirical contribution by using open-ended, semi-structured interviews with leading global financial accounting experts on the development of consolidation accounting practices. The dataset provides new and valuable insights and addresses calls for researchers to engage directly with standard setters and practitioners to collect primary evidence on the operation of accounting standards in real-world settings (Burchell et al., 1980; Schipper, 1994; 2003).

Finally, the results will have direct implications for accounting standard setters (see Napier, 1989; Schipper, 1994). Concluding on whether or not accounting has finality (telos) is not an aim of this thesis. Nevertheless, the study's findings will contribute to this under-researched area in accounting practice and theory. If accounting is developing towards a final or optimal set of accounting standards (it is teleological) the IASB should, arguably, strive to set standards to achieve this end (see also Napier, 2001). If, however, accounting has no end point but is rather a tool to satisfy the information needs of the time-space specific society in which it operates, standard-setters might look to produce medium-term standards which are regularly reviewed and updated to satisfy society's changing needs (for more on studies of time-space see Stone, 1999; Seppänen et al., 2007).

1.4: Delimitations, assumptions and limitations

The thesis will focus on IFRS and pre-IFRS consolidation accounting practices. An extensive review of the International Accounting Standards Committee (IASC) and IASB's history and functioning is beyond the scope of this thesis. Aspects of the IASC and IASB's history and functioning are considered where necessary to understand or apply this thesis's objective[6]. There are also some references to US accounting practice but the development of the Financial

[6] For papers dealing with the IASC and IASB, please see Zeff (2002); Sacho and Oberholster (2008); Zeff (2012).

Accounting Standards Board (FASB) and its consolidation standards are beyond the scope of this thesis as is a detailed examination of jurisdiction-specific accounting standards and how these differ from IFRS.

This thesis will not examine the detailed mechanics of consolidation accounting and disclosure. Technical accounting is only discussed when necessary to explain or illustrate points. This thesis does not aim to make judgements about the “best” or “most appropriate” accounting treatments. As prior quantitative studies fulfil only a contextual and supportive role in this thesis, the thesis assumes prior empirical research is correct and no attempt has been made to re-perform such work. This allows the researcher to maintain focus on the specific research agenda.

The thesis deals with a single aspect of financial reporting. This may be regarded as an inherent limitation. But, by restricting the scope of the research to consolidation accounting, it ensures focus and allows relevant and detailed data to be gathered (Parker and Roffey, 1997; Strauss and Corbin, 2008). This rich dataset facilitates a thorough analysis of the research objective and enhances the quality of the findings (see Section 4.5).

This research follows an interpretative paradigm and is based on the assumption that accounting is an inherently social construction (see Hopwood, 1987; Baker and Bettner, 1997; Bryer, 2000a; Deegan, 2014). It aims to consider the applicability of two theories from different disciplines in explaining the development of consolidation accounting practices under IFRS. The objective is not to prove or disprove these theories empirically or to propose an optimal outcome or point of balance.

The thesis relies on detailed semi-structured, open-ended interviews as the primary data collection method. In spite of safeguards applied to reduce threats to validity and accuracy to an acceptably low level (see Section 4.5), such threats cannot be entirely eliminated (Alvesson, 2003; Rowley, 2012; Leedy and Ormrod, 2013). This thesis assumes that interviewees have sufficient accounting knowledge and experience to contribute to the research and will provide complete, relevant and honest accounts (Alvesson, 2003; Creswell, 2009; O’Dwyer et al., 2011; Rowley, 2012). In addition, most of the interviewees are from the researcher’s home country. Interviews with international accounting experts were also conducted. As a diverse group of interviewees with international work experience were engaged, this is not a significant limitation.

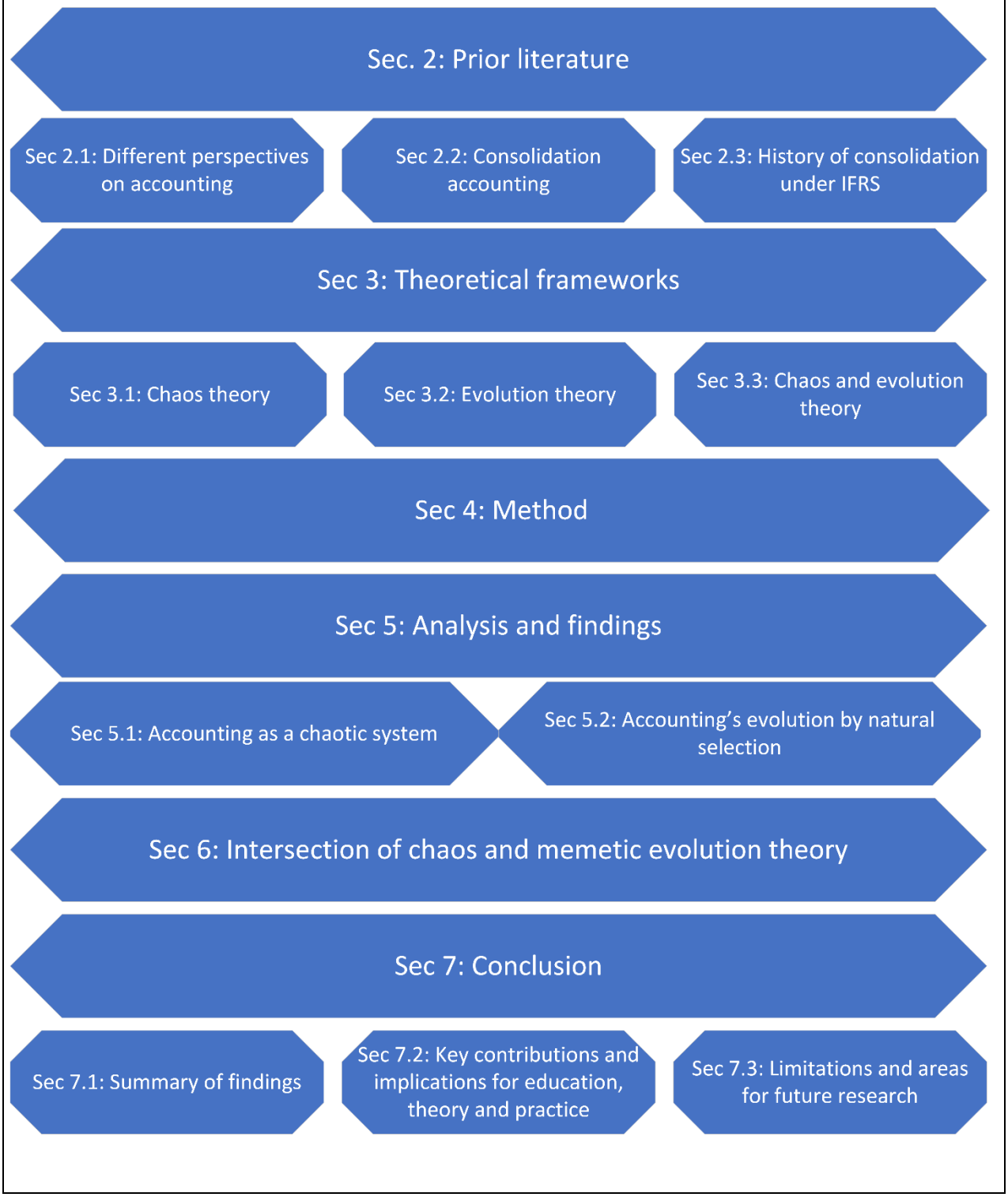
1.5 Structure of thesis

The remainder of this thesis is presented as follows. Section 2 presents the prior literature on different perspectives of accounting. It focuses on positivist and social constructivist perspectives. This is followed by a discussion of consolidation accounting in the UK and the USA. Section 2 ends with a brief history of consolidation accounting under IFRS. Section 3 presents the two non-accounting theoretical frameworks. First chaos theory is discussed (Section 3.1) followed by evolution theory (Section 3.2). Each sub-section ends with a discussion applying the theory to accounting to provide a grounding for the detailed discussion provided in the findings section.

Because biological theories and their application to non-biological systems are not commonplace in accounting research, Section 3.2 first deals with evolutionary game theory in a strictly biological sense. It then explains how evolutionary game theory is applied to non-biological systems and that in these instances, it is referred to as memetic evolution theory.

Section 4 presents the method in detail. Section 5 provides the analysis and findings separately for chaos and memetic evolution theory. Section 5.1 discusses the findings and how chaos theory provides a macro-level perspective of accounting's evolution. This is followed by Section 5.2 with a discussion detailing how memetic evolution theory provides a micro-level perspective of accounting evolution. Section 6 discusses the intersection between chaos and memetic evolution theories to provide a more complete theory of accounting's evolution from both macro- and micro-level perspectives. Finally, the thesis concludes in Section 7 with a summary of key findings and their implications for theory and practice. Finally, it presents a new research agenda under the proposed framework.

Table 2: Outline of thesis



2: Literature review

Early accountants could not look to internally coherent frameworks or theories to develop accounting techniques, principles, routines and useful disclosures (collectively referred to as accounting prescriptions). Instead, accounting was a mechanical and pragmatic process (Walker, 2006; Deegan, 2014, Ch 7). Accounting has no objective reference point, as with natural sciences, which can be used to calibrate results and confirm that methods, processes and techniques are "correct" (Ravenscroft and Williams, 2009). Consequently, many early accounting techniques were developed devoid of theory and, instead, prioritised practical considerations relevant for the time and circumstances (see Jensen and Meckling, 1976; Watts and Zimmerman, 1979; Hopwood, 1987; Walsh and Stewart, 1993; Bryer, 2000b; Walker, 2006; Nobes, 2014). In additional, most early accounting journals were descriptive and were primarily concerned with reporting current practices as opposed to proposing new prescriptions which were theoretically grounded (Walker, 2006; Deegan, 2014, Ch 1).

In two seminal papers, Watts and Zimmerman (1978; 1979) proposed a finance-centric theory of accounting and provided numerous motivations for the demand and supply of accounting theories. These range from protecting corporations' self-interests to genuine attempts to provide accounting information which is in the public's best interests (see also De Rond and Miller, 2005). How these views developed and were subsequently challenged by more critical theorists is discussed in Section 2.1 below.

2.1: Different perspectives on accounting

In its simplest form, accounting serves as a technical system for recording transactions and balances to provide information to its users (Basu and Waymire, 2006; Unegbu, 2014). Archaeologists suggest "accounting preceded abstract counting and writing" by using clay tokens which were aggregated into hollow clay receptacles to "represent symbolically assets and economic transactions" (Mattessich, 1987, p. 71). Other archaic accounts used pictographic and ideographic writing to capture some details of transactions. These archaic counting and accounting systems evolved "in several stages" or incrementally over time (Mattessich, 1987, p. 71). Recording transactions with different people, such as offerings to temples or disbursements from food stores to citizens was necessary to facilitate continued economic cooperation. It forms

the basis of the beginnings of the concept of *accountability* and stewardship as we know it today (see Mattessich, 1987; Basu and Waymire, 2006; Basu et al., 2009).

In the early agricultural era, the concept of stewardship was essential for accounting and reporting of a farm's (the equivalent of modern companies) economic performance and position. Under this concept, accounting's primary objective is to provide entity-specific, historical information which is reliable and verifiable. This type of information allowed users to understand how economic resources had been deployed by the management of that farm or company, and what gains had been realised. The concept of matching income and expenses is important to demonstrate the return generated on employed capital. Put differently, accountants focused on providing an account of management's stewardship of the company's resources in order for the owners to judge those actions and take appropriate action (Whittington, 2008; Ravenscroft and Williams, 2009). Because there is an incentive for management to overstate assets and incomes, and understate liabilities and expenses, the concept of prudence became one of the "cardinal virtues" of early accountants and accounting (Maltby, 2000, p. 51).

Under the stewardship objective of financial reporting, users seek a *reasonable return* on capital deployed. Users typically have a significant interest in the company and its success because of their equity interest. Consequently, the primary purpose of accounting was to allow the company's owners to manage the company from a distance (see Hopwood, 1987). Key decisions would include whether the management were performing well (generating reasonable profits) and whether the management team should be rewarded or dismissed. When comparisons to other companies were made, this was primarily to assess the efficiency of the companies' management teams against one another (Pandya et al., 2021; van Zijl and Hewlett, 2022).

The stewardship objective of accounting is the "root" of accounting and dates back to archaic accounting systems. However, it began to give way to a new and different objective of accounting (Mattessich, 1987; Ravenscroft and Williams, 2009). So-called neoliberal users' emerged and followed a more capitalist mentality in ernest (Bryer, 2000a; Ravenscroft and Williams, 2009; Zhang and Andrew, 2014).

Post World War II, Ravenscroft and Williams (2009) describe a major shift from the original stewardship objective of accounting to a more neoliberal-inspired objective. Neoliberalism was primarily concerned with generating the maximum return possible and its supporters also called

for political changes such as small governments, free trade and de-regulation of capital markets (see Chiapello, 2017). Under this new political ideology, companies could grow to compete with governments and, in doing so, they were characterised by having thousands of non-controlling owners as opposed to only a few people who controlled the company. Consequently, individual equity holders did not have sufficient voting rights to control companies. Accordingly, using financial statements to determine whether management teams should be rewarded or punished fell away. In its place, investors wanted current, unbiased and forward-looking information, regardless of its reduced reliability, as their primary decision related to estimating and comparing the returns of different companies at a point in time. This was needed for investors to shift their investments to those companies which offered the maximum return (Whittington, 2008; Ravenscroft and Williams, 2009; Zhang and Andrew, 2014; Maroun and van Zijl, 2022; van Zijl and Hewlett, 2022). This shift represents a fundamental change in how accountants think about accounting, especially under the heavy neoclassical finance and economic theory influences stemming from the US and grounded in Positive Accounting Theory (PAT[7]) as put forward by Watts and Zimmerman (see also Watts and Zimmerman, 1990; Ravenscroft and Williams, 2009; Deegan, 2014, p. 272, Ch 7).

2.1.1: Positive accounting theory

Traditional positivist research adopts an objective approach to accounting research. This research is not concerned with what accounting should do but with explaining and predicting why accountants behave in certain ways. It theorised why certain accountants would, or would not, adopt specific accounting prescriptions and the reasons for their choices. This resulted in theories on how to manipulate behaviour based on certain economic assumptions (Jensen and Meckling, 1976); different approaches to valuing assets (see Fama, 1998; Ravenscroft and Williams, 2009; Zhang and Andrew, 2014; Ram et al., 2016) and research concerned with the value-relevance of financial reporting (Barth et al., 2001; Deegan, 2014, Ch 7). Central to this research are economics-based theories and principles such as agency theory, Efficient Market Hypothesis (EMH), Black-Scholes Option Pricing model (Ravenscroft and Williams, 2009) and the Capital Asset Pricing Model (CAPM) (Watts and Zimmerman, 1990; Deegan, 2014, Ch 7). These were used to calculate asset values and predict behaviour based on risk, return and the time-value-of-money leading to what Zhang and Andrew (2014) refer to as the “financialisation” of accounting.

[7] Similarly, to Deegan (2014), PAT, upper case, refers to the specific theory put forward by Watts and Zimmerman. While positive accounting theory, lower case, refers to the general research conducted in the positivist fashion.

In keeping with a free market doctrine at the centre of PAT, the primary objective of accounting is not to provide a measure of past performance and hold management accountable; forward-looking information relevant for financial valuations is required (supporting a neoliberal user's information needs). The primary objective of financial reporting shifted from facilitating stewardship to enabling the efficient allocation of financial capital by market participants whose aim was to maximise their return on capital employed (Bryer, 2000a; Murphy et al., 2013; Zhang and Andrew, 2014). In this context, value-relevance research flourished. This research used the EMH and CAPM to determine expected share prices, abnormal returns and share price fluctuations in response to the release of accounting information to draw inferences about accounting information's relevance. The shift from stewardship to neoliberal economics also meant that traditional cost-based accounting gave way to the inclusion of more subjective and forward-looking fair value information based on models instead of verifiable past transactions (Whittington, 2008; Ravenscroft and Williams, 2009; Zhang and Andrew, 2014).

At the heart of positivist research and theories are the assumptions that all participants act rationally, without bias and that inefficiencies will be reduced through the natural functioning of a free market system (Deegan, 2014, Ch 7). Instead of attempting to change an individual's self-interest, contracts are used to align managers' and shareholders' interests.

For example, contractual bonus schemes are used to align management's and shareholders' interests (known as the bonus hypothesis). The unintended consequences of these schemes are well researched and include: manipulation of accounting data through accounting policy choices and estimates or through "real" manipulation such as reducing research and development and maintenance expenses[8] and the sub-optimal selection of projects for investment (Deegan, 2014, Ch 7). The debt/equity hypothesis states that firms will enter into contractual arrangements to reduce opportunities for managers to seize debt/equity holders' wealth. These would include debt covenant-type arrangements. The political hypothesis predicts that larger entities may actively attempt to reduce their reported accounting profit in order to reduce political attention. In other words, large established entities may want to reduce political attention through lower reported profits as high profits may result in wealth-transfer taxes being imposed and attract unwanted public and political scrutiny (Watts and Zimmerman, 1978; Deegan, 2014).

[8] To the detriment of the long-term sustainability of the firm such as in repairs and maintenance or research and development.

The first two hypotheses are efficiency-related while the political hypothesis is opportunistic. All predict the behaviour of internal and external parties using accounting information and explain why different people have different, and often conflicting, motivations and desires. As contracts utilised accounting figures, they were often the target of manipulation to achieve desired outcomes and had direct effects on financial reporting's development (Watts and Zimmerman, 1979; Deegan, 2014, Ch 7; Zhang and Andrew, 2014). Social constructivist accountancy researchers do not deny these logical outcomes but believe that other non-economic factors are also at play (these are discussed next).

2.1.2: Social constructionist views: Interpretive and critical perspectives

Murphy et al. (2013) describe accounting as a "living law" while Bryer (2000a) and Tinker (2005) frame accounting as a social construct. For both, accounting is both a product and producer of history (Bryer, 2000a). This contextual approach to accounting research, adopted by interpretive and critical researchers, ensures consideration of the socio-political environment in which accounting techniques are developed, adopted and implemented. These researchers recognise the importance of a range of factors affecting accounting's development, rather than making assumptions about each party's self-interests and concluding that accounting progresses logically according to behaviours which rationally maximise utility (Deegan, 2014).

For example, McKinnon (1984); Bhimani (2008); Hoogervorst (2012); Bamber and McMeeking (2016), Zeff (2002); Botzem and Quack (2005); Sacho and Oberholster (2008); Ravenscroft and Williams (2009); Stenka and Taylor (2010); Larson and Kenny (2011) and Zeff (2012) investigate the influence of political lobbying, culture, accounting standard setters' funding structures, conflict and contestation in setting global standards and the need to maintain legitimacy of accounting standards. These change factors are especially relevant in the aftermath of a crisis.

Corporate failures, market crashes and economic uncertainty are often followed by significant regulatory reforms (see also Schwarz, 2002; Unerman and O'Dwyer, 2004). Some reforms are genuine and improve the functionality of the object of regulation. Others are ceremonious, aimed at constructing an image of standard setters' and lawmakers' proactivity to repair and maintain their own legitimacy and authority (Unerman and O'Dwyer, 2004; Ravenscroft and Williams, 2009; De Villiers and Maroun, 2017). Accountants must implement new regulations and may find ways

to implement them creatively for their own advantage – called creative compliance (Rutherford, 1999). As a result, the introduction of proposals in reaction to a crises can result in hastily enacted changes which do not improve the quality of financial statements (see Walker, 2010). Moreover, once enacted these changes may be difficult to reverse either because of the lengthy formal processes required to make changes or because of the fear of being seen as having made a mistake when the reform was introduced (Walker, 2006, Ch 13).

Accounting prescriptions must also be interpreted and implemented by a vast number of actors, each of whom have different backgrounds, levels of experience, education, motivations, priorities, cultures and integrity (see Thietart and Forgues, 1995; Rutherford, 1999; Botzem and Quack, 2005; Haswell, 2006; Tremblay and Gendron, 2011). Some cultures and religions find certain accounting concepts incompatible, such as the time-value of money under Shria law (see Baehaqi et al., 2020).

The extent to which accounting prescriptions are rules- or principles-based also affects how management will implement accounting prescriptions and the type of prescriptions they prefer and accept. For example, jurisdictions which are more litigious are likely to favour rules-based accounting standards in order to avoid potential litigation, promote consistency and reduce the cost of regulation (Schipper, 2003). In contrast, principles-based accounting prescriptions require management (and auditors) to apply their judgement and is intended to allow the resultant accounting to be a more faithful representation of the underlying economics. A trade-off results between consistency and providing a tailored faithful representation of the underlying transactions, events and conditions of the business (Schipper, 2003).

Maroun and van Zijl (2016) and van Zijl and Maroun (2017) reflect on the operationalisation of specific accounting provisions. They show that accountants face significant coercive, normative and mimetic isomorphic pressures to comply with IFRS. While there is always resistance to accounting prescription, the general result is that alternatives to the accounting laid out by the IASB become unimaginable and instances of non-compliance with the accounting standards are reduced – but not eliminated (see also Hopwood, 1987; Hopper and Macintosh, 1993; Cowton and Dopson, 2002). At the same time, “flexible adherents” are able to rely on the fact that principles can be broadly interpreted while still being able to claim compliance (Durocher and Gendron, 2014; Maroun and van Zijl, 2022). Even as accounting standards become more complex, incorporate anti-abuse provisions and extensive guidance, preparers are able to exploit

ambiguities and the inherent subjectivity of financial reporting to circumvent accounting prescriptions (Rutherford, 1999; Tremblay and Gendron, 2011; Hoogervorst, 2012; Durocher and Gendron, 2014).

Despite these limitations, the accounting system determines what is recognised and measured and, in turn, provides the discourse for describing organisational "reality" (Cowton and Dopson, 2002; Mennicken and Miller, 2012). For instance, if accountants only recognise and measure profit in financial terms, performance is articulated and understood narrowly; a point well made by the social and environmental accounting research community[9] (Hines, 1988; Deegan, 2014, Ch 12). This power emanates from the accounting profession's appearance of objectivity and its claims to technical expertise. Accounting has also been accused of being used to disenfranchise the less powerful (see also Tinker et al., 1982; Hines, 1988; Broadbent, 2002).

To illustrate, when profits are down financial "imperatives" provide a corporation with the means to justify, without reproach, retrenchments and significant disparities in compensation between low-income workers and high-paid executives (see Tinker et al., 1982; Broadbent, 2002; Deegan, 2014, Ch 12). This is possible because, in a capitalist context, social and environmental issues are easily framed in the calculative economic discourse of the accountant. Having become a taken-for-granted part of the organisational and societal dynamic, the "reality" described by the numbers is accepted as an accurate and trustworthy "account" that need not be challenged. The legitimacy of accounting's dominance may be questioned in times of crisis (Deegan, 2014, Ch 12) but accounting can be mobilised to regenerate trust and restore power to the profession. Ironically, the result is that corporate failures and financial crises can lead to condemnation of accounting systems only to be followed by calls for more detailed reporting standards, additional regulatory requirements and an expansion of the already vast calculative infrastructures (Richardson, 1987; Mennicken and Miller, 2012; Deegan, 2014). This may broaden the knowledge and skills gap between the accounting profession and non-members, increasing the profession's authority and power.

While these critical and interpretive perspectives play an important role in complementing the positivist perspective of accounting, they do not offer a coherent and comprehensive framework

[9] The inclusion of more environmental, social and governance information in corporate reporting has gained prominence and, it may be argued, illustrates the power of accounting and accountants to mobilise public opinion. A detailed review of these non-financial reporting systems is deferred for future research.

for explaining what Ravenscroft and Williams (2009, p. 777) describe as a "hodge-podge of concepts and assumptions" and provides the basis for this research. Using consolidation accounting as a base to explore accounting's evolution, this thesis seeks to develop a framework which illustrates how these factors interact in a deterministic fashion to yield an accounting system the development of which would otherwise appear chaotic or undirected. Before considering how chaos and evolutionary game theory can provide new insights, a brief review of the history of consolidation accounting[10] is provided.

2.2: Consolidation accounting

Consolidated accounting has its roots in the late 19th century in the UK and USA. While it appeared in both countries at roughly the same time, the impetus for consolidated reporting differed (Walker, 2006). As discussed in Section 2.1, the lack of any accounting framework for developing internally consistent accounting prescriptions resulted in consolidated reporting conventions developing in "a theory-free" manner with largely practical solutions in mind (Walker, 2006; Nobes, 2014, p. 1001). After some time, consolidation reporting achieved a state of cognitive legitimacy (see Suchman, 1995), with many accountants simply accepting it "must be worthwhile" because it is a widely-applied form of reporting (Walker, 2006, p. 4, Ch 1; Deegan, 2014). Little was done to ensure a clear and consistent set of principles informed consolidation accounting prescriptions. The result was conflicting objectives and prescriptions which were not universally applied. This continued until well into the 20th century when the Securities Exchange Commission (SEC), FASB and the IASC[11] began codifying normative accounting practices prevalent at the time (Walker, 2006).

2.2.1: Consolidation accounting in the UK

To understand the development of consolidation accounting in the UK, this section considers how and why UK accountants developed specific asset valuation prescriptions before the emergence of organisational group structures. Several court cases on the correct determination of

[10] Some argue that there is a difference between 'accounting' and 'reporting' with the former referring to internal processes and activities while the latter is the act of communicating information to users (Hopwood, 1987). For the purpose of this research, the terms are used interchangeably.

[11] This is the predecessor body to the International Accounting Standards Board (IASB).

distributable profits and dividend declarations prompted UK accountants to focus on asset valuations and determining distributable profits in the 1880's and 1890's (Walker, 2006, Ch 1). The main issue was whether or not operating profits could be declared as dividends irrespective of capital losses[12] and whether or not depreciation of capital assets was a deduction from distributable profit (Walker, 2006, Ch 2).

As there were no prescribed accounting rules at the time, auditors frequently stood as expert witnesses to testify about the appropriateness of accounting treatments in court. Auditors were, themselves, concerned with their own liability when signing off company accounts and this led to a pressing need to develop a framework for valuing assets which could be defended in court (Walker, 2006).

Dicksee (1892, cited in Walker, 2006, Ch 2) provided one of the first formal guides on how to value assets. His book proposed that assets be categorised as either permanent or floating. Permanent assets were to be held at cost (or depreciated cost) while floating assets should be held at the lower of cost and market value. When group structures emerged, inter-corporate holdings[13] were classified as permanent assets and held at cost. The only income recognised from these inter-corporate shareholdings were dividends declared by the underlying subsidiary companies (Walker, 2006). This was known as the cost model for inter-corporate holdings.

At the time, most inter-corporate shareholdings were either minor or 100% investments (Walker, 2006). The cost model treatment was considered reasonable for minor investments. The owners had no influence over the company's affairs and performance. Owners had rights to dividends only when declared and an interest in the residual net assets of the company, represented by the cost of the investment.

Holding wholly owned subsidiaries under the cost model seemed reasonable until loss-making subsidiaries began to reveal the limitations and weaknesses of this treatment. For instance, loss-

[12] A series of cases went to court concerning the determination of distributable profits when trading profits was made but the opening capital had diminished. For example, if a trading profit of Currency Units (CU) 5000 was made but capital diminished by CU 6000, could a dividend of CU 5000 be declared? It was held in the 1894 case of *Verner v. General & Commercial Investment Trust Ltd* that such a trading profit could be declared without having to make up the capital loss (Walker, 2006, p. 12).

[13] Where one company owns shares in another company. It is interesting to note that companies in the UK were always allowed to own shares in other companies and didn't require specific enabling laws, as was the case in the US.

making subsidiaries were not impaired to reflect the decrease in their value. Furthermore, subsidiaries with sufficient retained earnings could still declare dividends, creating the false impression of being profitable in the holding company's financial statements (Edwards, 1991; Walker, 2006, Ch 3,4 & 5). The accounting for significant inter-corporate shareholdings could be used to deceive users of financial statements resulted in accounting figures that could be "misleading" (Walker, 2006, p. 59, Ch 5). Importantly, group structures were sparsely used resulting in a limited impact until the implementation of mandatory requirements to publish financials statements which helped make the use of group structures more common (Walker, 2006).

During the early 1900's the UK's 1907 Companies Act required public companies to publish their financial statements[14]. UK companies wanted to maintain their corporate privacy and realised that they could use group structures to do so (Walker, 2006, Ch 2,3 & 4). By re-structuring their organisation into publicly traded holding companies with private operating subsidiaries, companies could maintain access to capital markets whilst maintaining corporate privacy. This is because private subsidiaries were not required to publish their financials and were held at cost in the holding company's financial statements (Walker, 2006, Ch 2, 3 & 4). The result was that most groups consisted of 100% owned subsidiaries. As more public entities became holding companies, the limitations of accounting for subsidiaries at cost with dividend-based income models became a significant concern (Edwards and Webb, 1984; Walker, 2006).

Sir Gilbert Garnsey, a renowned audit partner at the time, gave a lecture to debate various accounting treatments for group structures, one of which was to prepare a consolidated balance sheet. Owing to the weaknesses of cost-based models, alternatives to a consolidated balance sheet received little attention. Consolidation was considered a simple and practical solution (Walker, 2006, Ch 4). The consolidated balance sheet would consolidate the assets, liabilities and equity of the subsidiaries with those of the holding company. Through this report, changes in subsidiaries' assets and liabilities are reflected making it easier for users to determine whether subsidiaries were performing well. Importantly, the consolidated balance sheet did not replace the "legal balance sheet" where law required inter-corporate investments to be held at cost. Instead, the consolidated balance sheet was seen as a supplementary report (Walker, 2006).

[14] Before this, only banks and insurance companies were obliged to publish company accounts. This meant most companies' shareholders never saw the company's (in which they were invested) financial statements (Walker, 2006, p. 45).

At this time there was no discussion regarding which subsidiaries to include or exclude from the consolidated balance sheet (Edwards, 1991; Walker, 2006, Ch 4; Stenka and Taylor, 2010; Nobes, 2014). This may be because most investments were minor or 100% holdings making the determination of whether one entity should be consolidated simple.

2.2.2: Consolidation accounting in the USA

While corporate privacy was important to UK companies, this was not the case for the US. Business combinations, mergers and takeovers were well-established practices from 1866 onwards[15] (Edwards and Webb, 1984; Edwards, 1991; Walker, 2006). In the late 1800's, industrialisation facilitated rapid economic expansion - especially for railroad companies where competition was fierce. At this time, US legislation did not allow inter-corporate shareholdings. Consequently, railroad companies growing by acquisition took the form of shareholder agreements or relied on trusts to effect unified control (Walker, 2006, Ch 8). Powerful monopolies arose, leading legislators to develop and implement anti-trust laws (the Sherman Act) to disband monopolies in an effort to protect the public (Walker, 2006, Ch 8; Ding et al., 2008).

At the same time, individual states were competing with one another for company registration fees and taxes. The state of New Jersey enacted enabling legislation in 1889, shortly before the implementation of the Sherman Act, which allowed inter-corporate shareholdings[16]. This enabling legislation made it easy to form groups without complex shareholder agreements or incorporating trusts[17]. It was also one method to circumvent anti-trust laws. Other states followed suite and formal business combinations using inter-corporate shareholdings boomed (Walker, 2006, Ch 8).

As one of the first major business combinations in US history, US Steel is well documented by accounting historians (Edwards and Webb, 1984; Edwards, 1991; Walker, 2006; Stenka and Taylor, 2010). The company's use of consolidated reporting is considered a major contributing

[15] The first documented consolidated statement was issued by American Cotton Oil Trust in 1866 (p. 115) (Edwards, 1991).

[16] For the first time is the US, one company was allowed to hold shares in another company. Although the effect of 'groups of companies' was still achieved through shareholders agreements and trusts, this legislation made forming groups much easier.

[17] Shareholder agreements and trusts were more difficult to administer when investors wanted to buy or sell "shares".

factor to the adoption and acceptance of consolidation reporting by US corporations. Even more important was that this public disclosure was entirely voluntary. This is in stark contrast with the UK. US corporations were happy to make voluntary financial disclosures and used group structures for economic expansion (Edwards, 1991; Walker, 2006, Ch 3 & 8).

There may be several reasons for US Steel's voluntary consolidated reporting disclosures. US Steel was an amalgamation of several prominent steel companies from which the shareholders of each of the former companies received shares in the newly formed holding company. As US Steel was a "pure" holding company, consolidated statements presented the group's financial performance and position in a favourable light[18]. Leading up to the amalgamation, financial commentators aggregated each company's separate financial statements in an attempt to predict the group's performance and financial position. It is possible that this activity by analysts prompted US Steel to prepare and publish consolidated financial statements (Walker, 2006, Ch 8). It may also be that, as US Steel was a merger of multiple large companies, shareholders understood corporate reporting and the limitations of holding companies using cost-based and dividend income measurement methods. Shareholders were sufficiently influential to demand financial disclosures which reflected the aggregate performance of the group as if it were a single economic entity.

Similar to the UK, it was clear which companies ought to be consolidated given that inter-corporate holdings were either immaterial or almost complete. However, as more holding companies began to hold less significant investments in other companies, or where subsidiaries themselves held less than 100% investments in other companies, the "boundary [scope] of the group" became less obvious and the scope of consolidation accounting came under increasing scrutiny (Nobes, 2014, p. 995).

2.2.3: The scope of consolidation

Since group structures were first employed, the scope of consolidated reports has continuously been debated (Edwards and Webb, 1984; Walker, 2006; Stenka and Taylor, 2010; Nobes, 2014; IASB, 2015e). Incorrectly defining the group has been implicated in a number of accounting

[18] In other words, instead of only a few assets being reflected on the balance sheet and dividend income in the income statement, consolidated financials presented all of the underlying assets, liabilities, income and expenses providing an, arguably, more transparent reflection of the group.

scandals (see Chandra et al., 2006; Walker, 2006), demonstrating its importance. Lander and Auger (2008, p. 27) state that "off-balance-sheet financing is one of the most significant ways … that the user of financial statements can be misled".

Enron[19] is a widely cited example of the consequences of incorrectly assessing the scope of the group (Haswell, 2006; Jones, 2011; Nobes, 2014; IASB, 2015e; Maroun and van Zijl, 2016). Enron used unconsolidated subsidiaries to hold debt on the Group's behalf, achieving off-balance-sheet financing. Enron's unconsolidated special purpose vehicles (SPVs) often used "racy names from the Star Wars films, like Raptor and Chewco" (Jones, 2011, p. 58). Shifting debt off the balance sheet is complex and often requires the involvement of merchant banks and allowed the Enron group to report higher net assets and create the appearance of reduced financial risk (Jones, 2011). The Enron debacle put significant pressure on accounting standard setters to re-consider their consolidation scope prescriptions (Haswell, 2006; Nobes, 2014; IASB, 2015e; Maroun and van Zijl, 2016).

The UK's LEP provides another example from 1988. LEP had a 90% equity stake in a company which purchased property from LEP. Using the UK's regulations at the time, the investment was correctly classified as an associate and was not consolidated. The full profit on the sale of properties of £8.7 million was presented in LEP's financial statements, doubling their reported profit. By today's standards, the company would be consolidated. Property sales would have been treated as inter-company transactions and the inter-company profit eliminated in the consolidated financial statements providing a more transparent and faithful representation of the underlying economics of the transactions (Jones, 2011).

Cross guarantees illustrate another problem. Without appropriate consolidation scopes, guarantees of unconsolidated subsidiaries' debt can be difficult to identify to the detriment of investors and creditors. The 1988 case of British and Commonwealth Holdings provides an informative example. British and Commonwealth Holdings acquired Atlantic Computers via a series of transactions. Atlantic Computers had a flawed business model and mounting contingent liabilities, which British and Commonwealth Holdings guaranteed. When Atlantic Computers collapsed, British and Commonwealth Holdings was called upon as the guarantor but could not meet its commitments (Jones, 2011). Had the cross guarantees been reported, investors and

[19] A detailed review of Enron's accounting practices is beyond the scope of this thesis.

creditors would have been in a better position to assess the risk associated with those guarantees and acted accordingly.

The key message is that accountants can find loopholes in poorly formed accounting rules. They can take advantage of subjectivity and allowances for judgement to deceive users for the accountant's own self-interest. Auditors are also impacted as it is difficult, if not impossible, for them to alert users to accounting irregularities "if there is not a rule to prevent an entity from handling a particular transaction a certain way" (Lander and Auger, 2008, p. 27). But, as Botzem and Quack (2005) discuss, regulation is a politicised process where different stakeholders manoeuvre to pursue their own goals.

More generally, regulators and legislators react to scandals with new regulations, prescriptions and laws (Schwarz, 2002; Unerman and O'Dwyer, 2004). Such actions are required to repair and maintain the institutions' legitimacy and present themselves as being proactive to regain public trust (Unerman and O'Dwyer, 2004; Malsch and Gendron, 2011; De Villiers and Maroun, 2017). In doing so, new regulations may be more ceremonial than reflective of substantial change. To illustrate, Schwarz (2002, p. 1318), reviewed changes to consolidation accounting practices following the demise of Enron. He argued that, contrary to popular opinion, there were no material problems with existing consolidation standards at the time[20]:

> "It is human nature to overreact to dramatic events, like air crashes or, in this case, a landmark bankruptcy. Enron does not, however, represent a systemic problem; conflicts of interest can be managed, and the existence of isolated cases of fraud and bad judgment should not, in and of itself, be a basis to change the legal, financial, and accounting infrastructure of business that has - Enron aside - served us so well" (Schwarz, 2002, p. 1318).

Consolidation scopes provide an excellent illustration of the impact of adopting a rules-based versus principles-based accounting framework, and how neither is perfect (see Section 2.3 for more details). It also raises the question of whether specific anti-abuse provisions should be

[20] It should be noted that Enron prepared its financial statements in compliance with US Generally Accepted Accounting Practice (GAAP) and not IFRS. The discussion is still relevant as it had an impact on IFRS with the IASB updating its own consolidation standard in response to both Enron, other corporate scandals and the financial crises of 2007/8.

included. Former IASB Chairperson Hoogervorst (2012, p. 4) felt anti-abuse[21] provisions are necessary:

> "If we see ample scope for abuse in a standard, we had better do something about it. There are sufficient temptations and incentives for creative accounting as it is".

Regardless of a person's opinion about anti-abuse provisions, it is clear that accounting prescriptions with more sound conceptual foundations are crucial to guide accounting's development. In this light, the following discussion provides more specific detail on the functioning and consequences of different scope proposals when preparing consolidated financial statements.

Relationship between objective and the scope of consolidated reports

Theoretically, the scope of consolidation should be linked with the purpose of consolidated financial reporting as different objectives require different investee companies to be included or excluded (Walker, 1978; Nobes, 2014). Walker (1978) discusses five potential consolidation objectives and their consequential scope requirements. These are summarised in Table 3.

Table 3: Five propositions of supposed purposes of consolidated financial statements

Status and supposed function of consolidated reports	**Required scope of consolidation**
1. Primary documents to depict the financial position and performance of holding companies	Holding company plus "substantially **owned**" subsidiaries
2. Supplementary reports – to amplify the financial statements of holding companies	Substantially owned subsidiaries only – excluding holding company or A series of group statements, each covering those subsidiaries engaged in a **particular line of business** or

[21] Accounting prescriptions included to specifically prevent potential abuses of accounting principles that may lead to misleading information.

Table 3: Five propositions of supposed purposes of consolidated financial statements	
Status and supposed function of consolidated reports	**Required scope of consolidation**
	A series of group statements each covering **domestic** subsidiaries, **foreign** subsidiaries or Holding company and all **'material'** subsidiaries
3. Supplementary reports – to facilitate assessments of the ability of firms to meet their debts	Holding company and all **'controlled'** subsidiaries or All companies which have guaranteed the indebtedness of other companies, plus the companies subject to those guarantees or Some other combination, depending upon the **pattern of inter-company loans** (e.g., all subsidiaries involved in inter-company loans but excluding the holding company, if it is not involved in loans). (Note: foreign subsidiaries and/or jurisdictional limitations make resources unavailable to creditors and affect which companies to include. In addition, certain industries, such as banking, finance or insurance subsidiaries, might be excluded to avoid 'distortion' of liquid ratios.)
4. Supplementary statements – to depict the position and performance of "group entities"	All incorporated and unincorporated businesses subject to (actively exercised) control. (N.B.: tests of control might be based on voting power or contractual rights.)
5. Supplementary statements – to depict the position and performance of "economic entities"	All "controlled" corporations (or unincorporated associations) engaged in some specified business activity or activities.

(Adapted from Exhibit 1, Walker (1978, p. 104, emphasis added))

The first three propositions see consolidated reports as extensions of, or supplementing, a holding company's separate financial statements. This is sometimes referred to as the "parent company concept". The first objective was simple to apply in the early 1900's when entities were wholly or substantially wholly owned. In such cases, minority interests were negligible and presenting

subsidiaries' financial position and performance provided a more complete representation of the group for parent company shareholders and creditors. However, as structures became more vertically tiered, the effective ownership of subsidiaries by the ultimate parent company could be low[22]. In these instances, commentators felt that the inclusion of "low-tier non-wholly owned subsidiaries" is misleading as it overstates the assets, liabilities and profits available to creditors and investors of the holding company in the event of liquidation. Unincorporated partnerships and joint arrangements were excluded, providing opportunities to manipulate the financial position and performance of the parent/group (Walker, 1978; Walker, 2006).

The second objective was an attempt to overcome the shortfalls of the UK's legal balance sheet requirement where holding company reports used cost-based valuation rules and dividend income-based recognition methods. Consolidated reports amplified a parent's separate financial statements by reflecting the earning capacity of the group and the specific assets in which the holding company is invested. Goodwill was not necessarily seen as an asset and was to be identified as a balancing figure when preparing consolidated accounts (Walker, 1978; Walker, 2006).

The third objective is linked to the second but is more focused on the consolidated balance sheet as supplementing the parent company's balance sheet when considering the parent's credit worthiness. Consolidated balance sheets eliminate inter-company loans and provide a clearer picture of assets and claims on those assets. In addition, seniority of subsidiary loans should be reflected so that creditors can assess the actual liquidity of the parent. Where minority interests were present, goodwill on acquisition was deducted from shareholders' equity, again reflecting the liquidation value of assets to shareholders of the parent company (Walker, 1978; Walker, 2006; Ding et al., 2008).

Finally, the fourth and fifth objectives were ambiguous in that they presented consolidation reports as reflecting the position and performance of a group of economic entities *as if* the group were a single entity or as if subsidiaries were branches of the holding company. Some preparers interpreted this objective to mean strictly those subsidiaries within the *same or similar activities* as those of the holding company should be consolidated. This resulted in controlled subsidiaries

[22] For instance, consider a vertical group where the holding company owns 60% in Company 1, which itself owns 60% in Company 2 which itself owns 60% of Company 3. In this group, effectively only 21.6% (60% * 60% * 60%) of Company 3's profits are attributable to the holding company.

with dissimilar operations being scoped out and held under the cost model. An alternate interpretation was to include all *controlled* subsidiaries with some exclusions entertained on different grounds. For instance, if foreign subsidiaries' profits could not be repatriated to the holding company, it may exclude those entities from the consolidated accounts because those funds are not available for use by the rest of the group (Walker, 1978; Walker, 2006). For both the fourth and five objectives, goodwill on acquisition was considered a real asset with value and it should be calculated by grossing up the excess of the amount paid over the relative proportion of net assets acquired to determine the entirety of goodwill (Walker, 1978; Walker, 2006, Ch 15; IASB, 2015d).

At present, the scope of consolidation is much clearer. However, even in the 1990s there were strong interpretation differences regarding the scope of consolidation. A brief history of consolidation under IFRS is provided next.

2.3: History of consolidation under IFRS

This section provides a summary of consolidation accounting under IFRS. It is not meant to be complete, but to provide relevant detail so that readers can follow the application of the non-accounting theories to consolidation accounting.

The IASC issued IAS 3 – Consolidated Financial Statements (IAS 3) in 1976. It provided the principles for identifying and consolidating subsidiaries as well as how to account for investments in associates and unconsolidated subsidiaries. IAS 3 defined control as the ownership of more than half of the voting power of a company either directly or indirectly (IASC, 1976, para 4). This was in line with pre-IFRS GAAP of the time. IAS 22 – Accounting for Business Combinations (IAS 22) was issued 7 years later (1983). It dealt with the at acquisition transaction outlined by IFRS 3 – Business Combinations (IFRS 3).

IAS 3 took a wide view of the users of financial statements by including employees and customers. It included creditors as a user group which "in some circumstances" may be interested in consolidated financial statements (IASC, 1976, para 5). This is significantly different from the current narrow perspective of users which only includes current and potential shareholders and *creditors* (IASB, 2018).

IAS 3's objective was to provide information on "the fortunes of the entire group … to be informed about the results of operations and the financial position of the group as a whole" (IASC, 1976, para 5). Accordingly, consolidated financial statements presented the financial position and performance of a group as if it were a single economic entity, as is currently stated by IFRS 10 – Consolidated Financial Statements (IFRS 10). IAS 3 recognised that many GAAP exceptions to consolidating subsidiaries were subjective and allowed wide variations in the consolidation practices of different companies for similar situations. For example, if consolidation was impracticable, if consolidation would result in disproportionate expense or delay or if, in the opinion of the directors, consolidation would provide misleading or harmful information (IASC, 1976, para 10). IAS 3 concludes that only the following are acceptable consolidation exclusions:

- where the parent has temporary control or where the long-term ability to control the subsidiary is impaired because of restrictions on the transfer of funds (*mandatory* exclusion) (IAS 3: 8 & 36) and
- where the subsidiary's activities are so dissimilar from the rest of the group's that providing the separate financial statements of these subsidiaries with the consolidated financials will provide better information (*optional* exclusion) (IAS 3: 9 & 37).

IAS 3 allowed, but did not require, companies to be treated as subsidiaries and consolidated if the parent:

- owned a majority of the company's equity capital but less than the majority of the company's voting power (IAS 3: 38(a)); or
- had the ability to direct the financial and operating policies of the company because of statute, agreement or contract (IAS 3: 6 & 38(b)).

IAS 3 required the cost of acquiring the subsidiary to be allocated to its identifiable assets and liabilities on the basis of "their values" (IASC, 1976, para 10). Any difference between the cost of acquisition and the parent's share in the amounts allocated to individual assets and liabilities was to be shown in the consolidated balance sheet "appropriately described" (IASC, 1976 para 13). This is similar to IFRS 10, except that IFRS 10 requires that the fair value of identifiable assets and liabilities be recognised as goodwill.

Goodwill is the difference between the sum of the cost of the investment and the value of the non-controlling interest (NCI), and the net assets of the subsidiary's assets and liabilities fairly valued. All other consolidating procedures, such as eliminating preacquisition capital and intercompany transactions, balances and unearned profits are largely consistent with IFRS 10[23]. Subsidiaries not consolidated were to be accounted for using the equity method (with similar requirements to the current IAS 28 – Investments in Associates and Joint Ventures (IAS 28)) along with any investments in which the parent has significant influence over the operating and financing policies of that investee (IASC, 1976; IASB, 2015b).

IAS 22 was issued in 1983. It updated IAS 3's initial principles of the at acquisition accounting to be more in line with what is currently required by IFRS 3. All a subsidiary's identifiable assets and liabilities were to be initially recognised at fair value, instead of their separate company accounts' carrying values. In addition, the difference between purchase consideration and the net assets of the subsidiary were to be recognised either as goodwill (an asset in the consolidated balance sheet) and amortised over its useful life or as an adjustment to shareholders' interests. This still allowed divergence in consolidated financials unlike IFRS 3 which requires the difference to be recognised as goodwill (IASC, 1983; IASB, 2015d). IAS 22 required that if goodwill is recognsied, it must be amortised over its useful life (IASC, 1983, para 20). While IFRS 3 does not allow for the amortisation of goodwill, reinstating amortisation of goodwill is currently being considered by the IASB (IFRS Foundation, 2022).

IAS 27 – Consolidated Financial Statements and Accounting for Investments in Subsidiaries (IAS 27 1989) was issued in 1989 and superseded IAS 3. The major difference was an updated control definition. Under IAS 27 1989, control is present when the parent has the "power to govern the financial and operating policies of an enterprise so as to obtain benefits from its activities" (IASC, 1994, para 6). In the wake of Enron, Special Purpose Entities (SPEs) became a major concern. A SPE[24] is a structured entity with a special purpose, usually to enable off-balance sheet financing[25]. The US and many other countries' local accounting standards had flexible rules with regards to consolidating SPVs. When the Standards Interpretation Committee (SIC) was drafting

[23] IAS 3, however, instead of recognising NCI as a separate balance simply required the elimination of the parent company's share of the subsidiary's share capital, preacquisition reserves and profits (IASC, 1976, para 10(b)).

[24] Also known as Special Purpose Vehicles (SPV).

[25] Other uses of SPVs include securitization of financial assets, acquiring property, plant and equipment under the guise of long-term leases and funding research and development activities (Larson, 2008).

SIC 12 – Special Purpose Entities (SIC 12), 25% of the commentors "adamantly opposed it" including staff of the FASB (Larson, 2008, p. 27). SIC 12 was issued in 1998 and adopted a risks and rewards approach to determining control and did not require that the SPE operate on autopilot (SIC, 1998).

SICs are meant to help accountants apply the existing IAS and IFRS consistently. SICs are not meant to incorporate new prescriptions. However, it unintentionally led to the perception that there are two "methods" to determine when to consolidate a subsidiary – a *control* and a *risk and rewards* basis. Consequently, some accountants selectively applied one approach to use leading to divergence in practice (IASB, 2011; van Zijl and Maroun, 2017). This practice may have been genuine, but it may also have been accountants applying the definition which gave them a pre-determined outcome.

IAS 27 was revised again in 2011. This was a significant revision and marked the separation of standards for dealing with consolidated and separate financial statements. IAS 27 was retitled *Separate Financial Statements* (IAS 27 2011) and IFRS 10 was issued to provide the consolidated financial statements prescriptions. SIC 12 was superseded by the publication of IFRS 10's new improved definition of control. Now, "[a]n investor controls an investee when it is exposed, or has rights, to variable returns from its involvement with the investee and has the ability to affect those returns through its power over the investee" (IASB, 2015e, para 6). This new definition and extensive application guidance incorporated the principles of SIC 12 into the control principle.

IFRS 10 is a significantly longer standard than its predecessors and provides extensive guidance[26]. IFRS 10 states that an investor controls an investee when the investor has "(a) power over the investee; (b) exposure, or rights, to variable returns from its involvement with the investee; and (c) the ability to use its power over the investee to affect the amount of the investor's returns" (IASB, 2015e, para 7).

In 2010 the IASB, as part of the project on consolidation, decided to develop and issue a separate standard focusing on the disclosure required where companies have interests in other entities. IFRS 12 – Disclosure of Interests in Other Entities (IFRS 12) was issued in 2011. IFRS 12 requires companies to disclose the significant judgements and assumptions made in determining whether

[26] IAS 3 presented 49 paragraphs while IFRS 10 has 33 paragraphs and 101 paragraphs of authoritative application guidance.

it does *and* does not control entities it has material interests in (IASB, 2020, IN 6 -7). This, at least, provides users with some information about unconsolidated entities. In doing so, it affords users with the ability to decide for themselves whether they agree or disagree with those judgements and how they want to proceed. Users may ask management for more information and incorporate that into their estimates and economic decisions.

Related standards – associates and joint arrangements

The preceding discussion dealt only with subsidiaries, defined as a structure where an investor can control an investee unilaterally. Control is a spectrum where no control lies on one extreme and absolute control lies on the other. In between are significant influence and joint control. The IASC first issued an exposure draft to deal with situations where a investor has significant influence over an investee (associates) in 1986. IAS 28 – *Accounting for Investments in Associates* (IAS 28) was issued in 1989. At the same time, IAS 31 – Financial Reporting of Interests in Joint Ventures (IAS 31) developed and issued in 1990 (IASPlus, 2022b; a).

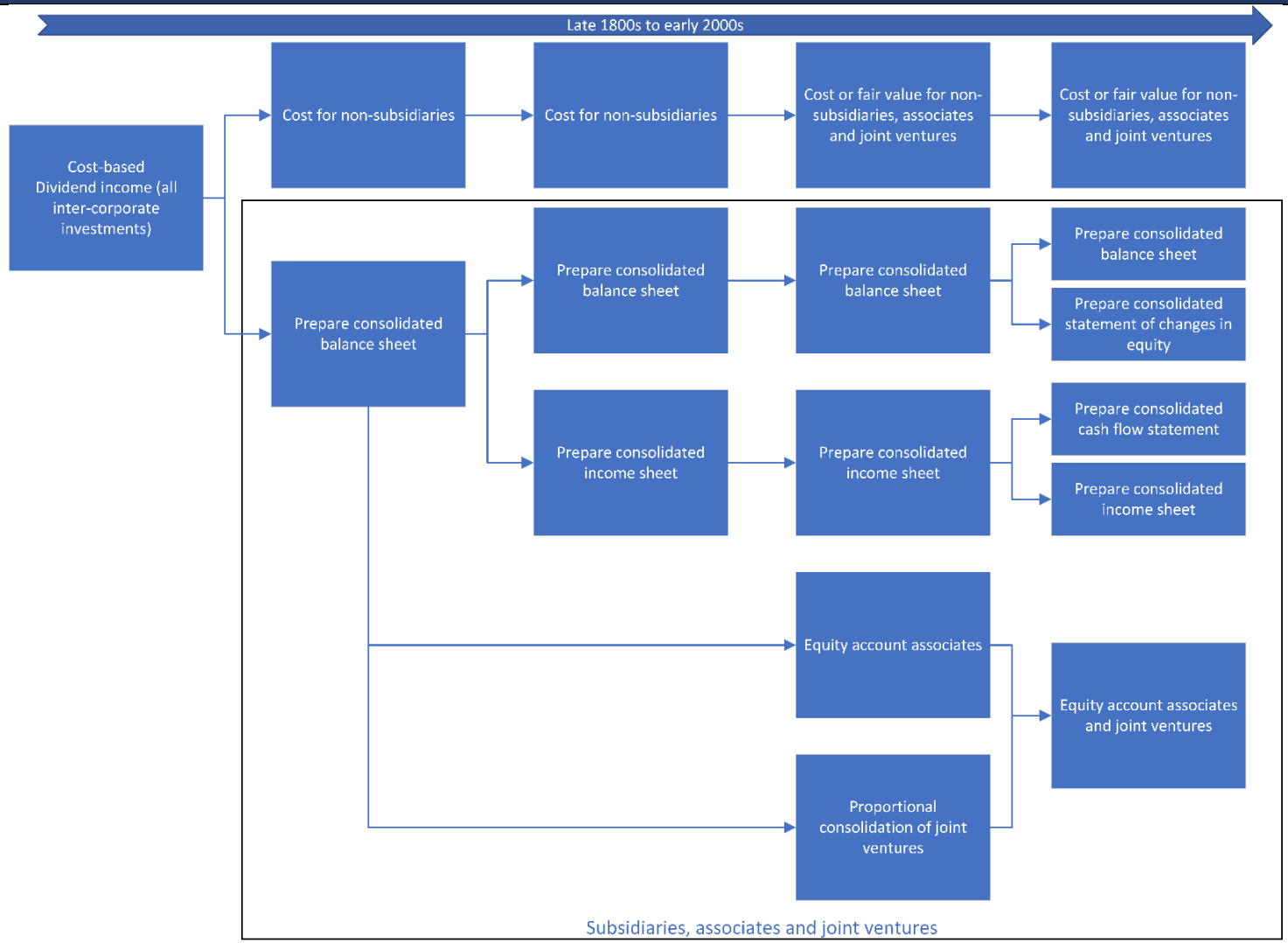
IAS 28 recognised that where investors have significant influence, merely recognising dividends does not faithfully reflect the economic substance of the relationship. Consequently, the investor's share of profits or losses of the investee are recognised. Similar to consolidation practices, the investor's share of inter-company transactions are eliminated (IASB, 2015b). Interestingly, joint ventures, where two or more investors have joint control over an investee, were proportionally consolidated. This leads to the peculiar situation where assets and liabilities are partially recognised (IASB, 2009).

At face value, proportionally recognising assets and liabilities makes sense as a good alternative than simply holding the investments at cost or consolidating 100% of the joint venture. While the IASB were working on their new consolidation standard (IFRS 10), they also changed their thinking of joint venture accounting. Reflecting the investor's shares of a joint venture's assets potentially gives a false impression that the investor controls the asset. This is not the case as although two or more investors control the investee, they only have a right to the net assets. Consequently, and supported by motives such as reducing complexity, joint venture accounting was changed to follow the equity method used for associates (IASB, 2015f).

The history of investment accounting in the UK and USA pre-IFRS as well as under IFRS reflects the diverse range of ways in which investments can be accounted for (see Figure 1). Each has

advantages and disadvantages with some rational justification at the time. What changed in twenty years to initiate a big change in the selected method to accounting for joint ventures? The next section discusses the two theoretical frameworks adopted by this thesis to contribute to our understanding of accounting's evolution.

Figure 1: Illustration of inter-corporate investment accounting



(Self-constructed)

3: Theoretical frameworks

The descriptive nature of accounting research led to initial accounting standards being based on "generally accepted practice", something which Deegan (2014, p.8-9) describes as a type of "accounting Darwinism":

> *"…*accounting practice has evolved, and the fittest, or perhaps 'best', practices have survived. Prescriptions or advice are provided to others on the basis of what most accountants do, the 'logic' being that the majority of accountants must be doing the most appropriate thing" (Deegan, 2014, Ch 1, p. 8-9).

Whether or not the dominant practice is most desirable or the practices of most prominent accountants are "actually superior to [their] rivals" is, however, questionable (Hoskin and Macve, 2000; Napier, 2001, p. 15). This is because of the way in which accounting techniques are understood, applied and replicated reflects the operation of multiple, and often competing, forces (see Watts and Zimmerman, 1979; Thietart and Forgues, 1995). This can be better understood by considering how accounting systems resemble features of chaotic systems and the concurrent operation of evolutionary game theory. Each is discussed next.

3.1: Chaos theory[27]

Chaos theory, also known as complexity theory, has its roots in mathematics. It deals with open, dynamic non-linear systems. Specifically, chaos theory relates to systems which may appear random but where there are deterministic patterns, feedback loops, self-organisation or periods of divergence and convergence. Because of chaotic systems' properties, small changes can lead to no or significant long-term trajectory changes. To illustrate, Lorenz said a butterfly flapping its wings can cause significant storms month later (Thietart and Forgues, 1995).

Chaotic systems are extremely difficult to predict, but there is some level of prediction possible. Obtaining a greater understanding of chaotic systems allows scientists to, for example, provide reasonable weather predictions. Such prediction is extremely important to countries which

[27] This section was "tested" at the 11th Accounting History International Conference and forms the basis of a book chapter in the Accountability Handbook: Business Section. The chapter has been accepted, but the book has not yet been published at the time of this thesis's submission.

experience natural disasters. Chaos theory has contributed significantly to improving early warning systems to help to save lives (Levy, 1994).

Chaotic systems' qualitative properties are also useful for social scientists interested in understanding systems which operate in open non-linear environments (Polley, 1997; Strogatz, 2014). The non-linear characteristic of chaotic systems is because of the compounding, dampening or combined compounding and dampening effects of feedback loops[28] between components of the system. These can result in system trajectories which appear to be random (uncontrolled or without method or design) but are deterministic in nature (Levy, 1994; Polley, 1997; Dolan et al., 2000; Boeing, 2016). This characteristic distinguishes chaotic systems from purely random systems. Other important characteristics of chaotic systems are that their future trajectories are significantly dependent on their initial states, and they are very sensitive to tiny variations in the initial conditions of the system because of the presence of feedback loops (Levy, 1994; Polley, 1997; Boccaletti et al., 2000).

Traditional scientists often aim to analyse the individual parts of larger systems. Their goal is to find "the easiest way to explain and predict natural phenomena … but partial analyses, as opposed to global ones, yield partial solutions" (Dolan et al., 2000, p. 3). To illustrate the importance of this point, Dolan et al. (2000) uses the folk-tale of four blind people each discovering different parts of an elephant. One person feels the elephant's trunk, another its tail, the third its hind legs and the last person touches its stomach. Each person's account is disconnected from the others', leading each person to believe incorrectly that they are dealing with four different animals. Any theories and views of reality will be distorted. Chaos theory can overcome some of these challenges. Chaos theory can be used to develop conceptual models which are more complete. In doing so, they are useful to understand systems in which multiple forces and stakeholders interact in complex ways to reconcile systems' inherent unpredictability and identify distinct patterns (Levy, 1994). By understanding systems and their relationships more completely, researchers can identify the general direction or directions towards which systems tend as well as what causes the system to converge or diverge. This ability has led researchers in mathematics, sociology, ecology, medicine, international relations and economics to use chaos theory extensively (Levy, 1994; Dolan et al., 2000). The key qualitative properties of chaos theory are discussed in Section 3.1.1 in the context of organisational studies.

[28] This is where the output of a system is fed back into the next iteration of it as an input. In this way, feedback loops are created.

3.1.1: Qualitative properties of chaos and their use in organisational studies

Social science researchers have been preoccupied with goals of control and prediction (Gregersen and Sailer, 1993) with many assuming that organisations are stable and can be explained by basic mechanistic models (Thietart and Forgues, 1995). This may be neither appropriate nor desirable because of the inherent unpredictability of real-world phenomena and the plethora of interactions between multiple variables yielding an inherently complex system. For example, there is competition between companies in the same industry. These companies are affected by the competition between their common suppliers. All of these companies are affected by general local and global economic conditions (Thietart and Forgues, 1995; Anderson, 1999). As recently seen, conflicts in one part of the world can have a significant and lasting impact on other parts not involved in the conflict in the first place. Gregersen and Sailer (1993) argue that any social science research which studies phenomena which display discontinuous, unexpected or unpredictable changes, should consider chaos theory as part of their study. This is because chaos theory does not reduce complex systems to manageable linear systems with assumptions which result in reduced applicability and explanatory power (Gregersen and Sailer, 1993; Levy, 1994; Boccaletti et al., 2000).

The main concepts of chaos theory relevant for many social science studies are: (1) that the system's future state is dependent on its current state, (2) the existence of positive and / or negative feedback loops, (3) that the system is extremely sensitive to initial conditions, (4) self-regulation and (5) fractal properties (see Gregersen and Sailer, 1993).

A chaotic system's future state is dependent on its current state because one or more inputs to these systems are a function of the system's previous outputs. This results in these systems being extremely sensitive to initial conditions (Gregersen and Sailer, 1993). This can be explained by considering how feedback loops function. A feedback loop arises where the output of a system has an impact on an input to the same system creating a loop. Positive feedback loops accelerate, reinforce or amplify the effects of a disturbance while negative feedback loops dampen or slow down the disturbance[29] (Levy, 1994; Manson, 2001). These feedback loops, coupled with the fact that the system's future state is dependent on its current state, result in the system being extremely sensitive to initial conditions. In other words, two identical systems which begin at

[29] This can result in exponential changes that are not proportional to the magnitude of the disturbance to the system.

insignificantly different starting points may follow drastically divergent trajectories depending on the type and number of feedback loops each system actually experiences (Levy, 1994; Thietart and Forgues, 1995; Anderson, 1999; Boccaletti et al., 2000).

Where systems which involve humans are concerned, chaos theory "underscores the fact that our intelligence is inherently limited" (Tsoukas, 1998, p. 300) with the result that a person's finitude[30] and historicity[31] *form the grounding for all understanding and action*. Important for this thesis is humans' cognitive finitude where we may not be able to comprehend and process all relevant information with consequential impacts on our decision-making. We may develop personal so-called *rules-of-thumb* to help us cope with situations of heightened complexity to make decisions timeously. It can also contribute to a person's *gut-feel* in time-sensitive situations where waiting for complete information and a thorough analysis to be complete may render the decision irrelevant (Sadler-Smith and Shefy, 2004). Historicity refers to the fact that our behaviour is a complex function of our current knowledge, past experiences and cultural context, amongst other factors. Our finitude and historicity can lead to biases, use of "quick shortcuts, heuristics" and divergent solutions when faced with complex situations and tasks (Hertwig and Todd, 2003, p. 214). This is especially the case where there is no objective and discernible solution or where subjective judgement is involved, such as in accounting (Hogarth, 1991; Hertwig and Todd, 2003).

Where subjectivity is involved, the preconditions which affect each person's finitude and historicity lead to the need to "collectively deliberate and, thus, to engage in political activity in order to settle our differences and decide on the course of action to be taken" (Tsoukas, 1998, p. 300). This requires that people react to and anticipate other people's actions, resulting in complex feedback loops (Levy, 1994) which, themselves, is fed back into each person's future decision making (Levy, 1994; Thietart and Forgues, 1995; Anderson, 1999). Importantly, "human beings have *bounded rationality* … and cannot be expected to solve any but the simplest games" (Colman, 2013, p. 285, emphasis in original).

In organisational complexity, Anderson (1999), Polley (1997) and Thietart and Forgues (1995) see both positive and negative feedback loops in organisations. Examples of negative feedbacks

[30] "Finitude" refers to humans' limited knowledge capacity and capability.

[31] "Historicity" refers to the prejudices developed based on each person's individual and arbitrary lived experiences (initial conditions) and how these come to constitute how a person interacts with and perceives the world and determines what choices to take (Tsoukas, 1998).

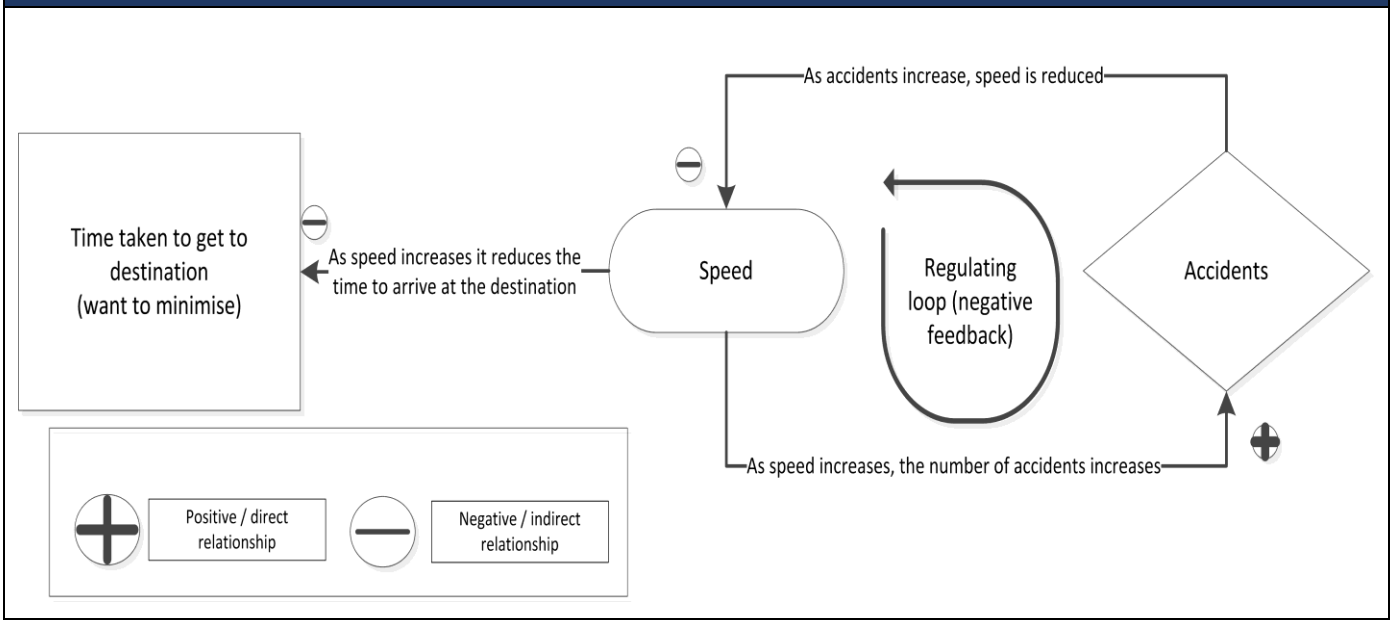
which will push an organisation towards stability are “planning, structuring and controlling” forces and organisational controls (Thietart and Forgues, 1995, p. 23). Organisational support and process which facilitates “innovation, initiative and experimentation” are examples of possible positive feedback loops which may cause instability in an organisation (Thietart and Forgues, 1995, p. 23). Importantly, organisations need to balance these positive and negative feedback loops in order to manage their businesses effectively at different stages of their life-cycle and based on current environmental factors (Thietart and Forgues, 1995; Polley, 1997; Dolan et al., 2000). For instance, during times of heightened competition or during crises companies may need to foster innovation and creativity by relaxing organisational processes which aim to control and standardise employee behaviour. When more stability and certainty is required to make employees feel comfortable to perform their duties efficiently and effectively, planning, structure and standardisation are paramount.

Feedback systems can promote a degree of self-regulation. This comes in the form of “strange attractors”[32] where stability can arise *within* the chaos of complex interactions between complementary and competing forces (Tsoukas, 1998). In other words, chaotic systems have points around which some degree of order occurs, creating a sense of self-organisation. Tsoukas (1998) uses traffic patterns as an illustration. In the absence of traffic laws, drivers would eventually follow some speed pattern for driving through busy intersections[33]. While higher speeds reduce the time to get to your destination, they also lead to more accidents which reduces speed and increases the time until you get to your destination (see Figure 2). In this way, the speed feedback loop has a regulating quality which prevents drivers from speeding uncontrollably, creating some stability among the chaos.

[32] The term “strange attractors” comes from the strange visual appearance of orbits of stability that are seen in logistic maps of chaotic systems (Thietart and Forgues, 1995).

[33] The possible feedback loops present in this self-regulation may include speed and the number of cars coming from each direction.

Figure 2: Traffic feedback loop



(Developed by the researcher to illustrate Tsoukas (1998) traffic patterns application)

The attainment of temporary states of relative order is usually explained in terms of the strange attractor/s. Thietart and Forgues (1995) consider strange attractors in organisations and present them as people, structures or situations which limit behaviour and, in so doing, form some order within disorder. According to Anderson (1999) and Thietart and Forgues (1995), companies need to be continuously innovative and creative to survive in the modern disruptive environment. Old management styles which were defensive and reactive will not be appropriate. Traditional management styles which sought to manage employees by objectives or via detailed instructions are also limiting success in modern business (Dolan et al., 2000; Dolan and Garcia, 2002). Consequently, Dolan et al. (2000); Dolan and Garcia (2002) and Levy (1994) investigated changing management styles using the strange attractor property *qualitatively* to design a new management style. The result was *management by values* where *values* are the strange attractors used to create a sense of order in employees' behaviour without limiting innovation and experimentation (disorder). If these values are well defined and used consistently throughout the business, the result is a workforce which is granted the freedom to be innovative, creative and experimental in a manner which aligns with the company's overall strategic goals.

Defining key values and social traits when hiring employees is an example. Ensuring the organisational structure is compatible with those values is also crucial. To illustrate, hiring highly motivated, ambitious, extrovert and self-directed employees but within an extremely hierarchical

and bureaucratic organisational structure will not work. But, hiring those same staff within a relatively flat, team-orientated organisational structure which empowers employees to identify challenges and opportunities and address or take advantage of them while working towards a unified goal may appear chaotic but is organised around the entity's goal (Thietart and Forgues, 1995; Anderson, 1999; Dolan et al., 2000; Dolan and Garcia, 2002).

Strange attractors often appear at different scales in similar forms, known as the scale invariance or fractal[34] property (Levy, 1994). For example, the fractal property of chaotic systems has been seen in daily, monthly and yearly stock market prices (Peters, 1989; Thietart and Forgues, 1995). These fractals may even appear on larger scales where "similar patterns of behaviour might be expected whether one examines competition between countries, between firms in an industry or even between departments in a firm" (Levy, 1994, p. 172). Because of the scale invariance property (fractals) of chaotic systems, research has shown that studying an organisation, its processes and changes at one level allow inferences to be made about the organisation at other levels. This is a valuable tool for studying large and complex organisations where access to all levels is difficult (Thietart and Forgues, 1995).

Utilising the qualitative properties of chaos theory, Polley (1997), Dolan et al. (2000) and Thietart and Forgues (1995) illustrate how chaos yields periods of instability within an organisation to encourage innovation and creativity during turbulent times, and periods of stability when order is desired to make employees feel comfortable and confident enough to carry out their duties. These different periods of equilibrium are needed at different stages in an organisation's life cycle. Employees within an organisation have the power to change the relative strength of dynamic forces to encourage changes from one state to another as required by business and environmental needs (see Van de Ven and Poole, 1995).

3.1.2: Classifications of chaotic systems

Chaotic systems can be classified into four different categories. This thesis adopts Hernes' (1976) taxonomy of chaotic systems as it is still utilised in its original form (Polley, 1997). Hernes (1976) developed this taxonomy for dynamic social systems and this is appropriate in an accounting context because of accounting's social construction nature (Hernes, 1976; Polley, 1997).

[34] Fractals are self-similar patterns which appear across different scales (Fractal Foundation, 2022).

Two of the four categories represent equilibrium states while the other two represent changing states[35]. The two equilibrium states are called simple reproduction and extended reproduction. The two change states are transition and transformation (Polley, 1997).

Simple reproduction is a chaotic system that has a single strange attractor to which the system always tends. This system typically has strong negative feedback loops. A disturbance results in temporary fluctuations which dampen over time until the system ultimately returns to its original strange attractor (Thietart and Forgues, 1995). As a result, the system structure, parameters and output do not change in response to a disturbance (Hernes, 1976).

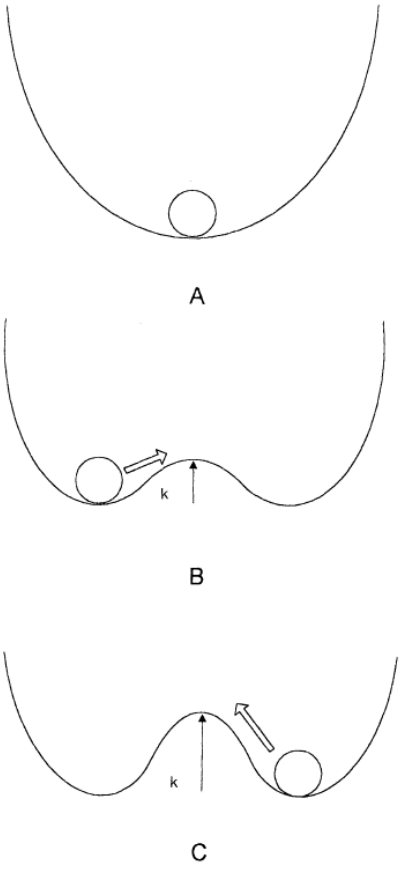
In an extended reproduction system, the system may oscillate between two (or more) strange attractors, crash or explode. In systems which oscillate between strange attractors, the system may reach the same point repeatedly or it may only tend towards the same attractors in a fluid motion without ever duplicating previous outputs precisely (Hernes, 1976; Polley, 1997). Because of this characteristic, this system is sometimes mistakenly categorised as a “pure” random system (especially if the time horizon of analysis is inappropriately short). However, under closer scrutiny, a pattern emerges over time revealing it as an extended reproduction chaotic system (Hernes, 1976; Polley, 1997). Extended reproduction can also be described as bifurcation systems where there are two or more ‘basins’ into which the system can settle. Disturbances may cause only temporary fluctuations or may result in a shift from one ‘basin’ strange attractor point to another (Hernes, 1976; Polley, 1997).

Transition describes a system where the parameter value(s) or boundary(ies) have changed because of a disturbance but the system structure remains the same. For example, a simple reproduction system with strange attractor X will remain a simple reproduction system but with a new strange attractor Y in response. Similarly, an extended reproduction system will remain as an extended reproduction system but with different strange attractors (Hernes, 1976; Levy, 1994; Polley, 1997).

[35] Mathematical chaos is not discussed as this is not a type of chaotic system. A chaotic system is deterministic. Genuine chaos, mathematical chaos, is not deterministic at all. A (deterministic) chaotic system can become genuinely chaotic (mathematical chaos). Such systems are not useful for the purposes of this thesis.

In contrast, transformation refers to a change in parameter(s) which results in the system's structure changing. This can move the system from one equilibrium category to another and even into a genuinely chaotic state. For illustration, a simple reproduction system with a single strange attractor (A) may transform because of a disturbance (change in parameter k) into an extended reproduction system as depicted in Figure 3 (Hernes, 1976; Polley, 1997). After the disturbance, the system may settle either in the left-hand basin (B) or the right-hand side (C).

Figure 3: Bifurcation of a system into two basins



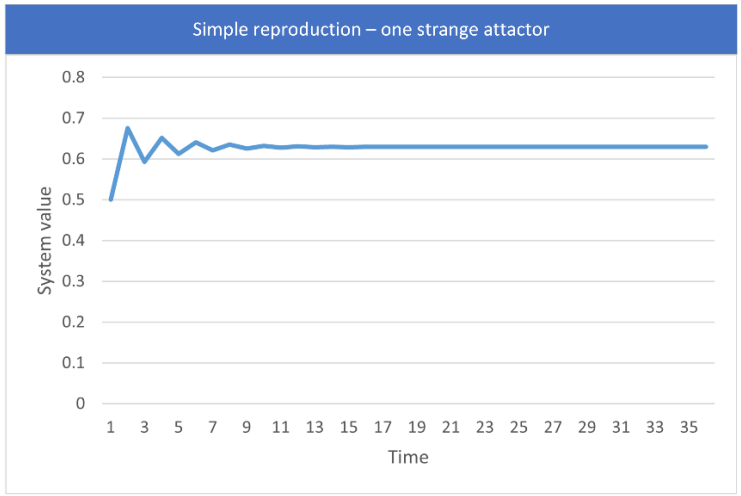
(Polley, 1997, p. 447)

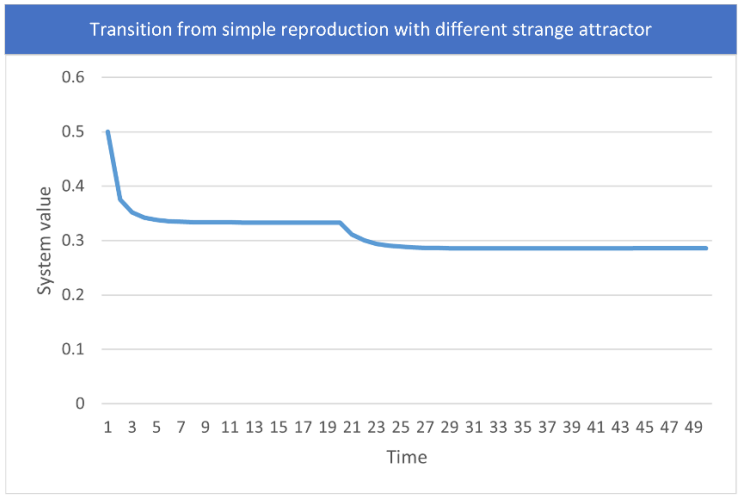
The two types of chaotic systems and the consequences of disturbances to the systems sufficient to cause a transition or transformation are presented in Figure 4.

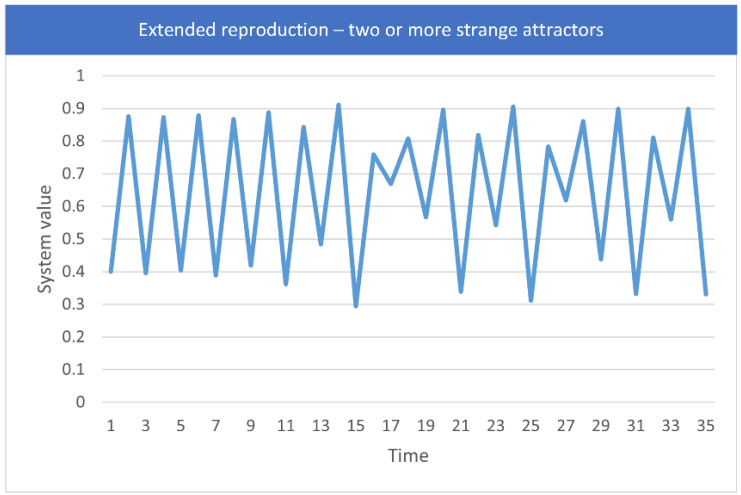
Figure 4: Types and result of disturbances to chaotic systems

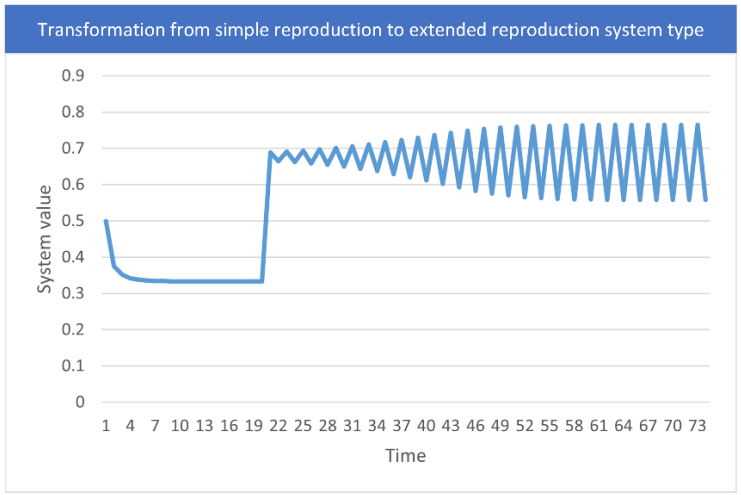
Two types of chaotic systems

Change to system type in response to disturbance









(Self-constructed)

Understanding the category of a system helps with short-term prediction but cannot ensure long-term prediction. This is because the system can transition or transform in response to disturbances. Nevertheless, these characteristics have proven useful in organisational and social contexts, particularly the self-organisation aspects (Hernes, 1976; Gregersen and Sailer, 1993; Levy, 1994; Polley, 1997; Dolan et al., 2000).

3.1.3 Path-dependence

Because a chaotic system's future state is dependent on its current state, path-dependency is an important and useful means to help understand social and political chaotic systems (Roe, 1996; Kay, 2005). Path-dependency is not a theory or model in itself that lists key variables and relationships (Kay, 2005), but a way to narrow down the potential paths a system may have taken by linking decisions taken at a point in time to where the system may head in the future. Path dependency is applicable where

> "initial moves in one direction elicit further moves in that same direction; in other words, the order in which things happen affects how they happen; the trajectory of change up to a certain point *constrains* the trajectory after that point" (Kay, 2005, p. 553).

Put differently, path-dependency explains why a person's historicity is important to understanding their choices. People make "political and economic" choices and path-dependency is a mechanism to conceptually reduce the possible choice sets and understand their decisions through time (Kay, 2005, p. 554).

Roe (1996) provides a useful illustration of path-dependence. Picture a spice trader walking a new path to find new customers. The trader intentionally takes a winding path to avoid predators. Over time, the path becomes well-trodden with an increasing number of people taking the same winding path. As the start and end destinations along the path become more populated, people begin to build structures along the bends in the road to house and feed travellers. Eventually, the road, houses and factories along the winding route are well established and maintained. Decades later, and despite the fact that predators are no longer a risk, the cost to demolish existing structures and create a more efficient straight road exceed the benefits.

The example illustrates that just because the winding road is accepted without change at present does not mean it is the most efficient method to travel between two points in the present day. Instead, it represents what exists based on decisions made many decades before and that the consequences thereof may continue to affect presents structures. Had the spice trader been a good hunter, it is possible the hunter may have taken a more direct route. Had that happened, the road at present may have been straight (Roe, 1996).

The example can be used to highlight three other important characteristics. Firstly, once it is clear that the winding road will not be replaced with a straight road, people will develop technologies to best deal with *winding* roads. For instance, cars will be designed to manoeuvring through corners and people will learn how to control the cars through corners safely. Secondly, authorities may decide at a point in future that the benefits of a straight road and related structures exceed the cost of demolishing the winding road, adjacent structures and rebuilding. Path-dependency does not mean different trajectories are impossible but provides a means to think through the importance of historical context to understand existing systems and their development. Lastly, path-dependence explains why existing systems should not automatically be assumed to be optimal (Roe, 1996; Kay, 2005).

3.1.4: Application of chaos theory in an accounting context

As discussed in Section 2.2, interpretive theorists argue that accounting is socially constructed (Walker, 2006; Rodrigues and Craig, 2007; Ravenscroft and Williams, 2009; IFRS Foundation, 2013, paragraph 1.1). What is acceptable for any current body of accountants is a complex function of, inter alia, their education (Carlin and Finch, 2010; van Zijl and Maroun, 2017), experience (Thietart and Forgues, 1995), exposure to different types of transactions (Haswell, 2006), willingness to change (Van de Ven and Poole, 1995; Carlin and Finch, 2010) and motivations (Watts and Zimmerman, 1979; Thietart and Forgues, 1995; Zeff, 2002; 2012). The result is a system whose future state is dependent on its current state as what will come to constitute “generally accepted accounting practice” is highly dependent on what is *currently* “generally accepted accounting practice”. For example, the Accounting Principles Board (APB) rejected early fair value measurement proposals because:

> "[fair value is] too radically different from generally accepted principles for acceptance **at this time**" (APB in Deegan, 2014, p. 9, emphasis added).

Accounting operates in an open, dynamic environment and is impacted by numerous feedback loops. The IASB's standard setting process may be an example of one loop. When a new transaction arises, preparers look to existing standards for guidance. If there is divergence in the accounting for a new transaction in practice, the IASB may add the issue to its agenda. Next, the IFRS Foundation technical staff (IFRS Staff) will draft new accounting proposals and pose issues for the IASB to consider. A discussion paper (DP) is typically published so that interested stakeholders can comment on the IASB's preliminary ideas and accounting proposals. Based on the feedback received, the IASB can revise their proposal and re-issue a DP or issue an exposure draft (ED) and, ultimately, a new standard (see IFRS Foundation, 2013, Ch 4). Significant opposition to, or divergence from, the DP are examples of what might lead to a revised and re-issued DP until relative acceptance is achieved (see Zeff, 2002; Sacho and Oberholster, 2008; Ravenscroft and Williams, 2009; Camfferman and Zeff, 2018).

The nature, scope and perceived importance of the issues being discussed in each DP will influence which, and how many, stakeholders engage with the IASB on its proposals (Zeff, 2002; Camfferman and Zeff, 2018). Kerr et al. (2014) argue that interest groups lobby standard-setters only when they are directly affected by the matter under consideration rather than in all instances equally (see also Watts and Zimmerman, 1979). This self-interest is a significant motivating factor when stakeholders are deciding on the level and extent of resources to direct towards commenting on, and lobbying for or against, a DP or ED (Wirl, 1994; Zeff, 2012; Kerr et al., 2014).

In addition, the relative power and influence of the stakeholder groups that engage with the IASB on specific DPs have an important impact. Consequently, not all DPs and EDs are interrogated by stakeholders to the same degree nor with the same intensity, adding a layer of complexity to accounting's evolution. For example, in some cases two stakeholder groups may have opposing views about a DP. This may lead to neither's preferred accounting treatment being adopted but rather a compromise being adopted (see also, Walker, 1978). In other cases, if one stakeholder group's view is unopposed, it can result in an amplifying effect by rallying support from other stakeholders to ensure a specific position is adopted. Inconsistencies between standards may arise (see also Wirl, 1994) which may confer an advantage on only some players and create further complexity in an already complex accounting environment.

Finally, as discussed in Section 2.1, society and accounting impact and affect one another in an iterative manner – they co-evolve (see Hopwood, 1987; Bryer, 2000a; Blackmore, 2001). This interaction adds a plethora of variables which may impact accounting's evolution. This can create an environment which is unmanageable for the limited human intellect of accountants (see Tsoukas, 1998). Similar to how traffic patterns will emerge despite the lack of formal traffic laws, specific concepts begin to guide accountants towards specific accounting treatments and routines. This contributes to creating a sense or order from disorder and, in doing so, navigating the complexity becomes manageable for accountants.

Murphy et al. (2013) provide insights useful to understand the concept of strange attractors in an accounting context. They use the shift from the stewardship to the neoliberal objective of accounting as examples of accounting "laws". Importantly, these laws are not necessarily reduced to writing and form part of the "living law of accounting" (Murphy et al., 2013, p. 72). The analogy is fitting as it helps to explain why certain concepts impact accountants' understanding and application of accounting despite not being codified and despite attempts to remove them (see also Whittington, 2008; Ravenscroft and Williams, 2009).

Building on the idea of "living laws", concepts such as stewardship, matching, the accrual basis of accounting, time-value-of-money and prudence are examples of what can be called strange attractors under a chaos theory lens. To illustrate, prudence can lead accountants to be more cautious about recognising assets and income under condition of uncertainty than they would towards the recognition of liabilities and expenses (see Maltby, 2000). Strange attractor is a fitting description as these concepts will not always lead accountants to employ identical accounting treatments but will narrow down what possible treatments accountants may find acceptable. Continuing with the prudence example, accountants may select cost-based measurement models or only allow the recognition of decreases in an assets value and prohibit the recognition of increases in asset values[36].

Strange attractors are, similar to living laws, not easily amended because no single body or group of people are charged with defining, amending and maintaining the collection of strange attractors (living laws). In other words, strange attractors are unlike a country's laws which can be amended

[36] Supporting this suggestion is the fact that many of the IASC's first standards specifically included the concept of prudence where increases in asset values were prohibited but decreases were recognized. Examples in the IAS 2 – Inventory; the original IAS 16 – Accounting for property, plant and equipment; and IAS 38 – Intangible assets.

by a specific and small group of people. Instead, strange attractors operate subtly at the unconscious level. Strange attractors can only be said to have changed when a large proportion of accountants change their attitudes and dispositions toward certain concepts in accounting and put those into practice relatively consistently (Murphy et al., 2013). From this point forward, new accountants will be socialised into accounting with the new strange attractor and have no other reference point but the new one. The process of changing strange attractors is very slow. At times "old" and "new" strange attractors may enjoy varying levels of support by accountants. This may explain what Ravenscroft and Williams (2009, p. 777) refer to as the "hodge-podge of concepts and assumptions".

In the accounting context, fractals may also include strange attractors. Strange attractors may operate at numerous levels and follow similar patterns. For example, accounting standard setting bodies, acting on the stakeholders' collective behalf, may be viewed as creating a collection of strange attractors. The strange attractors can take the form of the interpretive schematics which are used to organise and make sense of new regulations and prescriptions. For instance, although not referring specifically to the qualitative properties of chaos theory, Durocher and Gendron (2014) explain how practitioners' cognitive skills, value systems and personal experiences coalesce to provide a framework used to interpret and apply specific accounting and auditing requirements. To demonstrate, by accepting a basic definition of what constitutes an expense or a capital asset, accountants can resolve disagreements about the accounting for a collection of assets and create periods of stability until a new transaction or event arises which does not make sense under that definition (see Walker, 2006). The framework can also be used when concepts appear to be inconsistent or mutually contradictory such as lingering attractions to the concept of prudence and the more recent concept of neutrality (see Whittington, 2008).

Despite there being no scientific laws governing accounting (Ravenscroft and Williams, 2009), some level of order results regardless of formal codified prescriptions. Before codified accounting practice existed, preparers would engage with each other, investors and auditors to determine what was currently being done and seemed reasonable or practical (Walker, 2006, Ch 1). With no conceptual framework, these practices were not theoretically consistent and whether or not they resulted in information which was useful to users was not formally evaluated (Walker, 2006). Nevertheless, a sense of order was created around the values and experiences of stakeholders at the time (Tsoukas, 1998; Dolan et al., 2000; Dolan and Garcia, 2002). The same holds following the codification of accounting practice where administrative processes, systems and

technologies, such as accounting standard setting bodies, have been created to facilitate this self-regulating activity.

In summary, from an interpretive standpoint, accounting is an open and dynamic process (see Wirl, 1994; Zeff, 2002; Sacho and Oberholster, 2008; Zeff, 2012; IFRS Foundation, 2015) which fits the profile of a chaotic system. Accounting is a complex but deterministic (Levy, 1994; Thietart and Forgues, 1995; Boccaletti et al., 2000; Hoogervorst, 2012) discipline. Accounting typically resists change and requires a disturbance to effect change. Following a disturbance, the extent and form of engagement in dealing with the disturbance can have either a dampening, amplifying or combined effect on the trajectory of accounting's development. This makes short-term prediction possible but long-term prediction improbable (see Levy, 1994; Polley, 1997). Feedback loops can result in significant disturbances having no, minor (predominantly negative feedback loops) or major effects over time (predominately positive feedback loops) while insignificant disturbances can have drastic changes (where there are predominately positive feedback loops) (see Thietart and Forgues, 1995).

Section 3.2 describes evolution as a theoretical framework to analyse accounting evolution. It introduces how game theory has been applied in evolutionary studies. The Section then applies evolutionary game theory in non-biological contexts.

3.2: Evolution as a theoretical framework

Evolution theory is usually associated with Darwin's theory of evolution by natural selection (Darwin, 1859; Fisher, 1930; Smith and Price, 1973; Dawkins, 2016). Pioneered in the mid-1800s, it attempts to describe the processes which result in the evolution of, and diversity in, natural organisms. Evolution does not mean that each present organism has a flawless design and function. With all disciplines, the "best" engineer, accountant and biologist today are often bested by those coming later in history when there is more accumulated knowledge and tools. Biological evolution is no different. In addition, often similar organs and behaviours arise independently in different regions and different groups of animals use the same organs in "radically different ways" (Dawkins, 1986, p. 23). How bats use sonar is an example. In summary,

> "As many more individuals of each species are born than can possibly survive; and as, consequently, there is a frequently recurring struggle for existence, it follows that

> any being, if it vary however slightly in any manner profitable to itself, under the complex and sometimes varying conditions of life, will have a better chance of surviving, and thus be *naturally selected.* From the strong principle of inheritance, any selected variety will tend to propagate its new and modified form" (Darwin, 1859, p. 5).

While Darwin's hypotheses were based on observation, qualitative analysis and inductive reasoning, Gregor Mendel was experimenting with hybridisation of pea plants. Through these experiments he discovered and described genes. Mendel's discovery was largely ignored until it was re-discovered in the early 1900s when Fisher (1930) combined Mendel and Darwin's work. This led to the creation of Modern Synthesis theory which facilitated the mathematical modelling of evolution through genetics (Darwin, 1859; Huxley, 1942; Vincent and Brown, 2005; Dawkins, 2016).

Evolution is broad in the sense that it refers to "physical, genetic, or behavioural change in populations of biological organisms over time" (Vincent and Brown, 2005, p. 5). Put differently, evolution occurs when the next generation has an advantage over their predecessors. The advantage arises because of variations in heritable genes passed to offspring during sexual reproduction. Those variations which enhance the survival or reproductive success of an organism are selected and become more frequent in future populations. This type of evolution is slow and requires millennia (Dawkins, 1986; Vincent and Brown, 2005).

A frequent criticism of evolution theory is that there is evidence that certain species may regress. (Hammerstein, 1996) deals effectively with this criticism by relating biological evolution to the path taken by a streetcar coupled with the horizon over which the start and end points are compared. If you take too narrow a view in time, temporary fluctuations arising from disturbances to the system (see Section 3.1.2) and genetic variations may appear to reflect a type of evolutionary regression. But if an appropriately long view is taken, what will be seen are temporary stops along a winding road. In other words, evolution takes a path much like that of a streetcar in a major city. The car must stop at intersections and must sometimes travel along roads which may look as if the car is travelling backwards in order to get to its destination.

Dawkins (1986; 1993; 1999; 2016) also refined and extended evolution theory, making a number of important contributions. Three are key for this thesis. First is the proposal that the struggle for

existence does not occur at the organism level, but rather at the genetic level. In other words, individual organisms are not competing for survival in an evolutionary sense. Instead, the genes making up organisms are competing. Second is Dawkins' clarification that variations are random but that evolution requires the two-step accumulation of advantageous variations. Third is Dawkins asserts that all evolution is because of entities called *replicators*. A replicator is a relatively stable entity (Rutherford, 2020) which has the property "of being able to create copies of itself" (Blackmore, 2001; Dawkins, 2016, p. 20). Genes are an example of replicators. The implication of this development is that biological, as well as non-biological, evolution can be explained using the replicator concept and evolution theory. In non-biological contexts, replicators are called *memes* (Dawkins, 2004; 2016).

Evolution theory is further complemented by game theory, which is a branch of mathematics which deals with "the logic of decision making in social interactions" (Colman, 2013, p. 3) where different groups have conflicts of interest (Vincent and Brown, 2005). Game theory has been used in economics, ecology, biology and social science (Colman, 2013). It is relevant to social interactions where the following three properties are present:

I. there are two or more decision makers (referred to as players);
II. each player has two or more choices of how to act (referred to as strategies) where each player's outcome is dependent on both their own and the other players' strategies and
III. each player has a clear preference of which outcome they desire.

(adapted from Colman, 2013, p. 3)

Game theory is a formal, normative discipline which seeks to explain what each player ought to do. In social settings, however, game theory is used to provide insights to help understand the players' behaviour in different contexts. This application is often referred to as informal game theory (see Colman, 2013). Particularly in social sciences, informal game theory has accepted limitations in that humans' behaviour is boundless and is not always consistent or rational[37]. Despite these limitations, its explanatory power is valuable as it can provide "deep and illuminating insights" (Colman, 2013, p. 19).

[37] See Section 3.1.1 regarding historicity.

The wide explanatory power of evolution theory makes it useful in the context of this thesis[38]. It provides a broad theoretical framework for contextualising how accounting evolves in a metaphorical sense (see Llewelyn, 2003). The next section provides an overview of evolution theory in a purely biological context. This is followed by evolution theory in a non-biological context and concludes by presenting a preliminary application of evolution theory to accounting evolution.

3.2.1: Evolution in a biological context

Evolution is discussed under the following three headings: the principle of inheritance, two-step accumulation of variations and evolutionary selection.

Principle of inheritance

Genes provide the building blocks which form organisms. During sexual reproduction, genes from each parent are mixed in a process called recombination. The recombined genes are inherited by the offspring (Dawkins, 1986; Vincent and Brown, 2005). Recombination leads to variation in the inherited genes in one of three ways. Firstly, genes from either (or both) parents may be miscopied during reproduction. Secondly, correctly copied genes may be copied in different locations or patterns, resulting in a change in the offspring compared to its parents. Lastly, a combination of one and two may arise. New variations in organisms are rare because each parent's genes, through evolution, are stable entities which have survived in the gene pool for generations. This means each parent's genes themselves have longevity, fecundity or copy-fidelity (see below).

Genes are selfish molecules which want to survive and become frequent in the gene pool. Selfishness is not a conscious desire but, in this context, refers to the innate characteristic which, if allowed, will replicate itself indefinitely and at the expense of others (Dawkins, 2016). Because there are limited resources which can be used to copy genes, there is competition. This competition means that genes with longevity, fecundity or copy-fidelity will become more frequent in the associated gene pool. Longevity refers to how long a gene has been in existence. The longer a gene exists in identical forms within a gene pool, the more opportunities it has to replicate

[38] The purpose of this paper is not to develop and test a mathematical model of the evolution of consolidation accounting practices. Instead, it aims to draw on this theory to provide insights into the development of consolidation accounting practices.

and become even more frequent within that gene pool. Fecundity refers to the rate at which a gene can replicate itself. For example, if Gene X can replicate twice per hour, but Gene Y can replicate four times per hour, Gene Y will soon outnumber Gene X because it uses up available resources and copies itself more times and before Gene X can. Copy-fidelity refers to how accurately a gene can be replicated. Genes with low copy-fidelity (high error rates) create more competition as each miscopy begins to compete with the original gene for resources. Compared to situations where a gene has high copy-fidelity (low error rates), more identical copies of the original gene are made without creating as much additional competition (Dawkins, 2016).

Genes which are “long”, in the sense that they hold the information to form multiple organs of an organism, are likely to have low fecundity and copy-fidelity leading to low longevity. This outcome is because the longer or more complex something is, the more opportunities there are for copies to be incomplete or inaccurate. Also, the more complex something is, the longer it may take to copy. Consequently, successful genes are typically “short” and specific. This characteristic means that many genes must “collaborate” to form a complex organism. Moreover, the success of one gene (or group of genes) may affect the success of other genes (or groups of genes) making up that organism. For example, if the genes forming an organism’s heart are weak, the organism may die before being able to pass on any of its *other* genes to offspring successfully (Blackmore, 2001; Dawkins, 2016).

An offspring’s parents’ genes would be those which have longevity, fecundity and copy-fidelity. Accordingly, offspring often present with inconsequential differences in non-core elements and no difference in the core ones when compared to their parents (Dawkins, 1986; Vincent and Brown, 2005). For example, a human eye is made up of almost identical genetic code which determine its structure and function (core) although eye colour (non-core) varies among individuals with little consequence. This is because the eye is advanced and any random mutation is more likely to reduce functionality than to improve it (Dawkins, 1986; Vincent and Brown, 2005). In addition, even when recombination occurs, swopping sections of almost identical codes yields little or no variation which materially alters the core structure or function of the eye. In contrast, eye colour, which does not reduce the eye’s core functions, continues to vary among individuals as these traits do not affect survival or reproductive success resulting in no selection one way or another (Darwin, 1859; Dawkins, 1986).

Sexual reproduction's outcomes can be summarised as following one of four alternate routes. Firstly, there may be no material variation. Secondly, the recombination process may not affect an important core function or organ. For instance, human eye colour (Dawkins, 1986; 2016). Thirdly, the recombination process may affect an important organ or function. Because variations are random, the probability of a random change to a key organ or function being an improvement is low. In these situations, it is very likely the offspring will not develop properly and will either die before birth or struggle to survive and reproduce. Lastly, the recombination process may make a small but positive change to a key organ or function providing a survival or reproductive advantage which may become frequent in future populations (Darwin, 1859; Dawkins, 1986; Vincent and Brown, 2005; Dawkins, 2016). When variations do arise, a process of selection occurs and is discussed next.

Two-step accumulation

Two common misconceptions are that evolution by natural selection is proposing that a simple organism can become complex overnight (single-step) and that there is no direction to evolution (Dawkins, 1986). On the contrary, evolution by natural selection *necessarily* requires extremely long periods. Also, while *the variation* which arises during sexual reproduction is undirected, which variations *are selected* and remain within a gene pool is directed by the natural selection of advantageous changes (Dawkins, 2016).

Dawkins (1986) better articulates that evolution by natural selection occurs via the two-step accumulation of tiny adaptations over a vast timespan. Single-step evolution would require too many variables to be perfect, by chance, in a single occurrence. In other words, the possibility of a blind animal having offspring with perfect colour vision in a single generation is remote. It would require countless significant changes to cells related to light sensitivity, bone structure, ligaments and positioning to occur in one generation. However, the probability of a few cells becoming somewhat sensitive to changes in light over 1000 generations is probable because of competition and the number of iterations. Taken over thousands of generations, it is likely the light sensitivity and positioning of those cells will continue to slowly improve until the eye structure and positioning is as we see today in many animals (Dawkins, 1986). Supporting this theory is that not all eye structures and positions are the same, indicating independent variation suited to each animal's context. On the one hand, predators typically have eyes that are closer together to provide better depth perception but at the cost of their field of vision. On the other hand, many herbivores' eyes

are placed on the sides of their head reducing their depth perception but granting them a wider field of depth to see predators coming (Darwin, 1859; Dawkins, 1986; Vincent and Brown, 2005).

To provide a more simplified case of two-step accumulation, consider a person trying to solve a 4-digit combination. If each attempt is independent (single-step), it is almost impossible to guess the correct code[39]. But, if guesses of correct digits are retained and only incorrect choices are revisited (two-step), the code can be cracked in as little as ten attempts[40] (Dawkins, 1986; adapted from Dawkins, 2016).

Darwin noticed what he called the correlation of growth. This is the idea that a change in part of an organism will be accompanied by a change in a correlated part of the organism. For example, pigeons with feathered feet have skin between their toes and those with short beaks have small feet. From this, Darwin suggested that any change is likely to affect many aspects of an organism. Coupled with modern genetics, we know genes are often interrelated and interdependent corroborating Darwin's observations (Darwin, 1859; Dawkins, 1986; Vincent and Brown, 2005).

The next problem is understanding why and how some mutations are retained in two-step accumulation while others are discarded, and what is directing this evolution. This is discussed next.

Evolutionary selection

Darwin (1859) suggested each organism's struggle for survival and to reproduce guides the selection process. Using this logic, many advantages are intuitive such as those which make an organism stronger, more fertile or enhance its ability to find food and shelter. These are selected because these organisms are healthier, may live longer or are able to bear more offspring in comparison with their peers. In doing so, these parents' genes survive and are passed down more frequently within the gene pool increasing their frequency (Darwin, 1859; Dawkins, 1986; Vincent and Brown, 2005).

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[39] There are ten thousand possible combinations in a 4-digit numeric combination lock.

[40] Assume the code is 4778. If the first attempt if **4**444, the first 4 is retained and only the last three digits are re-attempted. If the second attempt is 4555, no new correct digits are found. If the next attempt it 4**77**7, the 4,7 and 7 will be retained, leaving only one more digit to find with only a few remaining possibilities (adapted from Dawkins, 2016).

But some surviving traits do not appear to improve the organism's survival. In other words, they do not appear to follow the logic of "survival of the fittest". For example, Darwin was initially puzzled by a peacock's attractive tailfeathers which offer no obvious food-gathering, defence or flight benefit[41] (Darwin, 1859; Dawkins, 1986). On the contrary, the feathers give predators an advantage by making it easier to see and catch peacocks. This should have resulted in lower populations of peacocks with attractive feathers as peacocks with these feathers are hunted at a higher rate than peacocks with dull tailfeathers (Darwin, 1859; Dawkins, 2016).

Dawkins (2016) solved this mystery by redefining the unit of selection. Previously, it was thought that the individual organism was the unit of selection and competition. Dawkins (2016) suggests the unit of selection and competition is the replicator – or gene in a biological context. Genes "selfishly" compete to be replicated where the organism is merely the host of replicators. The host animal is simply a means for genes to replicate (Dawkins, 2016).

Using game theory to understand the competition and selection of genes provides insights as to why counterintuitive traits have survived in nature (Smith and Price, 1973; Vincent and Brown, 2005; Dawkins, 2016). Often traits which offer no obvious survival or predation advantage are concerned with sexual mate selection. Accordingly, before the games involving these traits are discussed, it is important to understand mate selection in sexually reproducing animals.

In nature, most females select with whom to mate while males compete with other males to be selected by females. This is believed to be because of the unequal distribution of the required investment to both carry and rear offspring. Females invest vital personal bodily resources to provide nutrients to develop eggs and carry them to term. Females may also be more susceptible to predation while carrying offspring to term. After birth, females continue to invest significant time, energy and further personal bodily resources nurturing and training offspring. On the contrary, males carry very little of the investment as they primarily need only to fertilize eggs at a trivial cost to their personal bodily resources (Trivers, 1972; Miller, 1998).

Because of the disparity in the investment required, females have an incentive to select mates more carefully to ensure their investment provides strong, healthy offspring. From an evolutionary perspective, the females' genes selfishly want to prosper, meaning they want to be replicated in

[41] Darwin later noted and provided abundant evidence that extravagant male traits play a role in sexually-reproducing species (Miller, 1998) but did not provide the explicit explanation as Dawkins did.

offspring which will be able to carry and rear offspring (if they are female) or attract a mate (if they are male) easily and successfully to ensure the longevity of the genes (Blackmore, 2001; Dawkins, 2016).

In the evolutionary game, each player (gene) adopts a strategy. A strategy is the behavioural policy, organ or function the gene gives (or contributes to giving) rise to in a host (Blackmore, 2001; Vincent and Brown, 2005; Dawkins, 2016). It may be to dance in front of potential mates a certain way, lead to enhanced stamina in limbs to run away or be a weapon, such as horns. A host's decision making is dependent on the cumulative strategies (genes) it possesses. A host's form and behaviour are controlled by its genes and their associated strategies. This control is

> "not directly with their fingers on puppet strings, but more indirectly like the computer programmer. All they can do is to set [the host] up beforehand; then the [host] is on its own, and the genes can only sit passively inside" (Dawkins, 2016, p. 52).

If an animal has horns, when confronted with an aggressor it may decide either to use those horns to fight or to flee. Another gene responsible for the host's flight-or-fight strategy will help make this decision. But, if the host does not possess horns, genes with strategies which promote fleeing would do better than those promoting fighting as the host has no horns to fight aggressors with. In the latter situation, hosts with no horns but the gene promoting fighting may do poorly and die in battle before being able to pass on their genes. The case illustrates three important points related to strategies. Firstly, genes impact one another in the sense that they impact host survival and reproductive success. If an animal has no horns but has the gene with the strategy to use them to fight, the gene to fight becomes less effective than if the host also had the gene for horns (Dawkins, 2016).

Secondly, genes do not pre-program the host to act in set ways for *an exhaustive list* of possible scenarios. This would make genes too long, foregoing their fecundity and copy-fidelity and ultimately their longevity. Instead, genes promote specific strategies, ways of processing information to help the organism make decisions in a world filled with an infinite number of possible future situations which must be faced (adapted from Dawkins, 1986; 2016). As genes cannot predict every future possibility, they co-operated and evolved to develop organisms with increasingly complex brains capable of learning. In lieu of programming exhaustive lists of situations and appropriate responses, genes begin with limited lists of "good" and "bad" situations

and a mechanism for each host to add to their lists based on their experiences. For example, touching a red-hot stove causes pain leads to including red stoves in the list of “bad” as something to be avoided. Similarly, the pleasure derived from sweet foods (high in sugar and calories) result in adding those foods to the “good” list and as items that should be pursued in future. Orgasms are important for sexually reproducing animals to encourage reproduction (see Blackmore, 2001; Lipton et al., 2004; Dawkins, 2016). The point is that genes can, indirectly, control host behaviour but need not hold exhaustive lists of “good” and “bad” items and situations (Dawkins, 2016).

Using learning-style programming is particularly useful for genes which wish to stay short pieces of material in order to increase their fecundity, copy-fidelity and, ultimately, their longevity. Trying to predict each and every possible future scenario is lengthy and wastes resources. Allowing each organism to build their own *if-this-then-that* lists based on items and situations the host is actually exposed to in their environment is efficient (Blackmore, 2001; Dawkins, 2016).

There are limitations to the “good” and “bad” list approach. The system is imperfect as red stoves can be useful. Similarly, the sweet taste from high-sugar content foods can lead to obesity which can decrease survival and reproductive success. Animals in the wild are unlikely to encounter situations where there is such an abundance of food and lack of dangers that they are able to get unhealthily obese. But in the case of humans and pets kept at home by loving families, the programming to repeat behaviour which results in sweet tastes can become counterproductive, if not harmful (Dawkins, 1986; Blackmore, 2001).

Strategies cannot change as their environment changes. As genes are short and specific, any change gives rise to a new gene with a new (albeit only slightly altered) strategy that, itself, now wishes to become the dominant gene in the gene pool (Dawkins, 1986; Blackmore, 2001; Vincent and Brown, 2005). This new slightly mutated gene would engage its “parents” and other genes in a game. The outcome of the game will be dependent on all the strategies played by each player (gene) and other environmental factors.

To illustrate, in the peacock population assume there are two players, namely, the attractive and dull tailfeather *genes*. Each gene adopts a specific strategy. The former’s strategy is to focus on rapid reproductive success. Its strategy is to stand out to attract and mate with as many females as possible before the peacock with dull tailfeathers can mate. The strategy is risky to the host, but advantageous to the genes. This is an important distinction in evolutionary games.

The dull tailfeather gene's strategy is to enhance the survival of its (the gene's) host (the peacock) by avoiding predation with dull feathers. This strategy takes the view that having a longer lifespan will ultimately allow it to reproduce more successfully than the attractive tailfeather's strategy. With a longer host lifespan, the gene's host does not need to take risks when searching for a mate as it has more time to attempt reproducing (Dawkins, 2016). In this game, each gene has the same preferred payoff – greater reproductive (replicative) success than its competitor. All three conditions for a game are met: (i) there are two players (ii) each player has a strategy and (iii) each player has a preferred payoff (see Section 3.2, Vincent and Brown, 2005; Colman, 2013).

With hindsight we know that although peacocks with attractive tailfeather genes may have a shorter lifespan because of predation, they are able to pass on the gene for attractive tailfeathers to more offspring more quickly than dull feathered peacocks can. In other words, the strategy of the attractive tailfeather gene has produced a higher payoff. Overtime, it increased in the population displacing the lower payoff strategy (dull tailfeather gene). The case demonstrates that the payoff is not *host* survival but *gene* survival. In addition, it demonstrates that the attractive tailfeather gene has longevity, fecundity and copy-fidelity with the result that today most male peacocks have attractive tailfeathers (Colman, 2013; Dawkins, 2016).

The games between genes does not yield an optimal solution. It can be argued that it is in the peacock species' and genes' best interests for everyone to have dull feathers. This strategy would enhance every host's survival and time to replicate all genes. But, if all genes followed this dull feather strategy, it would be easy for one peacock to use slightly more attractive tailfeathers to gain a significant mating advantage. The advantage would lead to more peacocks with increasingly attractive tailfeathers as each slight variation in how the feathers are attractive tries to outcompete rivals. Put differently, if all peacocks have dull tailfeathers, their strategy could easily be invaded, and bested, by any gene with slightly more attractive tailfeathers (adapted from Dawkins, 2016). Consequently, an Evolutionary Stable Strategy (ESS) is defined as the strategy (or combination of strategies) which can resist invasion by other strategies. The dull tailfeather gene's strategy is easily invaded by one for attractive tailfeathers. The attractive feather strategy

resists invasion by a dull tailfeather strategy. As a result, attractive tailfeathers are an ESS for the peacock population[42] (Smith and Price, 1973; Vincent and Brown, 2005; Dawkins, 2016).

The peacock tailfeather illustration demonstrates a single strategy as the ESS. Often in nature there are two strategies that co-exist as ESSs. Consider the common biology example of a population of hunters. If one animal develops the strategy of stealing food from others, it will soon surpass its peers who hunt for themselves. This is because stealing food reduces the energy costs associated with hunting and the risks of injury but enjoys all the benefits. But, if all future offspring inherited the behavioural strategy of stealing, eventually there would be no-one to steal from. Both pure strategies are not ESSs. Instead, a mixed strategy is evolutionarily stable. Some animals in the population adopt the strategy of stealing while others that of hunting – for example, a 35/65 split respectively (adapted from Dawkins, 2015).

The ESS is impacted by a variety of factors. For instance, the environment affects the success of strategies as genes suited to wet conditions will not be well suited to dry conditions. Moreover, environmental factors often change over time adding a further dimension to evolution as ESS can also change (Vincent and Brown, 2005; Dawkins, 2016). But just as important are the *other* genes *making* up a host. Returning to the peacock example, the *other* genes in peacocks with attractive feathers *also* win when the attractive tailfeather gene wins. However, if the *other* genes in attractive peacocks have weaknesses, being able to mate more quickly than dull peacocks may be a moot point (Blackmore, 2001; Dawkins, 2016). For example, if the genes for creating healthy sperm are not functional, frequent mating encounters are moot and all genes in the peacock suffer as a consequence.

Strategies and the ESS can also be impacted by the frequency of strategies within a population. Some strategies are only effective when they are in the minority (negative frequency-dependence). The case of hunter and thief traits are an example. As the frequency of thieves decreases within a population, its advantage is increased as it has less competition from other thieves and more hunters to steal from. Because of its advantage, its frequency increases. As the number of thieves increase, it loses its advantage with more competition and fewer hunters to steal from. Consequently, its population starts to decrease. The result is a pendulum effect where

[42] Peacock tailfeathers are an example of runaway sexual selection (Fisherian Hypothesis) where a trait that is initially advantageous to attract female mates becomes exaggerated because of a positive feedback loop between the trait and the preference for it (Trivers, 1972; Miller, 1998; Blackmore, 2001; Crespi, 2004).

the frequency of hunter and thief traits varies over time but form an equilibrium[43] around a mixed strategy (Vincent and Brown, 2005).

The preceding discussion has intentionally oversimplified the evolutionary game. For instance, different lengths, patterns and densities of tailfeathers are likely to have emerged over the generations as variations to the attractive tailfeather gene. In addition, variations typically affect more than one aspect of an organism. As peacocks mutate towards increasingly long tailfeathers, others aspects of the peacock may also begin to lengthen which may or may not provide an advantage and an ultimate moderating effect (see Darwin, 1859; Dawkins, 1986).The number of predators in the area relative to the numbers of peacocks is also an important factor. (Dawkins, 1986; Vincent and Brown, 2005; Dawkins, 2016). Lastly, game theory has identified many different variations of games each of which have nuanced peculiarities which can impact evolutionary games. For example, arms race (see the height of trees in a forest), war of attrition (when players keep expending resources until the other gives up in order to receive the payoff), prisoners' dilemma and chicken (where one party backs away for fear of the other). There are also symmetrical and asymmetrical games, single- or multiple-iteration games and zero-sum or non-zero-sum games (Smith and Price, 1973; Vincent and Brown, 2005; Colman, 2013). An in-depth analysis of the complexity and diversity of interactions between strategies and frequencies, and how each different type of game will play out in an accounting context, is beyond the scope of this thesis. This is presented as an area for future research.

The next section provides an overview of evolutionary game theory in a non-biological context. This is followed by a brief application of evolutionary game theory in an accounting context. This suggests that it is plausible and reasonable to pursue this avenue of research.

3.2.2: Non-biological evolution

Inheritance, two-step accumulation and evolutionary selection have been applied extensively by biologists and have also informed research on non-biological forms of evolution. Examples include, mathematics (Felsenstein, 1989), law and economics (Roe, 1996), military theory (Finkelstein, 2008) and cultural developments including religious beliefs and social values (Heylighen, 1997; 1998; Blackmore, 2001; Dawkins, 2016; Rutherford, 2020). In all disciplines,

[43] Note this is similar to chaos theory's extended reproduction state and strange attractor concept. The respective proportion of each behaviour's frequency will tend towards a value and oscillate around it. For example, a 60/40 split.

evolution arises because of the presence of *replicators*. In biology, the replicator is called a gene. In the non-biological context, the replicator is called a *meme*. Examples of memes include “tunes, ideas, catch-phrases, clothes fashions, ways of making pots or of building arches” (Dawkins, 2016, p. 172).

Memes – non-biological replicators

There are many definitions of a meme. Blackmore (2001, p. 225 & 226, emphasis added) describes a meme as a unit of “information copied from person-to-person by imitation” with “variation or errors, and whose nature influences *its own probability* of replication.” Dennett, quoted in Rutherford (2020, p. 503), proposes that memes are a “salient (memorable) cultural item, something with enough design to be worth saving – or stealing or replicating”. Finkelstein (2008, p. 13) explains that a meme “consists of information which persists, propagates and influences human behaviour.” Memes are conceptualised by individuals and transferred to other hosts (transferees). If the meme satisfies the host’s selection criteria it becomes a resident in the host. If it does not, the meme is discarded. The cycle continues where new hosts transmit memes to further hosts, using the same or different means of transference (Finkelstein, 2008). Memes can use different vectors such as speech, books, social media and videos to replicate themselves in new hosts (Blackmore, 2001; Finkelstein, 2008; Dawkins, 2016; Rutherford, 2020).

Memetic replicators can be housed in human memory or may be reduced to a written or electronic record. These permanent stores can be copied and distributed many times simultaneously, allowing the meme to be replicated in a limitless number of new hosts (Dawkins, 1993; 2016; Rutherford, 2020). Advances in communication technology have had a significant impact on memes’ ability to replicate, be refined and influence human culture (Blackmore, 2001; Finkelstein, 2008).

While there are many similarities between biological genes and memes, there are differences and memetics should not be confused as stating that memes are and operate in an identical manner to genes (Blackmore, 2009; Wimsatt, 2009). Memetics has mostly been used to study cultural evolution. In this context, there are important differences. Firstly, genes have easily defined units across species while memes do not. For example, “copy-right three-word advertising jingles and 300,00-word books” are different units but are both memes (Blackmore, 2009, p. 259). Secondly, genes must be inherited from parents of the same species at inception. Memes, on the other

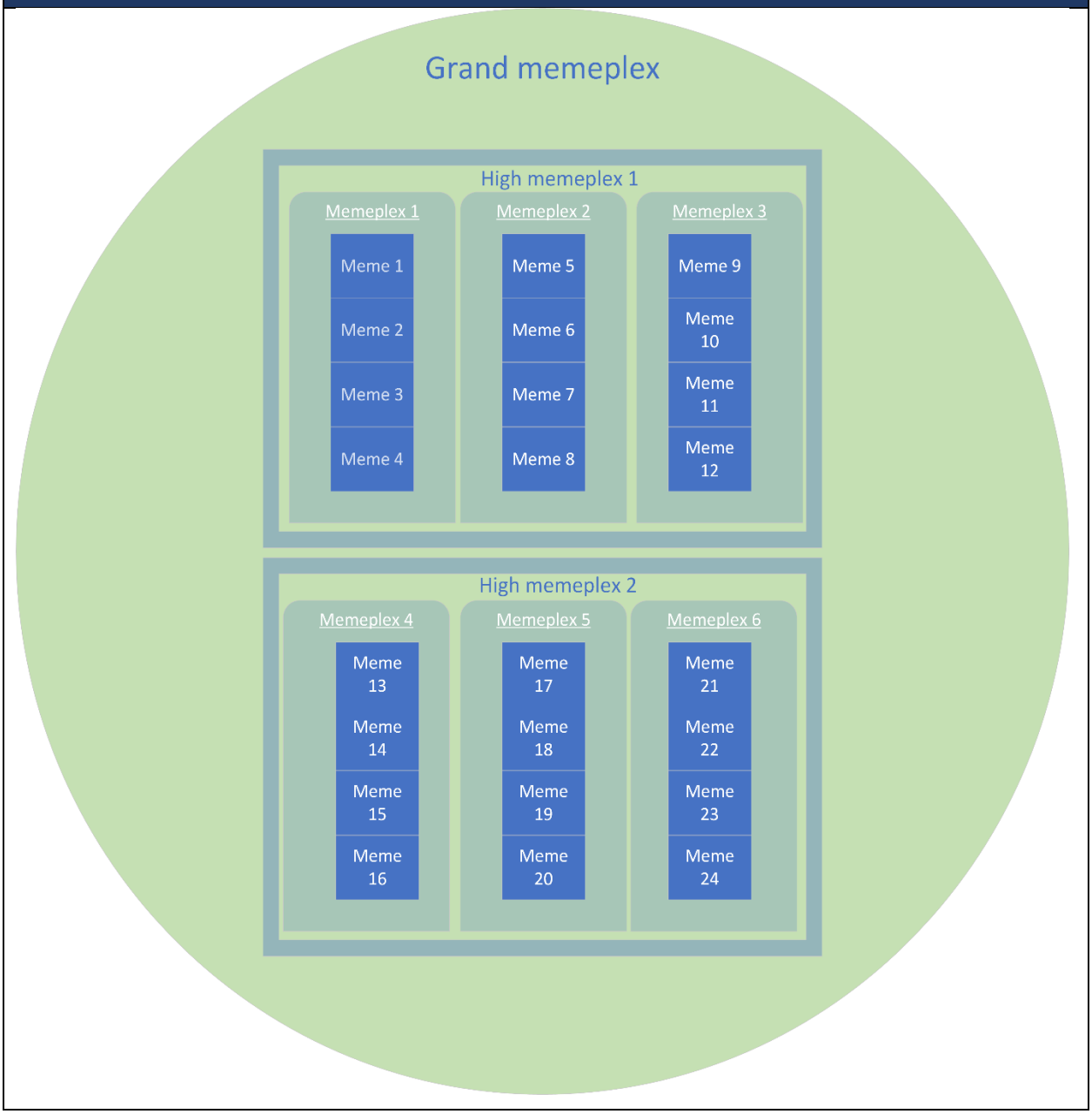
hand, can be inherited throughout one's life from anyone and from artefacts such as books, music and videos. Thirdly, the set structure and loci of genes and inheritance from parents allows them to be modelled and used to make predictions. At present, mathematical modelling of memes to make predictions is not developed (Blackmore, 2009; Wimsatt, 2009).

Fourthly, biological replicators take millennia to show signs of evolution. Meme replicators can evolve over much shorter periods (Blackmore, 2001; Finkelstein, 2008; Rutherford, 2020). Unlike in biological evolution, memes do not require reproductive lifecycles to provide opportunities for variation to arise. Both memes and genes can be modified because of inheritance replication errors. But memes can also be actively modified by their host's intellect based on the environment, context, experience and desires of human hosts. In this sense, meme modification can be directed towards achieving a specific goal (Dawkins, 1993; Blackmore, 2001). Consequently, memes can evolve over hours instead of millennia. Accounting research is an example of how minds can generate, distribute, expand on and reform ideas to create complex disciplines in relatively short periods (Blackmore, 2001; Rutherford, 2020). Despite these differences, the three closely interrelated concepts of inheritance, two-step accumulation and selection (making up evolution theory) provide a valuable framework to analyse the evolution of non-biological systems (Blackmore, 2001; Finkelstein, 2008; Blackmore, 2009; Dawkins, 2016).

A meme is the smallest unit of information. A collection of co-beneficial memes is called a memeplex. A collection of co-beneficial memeplexes are called a high memeplex and a collection of co-beneficial high memeplexes form a grand memeplex and is illustrated in Figure 5 below (adapted from Rutherford, 2020). A host can simultaneously hold a grand memeplex which houses core, highly stable and less stable memeplexes[44]. The latter can become a part of the stable grand memeplex or be rejected by the host. Hosts can also hold variations of the memeplex which exist as "local memeplexes" (Rutherford, 2020). These are similar to biology's speciation where a population becomes divided by some feature (such as a river) and evolves separately, but with clear links to other populations (Darwin, 1859; Rutherford, 2020). In a social context, memetic behaviours associated with different social circles can result (Finkelstein, 2008). For instance, how a person greets people in a professional and social environment differ but have clear similarities and illustrate two different local memeplexes which are held simultaneously by the host (Turelli et al., 2001; Rutherford, 2020).

[44] Highly stable memes can be considered memes with cognitive legitimacy.

Figure 5: Meme taxonomy



(Self-constructed)

The success of a meme depends not only on its own merits but on the merits of other memes in the meme pool. Memes which complement each other may confer a greater advantage in aggregate to themselves and their host. Consider, for example, a soccer coach selecting players from a population of unknown players. The coach randomly, and iteratively, constitutes different teams from the players (memes). The coach notes the players of the winning team after each game. The players most often in winning teams are selected for the final team. There is no

conscious bias for any player, just the outcome of many games being played. Similarly, memes which co-operate well with one another are more likely to be selected and become common within a population (adapted from Dawkins, 2016).

The selection of memes may sometimes appear to be pre-determined or directed, but it is the result of ongoing combinations and recombination taking place which tend towards the ESS (Vincent and Brown, 2005; Colman, 2013). Continuing with the soccer metaphor, the number of goalkeepers, defenders, midfielders and strikers on the team is not because of a conscious decision by the coach but the result of this combination of players winning most games (adapted from Dawkins, 2016). As with any game, there is also an element of chance. If a good player happens to be part of weak teams, that player may be overlooked. Conversely, a poor player may be selected because he was part of many successful teams (Vincent and Brown, 2005; Colman, 2013).

Further complicating memetic evolution is the co-evolution of genes and memes. To keep things simple, consider a stick that can be used for defence and hunting. From a gene's perspective, the right stick is the one that increases the inclusive fitness of all the genes in the host. People who replicate, for example, bigger sticks will be able to defend themselves against bigger and stronger attackers and hunt bigger and stronger animals for food (adapted from Blackmore, 2001). Genes which are better at distinguishing useful memes from harmful or wasteful ones will prosper. The result is that genes are pressured to be more capable of making "refined discriminations about what and whom to imitate [replicate]. And, crucially, the discriminations which have to be made depend upon the past history of memetics *as well as genetic evolution*" (Blackmore, 2001, p. 245, emphasis added).

From the meme's perspective, the right meme is the one which benefits the stick-meme itself. People copying the meme for longer sticks have survived with the result that genetic evolution favours memes for longer sticks. This allows memes to take advantage of the genetic evolution. If Meme A is for a 20cm stick, it is easily beaten by Meme B for a 25cm stick as the genes use stick length as an indicator of a "good" meme to replicate. This trend continues regardless of whether longer sticks are good quality and practical. From this point, biological success might become more aligned with the memes whose strategy is pragmatism or structural strength. People with impractically long or weak sticks cannot hunt or defend themselves effectively, leading to lower reproduction by those people and the genes using stick length as the primary

indicator of which memes to replicate (Blackmore, 2001). The point is that genes and memes are each evolving systems in their own right but also affect each other creating a complex co-evolutionary pathway (Gregersen and Sailer, 1993; Blackmore, 2001; Colman, 2013).

Delving deeper into memetic selection, Heylighen's (1997; 1998) ideas compliment and supplement those of Dawkins (1986); Blackmore (2001; 2009); and Dawkins (2016). Heylighen (1997; 1998) identifies and classifies selection criteria involved with the evolution of knowledge by function. He identifies three stages of memetic inheritance being assimilation, retention and expression. The selection criteria overlap but are presented and discussed separately for ease of understanding (see Table 4).

Table 4: Stages of memetic selection

Stage of selection	***Selection criteria***
Assimilation	Noticeability
	Understandability
	Fecundity
	Copy-fidelity (also simplicity)
	Acceptability (believability)
	Preciseness
	Authority
Retention	Longevity
	Complexity
	Coherence
	Utility (and group utility)
	Recurrence (also conformity)
Expression	Expressivity

(Adapted from Heylighen, 1997; 1998; Blackmore, 2001; Dawkins, 2016)

Assimilation[45] refers to how easily a meme can be inherited by a potential host. While a complex process, at a minimum, selection requires that a meme be noticed as something "sufficiently salient to attract the host's attention" (Heylighen, 1998, p. 917). Hosts must be able to understand

[45] In educational literature, assimilation is learning by addition (Illeris, 2009).

the meme so that it is capable of being retained and expressed. Simple memes are generally easier and quicker (fecundity) to inherent accurately (copy-fidelity) than are complex ones. Memes which require prerequisite knowledge to build onto are more difficult to assimilate as they depend on the correct and complete assimilation and retention of those prerequisite memes (see Illeris, 2009).

Memes must be acceptable or believable[46] to avoid being easily dismissed. Holding mutually contradictory memes can create confusion or hesitation when hosts draw on memes to inform their actions and behaviour. Consequently, contradictory memes may impede the host's survival and success (Heylighen, 1997). Memes which are clear, unambiguous or formally documented (preciseness) are also easier to inherit without error. Lastly, memes coming from an authoritative source have a selection advantage over non-authoritative memes (Heylighen, 1997; 1998; Blackmore, 2009; Dawkins, 2016).

Retention refers to memorising memes so that they can be recalled and expressed later. The longer a meme is stored in memory, the longer it has to be expressed to and inherited by other hosts (longevity) (Dawkins, 2016). Retention selection hurdles are high with many memes being stored in memory only temporarily (Heylighen, 1998). For example, complex memes are difficult to memorise and maintain for long periods without degradation.

In line with education literature (see Illeris, 2009), memes which are easily connected to, supported by, associated or consistent with existing stored memes are more easily accepted and retained by hosts. Critically, this adds a highly subjective component to selection because what is considered easy or complex, useful or irrelevant, acceptable or unbelievable will depend on the memes the host has already assimilated and retained (called historicity) (Heylighen, 1997).

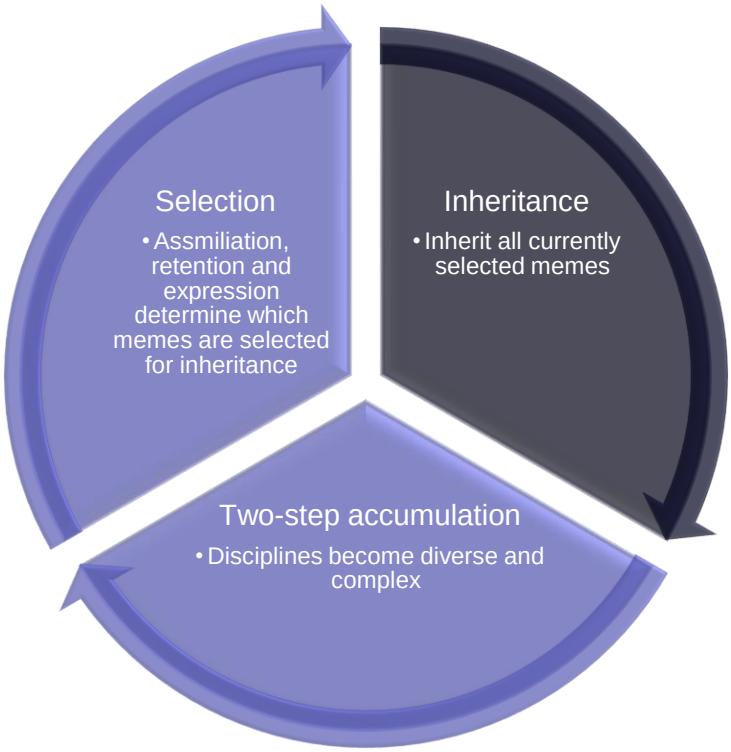
Which memes a host already has is a complex function of which previous memes the host has been exposed to and the order in which the host was exposed to them (Heylighen, 1998). This and a person's job, motivation and existing socio-cultural constructs and beliefs impact a person's assessment of the utility of each meme adding further complexity (Heylighen, 1998; Finkelstein, 2008). The more utility a meme provides its host, the more effort the host expends, for example, reciting the meme to ensure its faithful storage and continued retention in memory. Some memes

[46] For example, the meme that a human brain works because a person's head contains a little green individual that controls our behaviour is understandable but unbelievable (adapted from Heylighen, 1998).

have group utility where they are only useful in group contexts. Traffic laws are an example and groups of people who have group utility memes will be more successful than those which do not. Lastly, the more a host is exposed to the same meme, the more it is reinforced and stored in memory (Heylighen, 1997; 1998; Finkelstein, 2008).

Expression can take many forms, including speech, pictures and actions. Expression can enhance retention as memes which are frequently used are constantly reinforced, embedding them in stored memory and reducing meme degradation. This explains why habits and deeply entrenched ideas are difficult to replace with contradictory memes (Heylighen, 1997; 1998). Figure 6 provides a visual summary of the three interrelated evolution processes of memetic evolution.

Figure 6: Inheritance, two-step accumulation and selection



(Self-constructed)

The stages of selection can be viewed as the factors which affect the game played between competing accounting memes for selection. They provided a more nuanced framework to

understand why one accounting meme was selected over another and is, ultimately, inherited into the grand memeplex.

3.2.3: Initial application in the accounting context

In an accounting sense, technical standards, textbooks and individual accountants are the hosts of accounting memes. Memes are inherited by these hosts via imitation and replication (Blackmore, 2001). Accounting memes with longevity, fecundity and copy-fidelity will be more frequent in the accounting grand memeplex (Blackmore, 2001; Finkelstein, 2008; Dawkins, 2016). Biologists examine evolution at the level of genes and organisms. What are the equivalents for the accounting meme? Individual groups of accountants such as preparers, academics and auditors can be seen as “players” (replicators) in an Accounting Evolutionary Game (AEG). But, these groups do not possess longevity because members of different accounting groups change regularly as old members pass away and new members join regularly (Dawkins, 2016; Rutherford, 2020).

Accounting standards are also subject to regular change and are inappropriate units of analysis. For example, given the complexity of IFRS 9, it is unlikely that the standard will be understood and transmitted in its entirety to a new host. In contrast, the two distinct ideas that (i) financial instruments are recognised initially at fair value; and (ii) are subsequently carried at amortised cost or at fair value have greater longevity, fecundity and copy-fidelity as smaller units of information (Blackmore, 2001; Dawkins, 2016). It is also more probable that a particular principle, technique or practice, such as the use of the effective interest rate method, will be replicated accurately and repeatedly by more than one accountant with the result that the accounting technique has greater fecundity than the standard considered in its entirety. These techniques are also “selfish” in the sense that they appear in many standards and frameworks whether set by the IASB or other international and national standard-setters. Finally, while IFRS 9 has undergone extensive revisions over the last two decades while the mechanics of many “smaller” principles and techniques – such as amortised cost and the effective interest rate method – are largely unchanged pointing to greater longevity. These individual accounting principles and practices co-operate to constitute IFRS 9. Borrowing the idea from biology that genes are physically short pieces of genetic material, accounting principles, techniques and practices are a more granular unit of analysis suitable for studying the evolution of accounting memes (Dawkins, 1986; Blackmore, 2001; Finkelstein, 2008; Dawkins, 2016).

If accounting memes are the individual accounting principles, techniques and practices then accounting models are memeplexes, accounting standards are high memeplexes and IFRS is a grand memeplex (adapted from Rutherford, 2020). The physical manifestation or consequence of the grand memeplex is called a phenotype by biologists and can be understood by accountants as the various reports and components of statements produced in accordance with the applicable accounting framework or grand memeplex (Vincent and Brown, 2005; Rutherford, 2020).

Unlike biological variation, accounting memes, memeplexes and high memeplexes can vary because of random errors during inheritance processes, forgetfulness by human hosts but also from directed modifications by individual accountants based on their current environment, experiences and needs (Dawkins, 1993; Blackmore, 2001; Dawkins, 2016; Rutherford, 2020). Similar to biology and accounting is that evolution is a cumulative two-step process. Small changes to existing memes, memeplexes and high memeplexes are produced as opposed to accountants trying to re-invent new accounting memes as new business transactions and events emerge. This is demonstrated by the general resistance to change and rejection of "radical" departures from existing practices by the accounting community (Deegan, 2014; Durocher and Gendron, 2014; Maroun and van Zijl, 2016; 2022):

> "In support of these conclusions on the role of conceptual frameworks, there are specific instances of professionally-commissioned conceptual studies being rejected or ignored by practitioners as too radical when they advocate practices different from the conventional system of calculation" (Lee, 2006, p. 434).

Like biological genes, memes have a pre-set strategy to deploy. For example, the historical cost meme's strategy may be simplicity and ease-of-use allowing it to become more common. A meme cannot alter its strategy to adapt to changing circumstances. Any modification is actually the inception of a new modified meme with its own set strategy. For example, current cost is a new meme with its own strategy. Current cost may arise when accountants are no longer content with the limitations of existing memes, such as historical cost. In this instance, the two memes engage in a game. A meme "wins" by becoming the mandatory technique for that transaction or event. A meme's success is gauged by how long it endures, how frequently it is used to account for more transactions and events and into how many different accounting topics and frameworks it is used for (see Barlev and Haddad, 2003; Zhang and Andrew, 2014; Georgiou, 2018; Hayoun, 2019;

Pandya et al., 2021). The competition between historical cost and current cost takes place at a practical and technical level. Early studies deal extensively with the advantages and disadvantages of both measurement bases including understandability; comparability of the information produced and the trade-off between the relevance and reliability of that information (see Whittington, 2008; Ravenscroft and Williams, 2009; Zhang and Andrew, 2014; Pandya et al., 2021).

Applying the gene-meme co-evolution, sexual reproduction has an important role to play in the development of both genetic and memetic evolutionary systems (Blackmore, 2001; Vincent and Brown, 2005; Dawkins, 2016). Financial wealth, status and power are enviable positions. People without these try to imitate what those with wealth, status and power do in order to achieve success themselves (see Jones, 2008). “Success” is also an important mate-selection indicator for many species and humans are no different (Blackmore, 2001; Vincent and Brown, 2005; Dawkins, 2016; Hou et al., 2020). In the accounting meme context, memes which increase financial wealth, status and power are considered “useful”, a fact long-criticised by social and environmental accounting scholars who blame the persistence of financial constructions of value for undermining sustainable development (see, for example, Flower, 2015). This behaviour is often attributed to capitalism and its focus, almost to the exclusion of everything else, on maximising profit (Bryer, 2000a); the ascendence of neoliberalism (Ravenscroft and Williams, 2009; Zhang and Andrew, 2014) and the hegemony of capitalism (Tregidga et al., 2014). An alternate explanation involves our genes.

Wealth is considered by many social scientists as a good indicator of male success and a mate-selection factor (Hou et al., 2020). Females with genes which produce a behaviour which targets wealthy males for reproduction have a resource advantage. Offspring from such mating pairs have the financial resources to ensure good quality food in the right proportions are always available to promote health and intelligent offspring. The resources also can be used to provide protection, ensuring the success of the offspring and the parent’s genes. This leads to more male offspring with genes prioritising wealth-creation behaviour, and more females which target wealthy males for reproduction.

Financial wealth-creation is enhanced when investment decisions are based on better accounting information. Accordingly, accounting memes which provide more useful information for wealth

creation will also prosper (adapted from Blackmore, 2001; Rutherford, 2020). What constitutes "useful" information is not fixed and informs the accounting meme selection process.

Put differently, genes better at discriminating between useful, less useful and useless memes increase in frequency (Blackmore, 2001). A male's attractiveness is, in part, a function of his ability to select memes which give him a competitive advantage when it comes to investment and other financial decision-making (Blackmore, 2001). It follows that memes prioritising an economic framing of value and performance have become more common providing an explanation for the dominant monetarist discourse observed by critical accounting researchers such as Flower (2015).

Regarding the active modification of memes, the involvement of humans in memetic evolution adds an additional layer of complexity to the application of evolutionary game theory in the accounting context. A key difference between pure biological evolution and memetic evolution is the ability for directed modification. In the accounting context, reputation may play a key role in memetic evolution. Research into both an individual's personal reputation, as well as organisational reputation, demonstrates strong support for a range of positive benefits associated with a good reputation. From a personal perspective, a good reputation may grant access to benefits including autonomy, career advancement, power and self-esteem. Organisational reputation is associated with an enhanced ability to predict members' behaviours; attract talented employees and enjoy heightened customer support (Zinko and Rubin, 2015). These benefits incentivise people and organisations to strive to build a positive reputation.

A good reputation "is often viewed as a long-term investment" but can be destroyed quickly (Zinko and Rubin, 2015, p. 221; Wu et al., 2016). When accountants engage in active modification of existing memes, this thesis suggests that those with an existing positive reputation may act differently to those without an existing positive reputation. Those with a positive reputation are likely to have more confidence attached to their suggestions but are also likely to be conservative in their modifications out of fear of tarnishing their reputation. Those without a strong positive reputation, for example, young accountants, may be more willing to propose more extreme changes but their opinions carry less influence.

The remainder of this thesis provides, to the researcher's knowledge, the first preliminary evidence of each of these features at work in an accounting context. Mapping specific accounting

requirements to inheritance, variation and selection to explain how they have developed is not the aim. The objective of this thesis is more modest. The processes by which the features of memetic evolution work in general in a consolidation accounting context are explicated by relying on the academic literature, technical changes in IFRS and primary evidence collected from detailed interviews with accounting experts. The focus is on the AEG from the perspective of accountants. How the AEG is expanded to incorporate users, auditors and other stakeholders and the interaction among these groups is deferred to future research.

3.3 Chaos and evolutionary game theory

Chaos and evolutionary game theory have much in common. Both describe systems which are open, dynamic and where their future states are dependent on their current states. Chaos theory's key qualitative characteristics are (1) that the system's future state is dependent on its current state, (2) the existence of positive and / or negative feedback loops, (3) that the system is extremely sensitive to initial conditions, (4) self-regulation and (5) fractals. These qualitative characteristics do not explain, for example, why the system's future state is dependent on its current state. This is where chaos and evolutionary game theory complement each other.

Where chaos theory can be viewed as providing a macro-level perspective of system trajectories and short-term behaviour, evolutionary game theory provides a more detailed, micro-level perspective of relevant systems. For instance, evolutionary game theory, using memetics, explains why such systems' future states are dependent on their current state. The concepts of self-regulation and fractals from chaos theory complement evolutionary game theory in reflecting why, for example, we see similar patterns in a leaf's vein structure as well as branch structure.

The methodology is discussed in Section 4. In Section 5, each theory is first applied in an accounting context separately to maximise presenting the potential explanatory value each theory has to offer. Section 6 provides a review of how the two theories complement each other to provide a more comprehensive understanding of the evolution of consolidation accounting theory. Section 7 provides some discussion and concluding remarks along with areas for future research.

4: Methodology

4.1: An overview of the methodology

As discussed in Section 2.1, accounting theories cannot be tested objectively as accounting is a social science with no "external referent by which the validity – technical or ethical – of those rules can be judged reliably and consistently" (Ravenscroft and Williams, 2009, p. 771). Accounting operates in an environment of constant change and is itself a proponent of change (see Hopwood, 1987; Bryer, 2000a; b). This creates complex dynamic interactions which make reducing accounting's development to simplified mathematical models undesirable (see Gregersen and Sailer, 1993). This framing of accounting reflects a social constructivist ontological position (Falconer and Mackay, 1999; Morgan, 2007; Scotland, 2012) with implications for the epistemological position taken by this thesis (Scotland, 2012).

A positivist stance is considered too rigid to be able to acquire a detailed understanding of the complex intricacies of consolidation accounting's development (Parker and Roffey ; Arnold, 2009; Hopwood, 2009). An interpretive epistemology is more appropriate as it acknowledges the need to engage with the subject matter in order to gain an understanding of the development of consolidation accounting practices in the context within which it develops (Parker and Roffey, 1997; Falconer and Mackay, 1999; Alvesson, 2003; Morgan, 2007; Scotland, 2012). Given the exploratory nature of this research, a general qualitative methodology, drawing on primarily detailed semi-structured interviews, is adopted (Caelli et al., 2003). In addition, as the purpose of this study is to propose a new framework utilising non-accounting theory, aspects from grounded theory have been adopted.

Charmaz and Belgrave (2007, p. 28) describe grounded theory as:

> "(1) simultaneous involvement in data collection and analysis phases of research; (2) creation of analytic codes and categories developed from data, not from preconceived hypotheses; (3) the development of middle-range theories to explain behaviour and processes; (4) memo-making, that is, writing analytic notes to explicate and fill out categories, the crucial intermediate step between coding data and writing first drafts of papers; (5) theoretical sampling, that is, sampling for theory

> construction, not for representativeness of a given population, to check and refine the analyst's emerging conceptual categories; and (6) delay of the literature review."

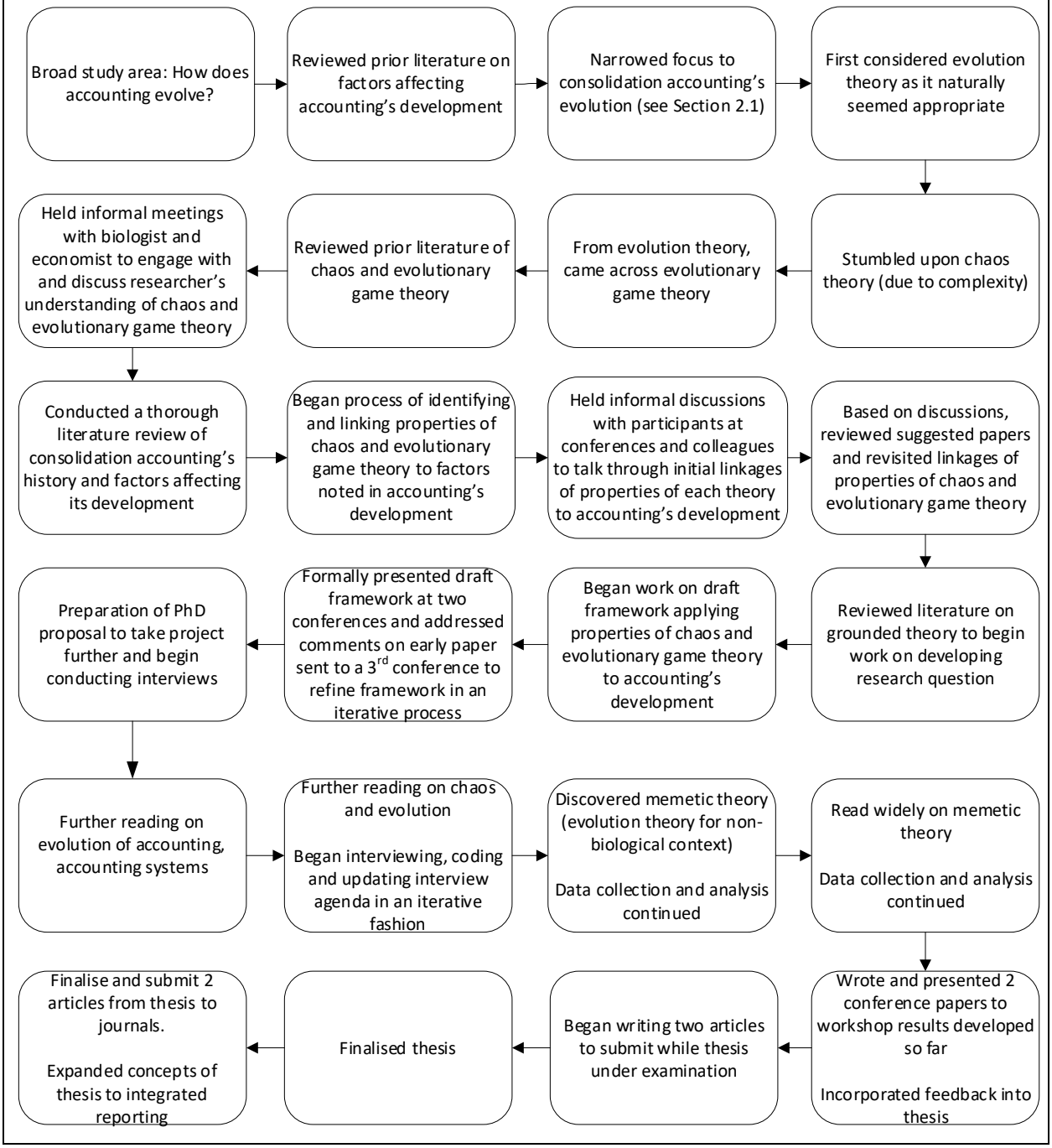
This thesis is inspired by grounded theory as it follows all but points *2* and 6 noted above. A thorough literature review was conducted upfront (6) and three existing (although non-accounting) theories are used to develop an initial framework (2). The initial framework will not be presented to interviewees. Instead, it informed the semi-structured, open-ended interview agenda. Following each interview and initial coding, both the framework and interview agenda were refined in an iterative and self-reflexive process to produce a "mid-range relevant" and good fit framework of how accounting develops (see Parker and Roffey, 1997; Glaser, 2002; Charmaz and Belgrave, 2007).

Different authors have different standpoints about the degree of rigidity which should be used when collecting and analysing data. Because of the exploratory nature of this study, and its choice of theory, a relatively flexible approach was adopted to collect and analyse data rather than being focused on procedural consistency (Strauss and Corbin, 2008). The methodology is characterised by:

> "(1) exploring the nature of social phenomena (rather than testing hypotheses about them); (2) working with unstructured data (not predetermined analytic categories); (3) investigation of a small number of cases in detail; and (4) data analysis involving explicit interpretations of the meanings and functions of human actions (mainly in verbal form)" (Parker and Roffey, 1997, p. 218).

The chosen approach allowed the research to "cut across disciplines, fields and subject matter" in order to provide alternate perspectives on the evolution of consolidation accounting (Falconer and Mackay, 1999, p. 288). As with grounded theory studies, this thesis began with an idea to improve our understanding of a phenomenon – in this instance – how consolidation accounting evolves. Figure 7 summarises the researcher's process from idea inception.

Figure 7: Research process flow



4.2: Data collection

Data were collected using semi-structured, open-ended interviews with 30 experts between February 2019 and 2023 (Parker and Roffey, 1997; Strauss and Corbin, 2008). Semi-structured, open-ended interviews were used as the primary data collection method. This allowed the

researcher to gather the specific opinions, experiences, historical views and rationales for the beliefs of individuals directly and indirectly involved in consolidation accounting processes (Alvesson, 2003; Creswell, 2009; Rowley, 2012).

Semi-structured interviews were selected rather than surveys or questionnaires. This allowed participants to explain themselves, their experiences, opinions, attitudes, values and insights by virtue of both verbal and non-verbal cues. Interviews were allowed to progress naturally (Onwuegbuzie et al., 2010). This allowed for a more detailed dataset to be collected (Parker and Roffey, 1997; Alvesson, 2003; Strauss and Corbin, 2008; Creswell, 2009; Rowley, 2012). It also ensured that themes which might not have been known prior to the interview were explored. In addition, interviewees were able to clarify any ambiguities (Parker and Roffey, 1997; Creswell, 2009; Rowley, 2012). As an added benefit, tone and non-verbal cues were noted and used when interpreting interview transcripts during the thematic analysis process to develop open, axial and selective codes (see Section 4.4) (Parker and Roffey, 1997; Alvesson, 2003; Creswell, 2009; Onwuegbuzie et al., 2010). The interviewee identification and selection process incorporate an inherent bias risk into the study. Table 6 provides the controls implemented to, inter alia, limit the potential of biased interviewee selection on the study's findings. However, the study's purpose is to determine whether chaos and evolutionary game theory may be applicable to consolidation accounting's evolution. Consequently, future research aiming to test the novel framework empirically should be more concerned with biased selection than this initial and exploratory research (see Brivot and Gendron, 2011).

The chosen method does not result in generalisable findings but does promote the development of a well-constructed framework within constraints (Charmaz and Belgrave, 2007; Strauss and Corbin, 2008). Questions posed to respondents were neutral and non-leading to enhance the validity of responses acquired (Strauss and Corbin, 2008; Creswell, 2009; Rowley, 2012). Interviewees were also requested to explain themselves in different words to both ensure there was no ambiguity and to address the potential of rehearsed responses (Alvesson, 2003).

The preliminary interview agenda was constructed drawing on the literature review and theoretical frameworks and is provided in Appendix C. As the purpose of this study is to develop a framework of accounting evolution, as opposed to testing pre-existing theory, the agenda and draft framework were refined, as appropriate, in response to interviews conducted and coding performed. This facilitated the continuous improvement of both the framework and subsequent

data collection (Parker and Roffey, 1997; Strauss and Corbin, 2008). The research design allowed responses from previous interviewees to be posed to subsequent interviewees to enhance the richness of the final data set and results.

Pilot interviews were conducted with 2 academics to assess whether the initial agenda questions were non-leading, did not pose an ethical risk to either the interviewees nor the researcher, were complete and were capable of providing the data necessary to address the research objective (Rowley, 2012; Leedy and Ormrod, 2013). No material changes were required following the pilot interviews. After the pilot study, potential interviewees meeting the criteria in Table 5 were identified from the researcher's networks, the prior literature and prominent practitioners. Interviewees were invited via telephone and e-mail to participate in the study. No invited interviewees declined to be interviewed. This initial contact included a brief overview of the research objective and emphasised the voluntary basis of the research. Times and dates were then set with willing participants to conduct the interviews face-to-face. Three interviews were conducted via MS Team. One because of the participant's location and two because of COVID-19.

A confirmation letter was sent to all participants. This letter included basic agenda points to allow participants to prepare and feel comfortable discussing their views in detail (see Alvesson, 2003; Creswell, 2009; Rowley, 2012). Detailed questions were not provided beforehand to reduce the risk of rehearsed responses. The letter also included the participant information sheet and consent form which were received before or at the commencement of each interview (Appendix A and B) (Alvesson, 2003; Creswell, 2009; O'Dwyer et al., 2011; Leedy and Ormrod, 2013).

Each interview began by confirming the participant has signed the consent form (Appendix B) and establishing rapport. The interviewee was reminded that the interview is voluntary, can be stopped at any time and is strictly confidential. The interviewee was encouraged to be open, honest and frank in all responses without fear as the interview is confidential and there are no correct or incorrect responses. Permission to record the interview is part of the consent form. Permission for all interviews except one was granted. For this exception, detailed notes were taken during the interview (Alvesson, 2003; Creswell, 2009; Rowley, 2012). Even when permission was

granted, notes of non-verbal cues, pauses and the interviewer's initial reactions, impressions[47], emotions and thoughts were documented to enhance subsequent coding and analysis. This is an important aspect of theory development (Parker and Roffey, 1997; Strauss and Corbin, 2008; Onwuegbuzie et al., 2010).

Each interview will be allowed to progress naturally. This allows interviewees to provide detail and emphasis where they see fit. While the interview agenda provided to respondents will be kept broad, a more detailed agenda will be used by the researcher to ensure all themes are explored in each interview. More detail on the interviewees is provided below.

4.3: Population and sample

Table 5 provides details on the populations. Purposive sampling was used to select interviewees as the purpose is not to generalise but obtain relevant information about accounting's evolution. Identifying potential interviewees that are expected to have valuable insights to provide was vital (Brivot and Gendron, 2011). Sampling was based on which categories of interviewees could best provide meaningful insights about the development and functioning of accounting in real-world settings. These categories were then refined into four groups (adapted from Alvesson, 2003; Creswell, 2009; Rowley, 2012). In total, 30 interviews were conducted. Details of the 4 categories of interviewees and their populations, sample and reason for inclusion are provided in Table 5.

Existing networks, the prior literature and prominent practitioners in each of the four categories were used to identify potential interview candidates with the necessary qualifications and experience, and who were accessible to the researcher. A similar approach was adopted by Brivot and Gendron (2011) where pragmatic purposive sampling was used to ensure both focus on the research objective and that sufficiently qualified participants were included to strengthen the quality of the research findings (see also Holland, 1998; Alvesson, 2003; Koerber and McMichael, 2008; Creswell, 2009; O'Dwyer et al., 2011; Rowley, 2012).

The result of the interview selection approach was a mix of interviewees with a variety of different backgrounds, work-objectives, experience levels and perspectives. Although it is not the purpose

[47] This ensures interviewer reactions and impressions are not presented to the interviewee which may affect their responses.

of this research to consider different jurisdictions' perceptions, participants from six different countries[48] were interviewed. All interviewees had multinational experience; this also ensures that the results are relevant to an international audience because their insights are not limited to a single jurisdiction (Maroun and van Zijl, 2016).

Interviews were on average 84 minutes. One interview was only 25 minutes because of time constraints of that participant. The longest interview was 120 minutes. Sufficient time was spent interviewing participants to generate a rich dataset (see Guest et al., 2006). Initial saturation was achieved after the 28th interview, as no new significant insights were gathered[49]. Determining data saturation required simultaneous data collection and analysis, in conjunction with the prior literature (Corbin and Strauss, 1990; Koerber and McMichael, 2008; Anderson, 2017).

The emergence of COVID-19 in early 2020 necessitated the development of policies, procedures, and content for the rapid implementation of online teaching and learning at the researcher's university. This resulted in delays to the research project. However, it afforded the researcher the benefit of returning to read the transcripts and draft findings after some time had lapsed. The "fresh review" of all work completed prompted further refinement of the draft findings and a final round of three interviews conducted between October 2021 and February 2023. The same interview agenda was adopted, but the researcher then had the benefit of having already completed the bulk of the research project, acting as a final credibility and dependability of the findings check (Golafshani, 2003). This is in line with the exploratory and interpretive stance of the project.

The first three interviews conducted were with preparers of financial statements. The researcher has the least personal experience in this area. By interviewing preparers first, the initial framework was expected to be most significantly enhanced with practical considerations the prior literature review and personal experience may not yet have highlighted (see Strauss and Corbin, 1994; Strauss and Corbin, 2008; Rowley, 2012).

[48] America, China, Greece, Romania, South Africa and the United Kingdom.

[49] Two more interviews were conducted as they had already been scheduled.

Two international conference[50] papers were developed and presented based on the thesis findings. One dealt with the chaos theory perspective while the other focused on the memetic evolution theory component. The researcher is grateful for the comments from the anonymous reviewers as well as those of the conference participants.

[50] 11th African Accounting and Finance Conference (Egypt) and the 11th Accounting History International Conference (United Kingdom).

Table 5: Category and population of interviewees			
Category and Population	**Sample and selection criteria**	**Average length**	**Why group was selected**
Professionally qualified and registered accounting academics with at least 10 years' experience[51] Represented by "T" in findings	7 | Accounting academics with a Chartered Accounting (or equivalent degree) and have at least 10 years' experience teaching for a Chartered Accountant (or equivalent) degree or in conducting research in accounting.	79	Accounting academics are selected because of their detailed knowledge and understanding of accounting and its changes. In addition, they know the foundations of accounting concepts and are able to identify deviations from those concepts in standards and potential reasons for any deviations. Accounting academics are likely to be the least biased (see Watts and Zimmerman, 1979). They are unlikely to advocate for specific procedures out of self-interest as some preparers may.
Analysts and users of financial statements Represented by "U" in findings	3 | Analysts, investors and creditors who use financial statements on a frequent basis.	66	Financial statements are designed to satisfy the information needs of this user group. Two of the users interviewed have accounting qualifications while one does not. This provides a balance to understand both types of users' needs. Limited interviews from this category were selected as this category is not necessarily familiar with how transactions and events are *accounted for*.

[51] 10 years experience was used throughout to ensure interviewees have sufficient experience to be able to meaningfully provide insights about accounting's evolution over time.

Table 5: Category and population of interviewees			
Category and Population	**Sample and selection criteria**	**Average length**	**Why group was selected**
Auditors and audit technical partners Represented by "A" in findings	7 | External financial reporting auditors with a Chartered Accounting (or equivalent) degree and at least 10 years' auditing experience	90	Auditors are IFRS experts and are aware of the pressures placed on them and preparers from different stakeholders (see Jensen and Meckling, 1976). Auditors are also exposed to a vast variety of situations and circumstances. They understand the need for pragmatism and have experience with the complications of consolidation accounting procedures and outcomes. Audit technical personal are included in this category and not with academics because of the pressure placed on them by different stakeholders when dealing with complex accounting problems in real-life situations.
Preparers, practitioners and users Represented by "P" in findings	7 | Preparers and practitioners with at least 10 years' experience	87	This group is expected to shed light on the practical concerns and difficulties of preparing and using consolidated reports. It is also expected that any real or perceived shortcomings in the standard will be highlighted by this category and whether they use such shortcomings to determine and justify applying variations of prescribed standards (see Jensen and Meckling, 1976; Ravenscroft and Williams, 2009). This group is expected to explain and provide examples of how new accounting techniques are developed and

Table 5: Category and population of interviewees			
Category and Population	**Sample and selection criteria**	**Average length**	**Why group was selected**
			implemented. Finally, preparers interact frequently with users and will have experience with which aspects of consolidated reporting is most and least useful to users.
Standard setters and regulators Represented by "R" in findings	6 | Previous or current members of: the IASB, IFRS Staff, FASB, IRBA[52], PMU[53] and FRIP[54]	90	This group has insights into the standard setting, regulation, politics and enforcement processes, know of unintended consequences, experience on the decision-making where trade-offs or compromises were made (Schipper, 1994; Zeff, 2002; Sacho and Oberholster, 2008; Zeff, 2012).
Total	**30**	**84**	

[52] International Regulatory Body for Auditors

[53] Proactive monitoring Unit of the JSE

[54] Financial Reporting Investigation Panel of the JSE

4.4: Data analysis

Data analysis was an iterative process. Atlas.ti was used to conduct the data analysis. Firstly, interview transcripts were studied individually to become familiar with their content. Informal preliminary coding was performed on each transcript based on headings and sub-headings used in the literature review (Holland, 1998; Leedy and Ormrod, 2001, p. 153). This also formed the initial stages of the open-coding process. The line-by-line approach was used to code each transcript. Open codes were not merely descriptive and strode to be analytical (Strauss and Corbin, 2008; Gibbs, 2010). The purpose of open coding is to be open-minded and help the researcher think through each transcript and what meaning can be found in each. This process involves asking what, why, when, how, how many and what-if type questions. Red flags such as “always”; “never” and “not possible” also promoted further inquiry and analysis to understand the deeper meaning behind these phrases. The ‘flip flop’ technique, where extremes are compared to aid further analysis and understanding, was also used (Gibbs, 2010).

Throughout the entire process, constant comparison between open codes, interpretations of responses and prior literature were performed. This helped to identify the motivations behind responses which helped develop the dimensions of open codes. The researcher contemplated each open code to appreciate its dimensions[55] in order to refine the open codes. Examples of initial open codes include: disturbance type, disturbance effect, feedback loop, consensus, inheritance, conflict, co-ordination and type of game.

The result from the open coding process was a list[56] of open codes and their meaning. This formed a type of completeness checklist while coding subsequent interviews and also allowed the researcher to be consistent with open codes. Moreover, as subsequent interviews were coded, any modifications made to open codes were also made on the code list to facilitate making the same changes on previous interview transcripts (Gibbs, 2010).

Where open coding is used to develop categories of information, axial coding is the process of determining links between open codes (Parker and Roffey, 1997; Strauss and Corbin, 2008; Creswell, 2009; Gibbs, 2010). During this process, open codes were refined by collapsing or

[55] Straus and Corbin provide examples such as intensity, duration, frequency and setting (Strauss and Corbin, 2008) These dimensions of codes are sometimes referred to sub-codes or child-codes (Gibbs, 2010).

[56] This list will include specific details such as date code originated and was modified, the analytic it refers to, sub-codes (dimensions) of each code and any other additional information that may be useful in subsequent coding processes such as haunches and preliminary linkages (see axial coding) (Gibbs, 2010).

expanding them as appropriate. This process involved looking for causal and other relationships, phenomena, strategies, contexts, intervening conditions, actions/interactions, consequences and results. The result was a data mind map of categories and links between categories which formed the initial bases for selective coding (Parker and Roffey, 1997; Alvesson, 2003; Strauss and Corbin, 2008; Gibbs, 2010).

Selective coding has its focus on selecting those categories and linkages which can be used to develop the framework for explaining the evolution of accounting. This process aimed to explain the investigated phenomena and identify the core issues in addressing the research objective. While having more than one core issue is acceptable, there would usually be three or fewer core issues (Strauss and Corbin, 2008; Gibbs, 2010).

4.5: Research credibility, transferability and trustworthiness

Validity and reliability, as understood in quantitative studies, do not fit precisely into qualitative studies (Golafshani, 2003; Ahrens and Chapman, 2006). Instead, credibility, transferability and trustworthiness are measures of the success or failure of a qualitative study. These can be enhanced by presenting the method and controls put in place in order to enhance trust in a study (Golafshani, 2003; Anderson, 2017). The controls adopted are presented in Table 6.

Table 6: Controls adopted to enhance credibility, transferability and trustworthiness	
i.	Clearly documenting the research journey (see Figure 7, Section 4.1) and method (Golafshani, 2003; Anderson, 2017).
ii.	The supervisor acted as a member checker by reviewing interviews transcripts and re-coding a sample of transcripts to safeguard the analysis and interpretation processes were consistent and resulted in fair representations which are confirmable (Anderson, 2017).
iii.	The study was grounded with extensive prior literature reviews, coupled with discussions with subject experts to ensure the researcher's understanding of the properties of chaos and evolutionary game theory were appropriate[57].
iv.	Triangulation[58] between prior literature, interviewee data, IASB documents and APs. This was not done to ensure mutual confirmation but aided determining whether all

[57] A comprehensive understanding of all the intricacies of chaos and evolutionary game theory is not required for the qualitative use of these theories and is beyond the scope of this project (Strogatz, 2014).

[58] The term is used to describe a type of completeness and logic check rather than having the same meaning as in positivist studies.

	themes had been identified and considered. It also highlighted outliers which are of particular interest to qualitative studies (Golafshani, 2003; Strauss and Corbin, 2008; Anderson, 2017).
v.	Interviewees were subject experts with many years of international experience ensuring that the data gathered were from experienced and knowledgeable professionals. Interviewees from more than one jurisdiction, and who have multinational experience, were interviewed to ensure findings are not unique or specific to only one jurisdiction (Alvesson, 2003; Rowley, 2012).
vi.	Interviewees were not interviewed in group settings where responses from one interviewee may have affected the honest and frank responses of other participants (Creswell, 2009). Instead, respondents were interviewed separately (unless specifically requested otherwise[59]) ensuring interviewees' confidentiality was guarded and promoting detailed and honest responses to interview questions (Alvesson, 2003; Rowley, 2012).
vii.	Interviews were conducted using semi-structured, open-ended and non-leading questions to reduce researcher interference. This ensured responses were genuinely those of the interviewee. This also allowed issues and themes to be explored fully adding to the richness of the data set (Alvesson, 2003; Rowley, 2012). Respondents were also asked to rephrase certain statements to ensure no ambiguities and address the risk of rehearsed responses or incorrect interpretation of comments by the researcher (Alvesson, 2003).
viii.	Interviews, with permission, were recorded[60] to allow the interview to progress uninterrupted, allow the researcher to make notes of non-verbal cues, expressions and initial impressions during the interview. It also reduced the risk of transcription error (Parker and Roffey, 1997; Creswell, 2009; Onwuegbuzie et al., 2010). Transcripts were made available to interviewees for review on request to further reduce transcription error (Creswell, 2009). Requiring interviewees to review transcripts may reduce the number of willing participants because of the time commitment of such a requirement and was not required.
ix.	Ethics has been considered and approval obtained from the University of the Witwatersrand's Human Research Ethics Committee (HREC) (non-medical) (see Section 4.6).

[59] Interviewees P1, P2 and P3 requested to be interviewed together as did P5 and P6.

[60] Only U1 declined to be recorded. Detailed manual notes were made throughout the interview.

x.	Peer debriefing was utilised with two (one IFRS expert and one non-IFRS expert) research active academics who “commit to question the research approach in a consistent and systematic fashion [as a] means to demonstrate rigor through making aspects of the research explicit as well as [ensuring] critical evaluation of the patterns that are identified and the analysis process” (Anderson, 2017, p. 5).
xi.	Finally, the work has been extensively workshopped at international conferences. One article has already been submitted to the Accounting, Organizations and Society journal which has cleared the editor and is currently under review while another near-complete draft will be submitted to the Accounting History journal.

4.6: Research ethics

Research ethics are of paramount importance. As all intended participants in this study are expected to have some accounting qualification and at least 10 years’ experience, the risk of dealing with vulnerable persons is negligible (Creswell, 2009). The interview agenda does not require or prompt any religious, ethnic or other sensitive matters to be dealt with. Audio recordings and transcripts are kept strictly confidential via physical and logical access controls. No public access to recordings and transcripts will be granted. Finally, recordings and transcripts will be retained for a period of 3 years and then destroyed.

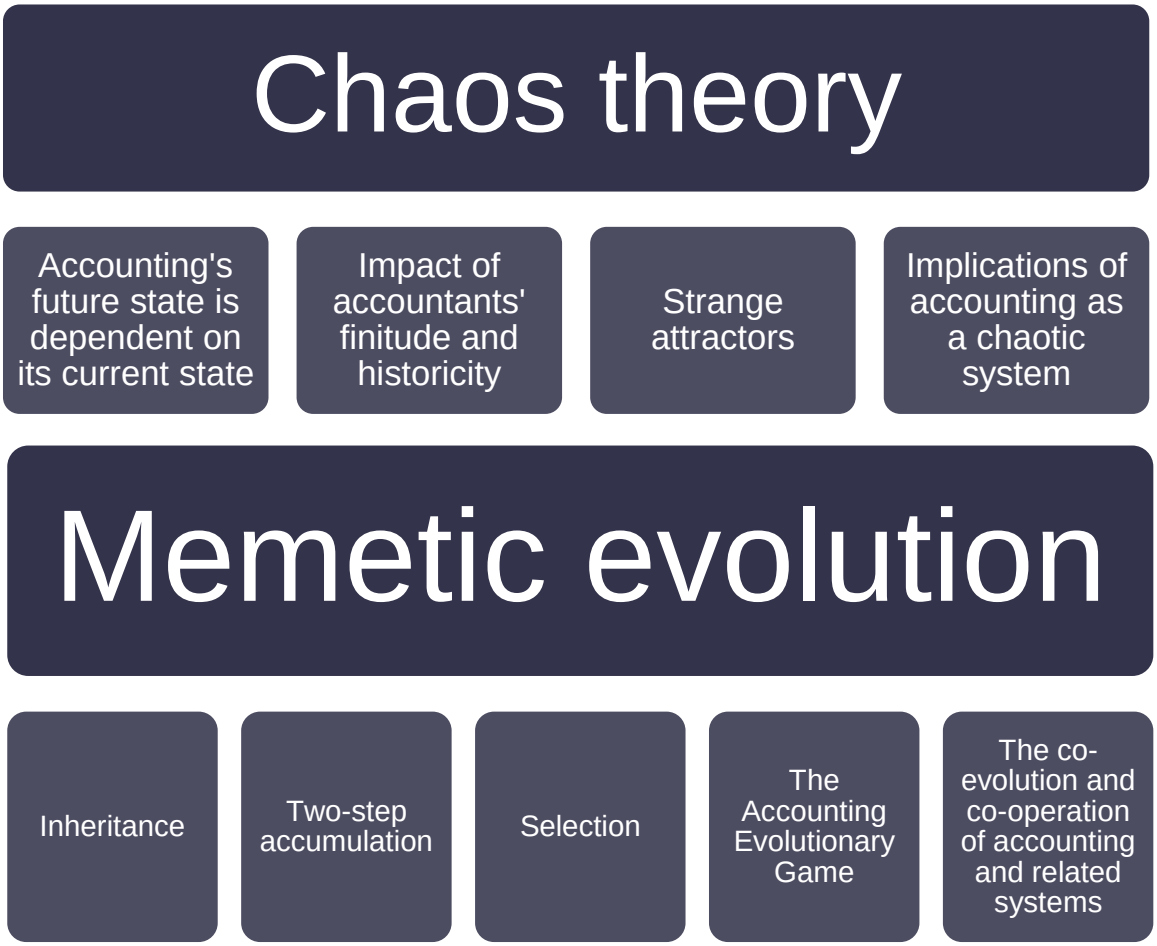
As an additional safeguard, the results will be presented in such a way that readers should not be able to link quotations or viewpoints with the respective individuals. When writing the results, care will be taken to ensure that the report is not biased and is culturally sensitive.

No interviews were conducted without the University of the Witwatersrand’s HREC’s (non-medical) written authorisation (see ethics clearance certificates in Appendix D and Appendix E). This ensures that appropriate procedures have been followed, and that the study has been adjudicated by an independent committee as conforming to ethical standards.

5: Analysis and findings

First, chaos and memetic evolution theory are considered separately[61] (see Table 7). Thereafter, the intersection between the two theories is discussed and how they can be combined to provide a more complete and holistic framework of accounting's evolution. The last section provides closing remarks and areas for future research.

Table 7: Outline of analysis and findings section



5.1: Accounting as a chaotic system[62]

Chaos theory provides useful insights where systems are open, dynamic and non-linear (Gregersen and Sailer, 1993; Polley, 1997). These are systems whose future state is dependent on its current state and which have one or more feedback loops resulting in deterministic, but chaotic, trajectories. As the number of interacting components increases, so

[61] This aligns with how publications have been developed from this thesis.
[62] This section forms the basis of an article submitted to the Accounting History journal.

does the complexity of the system. The complexity is compounded when humans are part of chaotic systems because of each human having a unique upbringing and accounting experience (Levy, 1994; Thietart and Forgues, 1995; Polley, 1997; Tsoukas, 1998).

Section 5.1 begins by using the qualitative characteristics of chaos theory to demonstrate its applicability to accounting evolution. In doing so, the importance of accounting's social construction are highlighted as accountants' finitude and historicity (see Section 3.1.1) have a great impact on accounting's evolution. More specifically, accountants' formal education and training, experience and their roles at a company or regulatory body impact how they understand and apply accounting treatments. Consequently, these factors affect the development of accounting.

5.1.1: Accounting's future state is dependent on its current state and feedback loops

All interviewees emphasised the cumulative nature of accounting for two reasons. Firstly, it is simply more efficient to build on what already exists than to reinvent something (P1-7; A1-7; R2-4; T1-7 and U2). This approach is also pragmatic. As issues are identified with accounting treatments, they can be modified in respond to the question. The problem may be a deficiency with how the treatment deals with existing transactions and events, or be a result of new transactions and events. This approach also helps to ensure that the aspects which did not present problems are not needlessly reinvented with the added risk of creating other problems unintentionally (all interviewees). Secondly, interviewees highlighted the need to obtain a sense of consensus regarding how to treat new transactions and events, or how to interpret accounting standards (all interviewees).

Interviewees felt the best way to achieve consensus is to base new accounting prescriptions on existing accepted practices (P1-7; A1-7; R2-5; T2-7). This approach also reduces the cost each accountant and user must bear as only the marginal change must be understood and applied. The desire to achieve consensus and to base new accounting treatments on existing accounting practice may also be, in part, because of the value accountants place on their personal reputations. For example, P7 noted that "to me, it's everything", and discussed how accountants are "judged according to their roles". The position accountants hold is interconnected with their personal reputation and, consequently, the expectations colleagues have of them (Zinko and Rubin, 2015). For example, people have an expectation that technical accounting partners at Big 4 audit firms are experts in IFRS and should be able to recognise accounting matters quickly and offer solutions easily. People also expect that any recommendations they offer are well-thought out and have some level of internal consistency

and theoretical validity. By modifying existing practice, accountants also reduce the risk that their proposals will be identified by as problematic by other accountants.

To protect one's reputation, "you will really want to avoid any form of criticism, even if it's not well founded" (P7). This may explain accountants' general inclination to corroborate their interpretation of accounting treatments with colleagues before committing to them. Similarly, it may explain why accountants tend to exercise prudence when developing accounting treatments to deal with new transactions and events. Prudence manifests itself as a tendency to make only the most necessary changes to existing accepted accounting treatments to account for new types of transactions and events. In other words, accountants try to change currently accepted treatments as little as possible to develop an acceptable treatment for new transactions and events.

By making minimal changes to existing accounting treatments, accountants reduce the risk that colleagues, auditors and regulators will find problems with their proposals as the proposing accountant piggybacks off of the existing acceptance of the current treatments. Consequently, the proposing accountant maintains his or her reputation without question. The APB's rejection of formally commissioned research into measurement methods in the 1950s provides an example of the accounting fraternity's reaction to proposals which appear to diverge significantly from existing practice. Despite valid and credible research explaining fair value and why it should be used, it was rejected because it represented a departure too far removed from what was then accepted accounting practice (see Deegan, 2014).

IFRS expert interviewees also commented that International Accounting Standard 8 - Accounting Policies, Changes in Accounting Estimates and Errors (IAS 8) formalised the process of modifying accounting as opposed to reinventing it[63] (IASB, 2015a, A1-7; P3-7; R2-5; T5-7 and U2). IAS 8 codifies what accountants were doing implicitly and supports the conclusion that accounting's future state is dependent on its current state. In doing so, this confirms the applicability of first qualitative characteristic of chaotic systems for accounting. Further support comes in what accountants require before the system will change and how accountants respond to that change.

[63] Pre IFRS, accountants were using and modifying existing concepts, practices and techniques to deal with new transactions and events. IAS 8 codified this practice by formally requiring that accountants draw on and modifying existing concepts, practices and techniques to account for transactions and events not currently dealt with specifically by IFRS.

Respondents discussed how accountants resist accounting change to a significant degree (A1-7; P1-7; R2-5; T1-7; U2-3). Accountants employ resistance techniques including, lobbying against changes; de-coupling their actions from their representations to be seen as adopting new changes while there are no substantive changes adopted and misapplying changes with the rationalisation that any non-compliance is not material. The implication is that accounting, or aspects of accounting, reach periodic states of equilibrium – called a status quo – and only change in response to a disturbance:

> "To change that we need a trigger. So, a trigger will exist or [will] not exist and when the time comes it will make a change. Then that change will not be perfect and then we will change again. It will not be perfect. But as we change, it's not that the underlying economic reality is constant, it changes as well. This is kind of a tit-for-tat situation" (T3).

The prior literature reaffirms accountants' general resistance to change (Broadbent et al., 2001; Jermias, 2001; Zeff, 2002; Maroun and van Zijl, 2016; 2022) and tendency to avoid radical changes (Botzem and Quack, 2005; Lee, 2006; Deegan, 2014). Crises, standard setters' due process and accountants' inherent need to corroborate accounting practices with colleagues were provided as examples of mechanisms which can lead to disproportionate changes in responses to disturbances (A1-2: A4-6; P5-6; R2-4; T3; T5; T7; U2). In the context of chaos theory, these features can be viewed as examples of feedback loops in accounting's evolution.

Standard setters' due process, accountants' compulsion to achieve consensus on accounting treatments and an entrenched conceptualisation of cost-benefit are examples of negative or dampening feedback loops. Existing standards, being the outcome of previous accounting discussions, are used as the inputs to determine the accounting for new transactions and events. Similarly, some academics, auditors and preparers prioritise developing new accounting treatments which utilise existing structural, procedural and software setups to minimise change and ensure the cost-benefit of necessary changes are realised (A1-7; P1-6; R2-5; T2-7; U2-3). Consequently, the magnitude of a new transaction or event's disturbance is stifled with a stabilising effect in that it reduces the likelihood of radical changes to existing accounting prescriptions. However, these dampening feedback loops are not perfect nor are they all-encompassing. A stakeholder's role can impact the relative strength of dampening feedback loops.

For example, some interviewees sub-categorised accountants within the academic, auditor and preparer roles according to whether they apply IFRS directly or are indirectly involved. The accountants who must operationalise accounting have greater tendencies to support dampening feedback loops as these reduce their personal workload, complexity or risk (A1; A5-7; P1; P3-6; R2; R4-5; T3; T5; T7). For example, audit managers and accountants whose job it is to determine and process the debits and credits on a daily basis resist accounting change and want new transactions to fit into existing accounting treatments to the maximum extent possible. In doing so, these accountants avoid the costs associated with understanding and applying new treatments.

Academics were also sub-categorised as follows:

> "let's categorise the academics into those who think and those who teach. Those who teach would encourage minimal change but on a regular basis with a long implementation lag time so that they could change all of their case studies, textbooks and other material to ease their teaching workload. I say that from experience. The thinking-type, the researchers, would be more inclined, but equally more divergent in their views, of what should be done by aligning themselves to particular concepts, paradigms and then developing what they would feel are the standards that embody those principles in the way that they would prefer to see them employed" (R4).

The accountants who answer to investors, lenders and clients as well as those who are researchers do not have as great a focus on maintaining the status quo. These researchers, audit technical partners, CEOs and CFOs have slightly different priorities based on their roles. The researching academics and audit technical partners are focused on theoretical correctness, consistency, validity and the provision of useful information in the present context. As weaknesses in incumbent accounting treatments are identified, these accountants may be more willing to consider new treatments, regardless of the extent to which they differ from existing practice. In addition, these accountants may take advantage of situations which enable them to recommend the replacement of techniques with drastically new ones they feel are more suitable (A5-6; P1; P5; R2: R4-5; T2 and T7).

"Funding-type CFOs" (A5) are more inclined to support flexible (and divergent) accounting practices which enable them to "tell a story" that puts their entity's numbers into context (P1). This is because operationalising the accounting is not their primary role and concern, but maintaining investor and creditor confidence is. The result is accountants willing to accept

change regardless of how drastic it may be (A1; A5-7; P1; P3-6; R2; R4-5; T3; T5; T7). Consequently, these accountants may sometimes use small disturbances to initiate disproportionately large changes (positive feedback loop).

The Big-4 accounting firms were raised as another normalising (dampening) feedback loop. While there is robust debate within technical departments of the Big-4 audit firms, once a decision on how to interpret or account for specific transactions is decided, all global member firms must "tow the party line" (T7) to ensure consistency. As one technical accounting partner at a Big-4 firm put it,

> "So clearly part of what we're trying to do is risk management and so, yes, we restrict the way we interpret the particular standards …to try and mitigate our risk we provide written guidance, and that written guidance is restrictive. It's designed to be restrictive that in these scenarios this is what you are *supposed to do*. … We do globally try and restrict the way you do things based on the way we think the standard *should* be interpreted and all of the large firms do that" (A5, emphasis added).

A5's sentiments were echoed by A1, A4, A6 and A7. The Big-4 accounting firms reduce divergence in how codified accounting prescriptions are interpreted and operationalised. This system extends beyond just their auditors. Big-4 accounting firms' clients are also, indirectly, affected as they disagree with clients which attempt to depart from the Big-4 firm's "technical manuals" (T7). Only A6, also a technical accounting partner of a Big-4 firm, felt confident that, on rare occasions, he would be willing to depart from global interpretations with sufficient justification. This signals that, while negative feedback loops are present, they are not complete and can be negated in rare circumstances.

Confirming the auditors' point about the restrictive nature of Big-4 firms' interpretations, P7 recounted how his auditors "forced" him to consolidate a zero-shareholding social welfare entity[64] his group set up under very particular circumstances. In this case, P7's company had Board representation to ensure the proper functioning of the social welfare entity but obtained no variable returns associated with that representation or entity. Despite obtaining several opposing views from highly regarded accountants, P7's audit firm's global team still required consolidation of the welfare entity. P7 suspected that, from the reasons provided by the auditors, a similar situation had arisen at an oversees client and the audit firm was forcing that

[64] To protect the anonymity of the interviewee, no specific details have been included. The researcher agreed with the interviewee that it is at least a grey area or requires judgement to conclude.

interpretation onto his company's circumstances. P6 and T3 described similar situations where their auditors required the consolidation of entities they felt were clearly not controlled.

In contrast to negative feedback loops, crises can lead to positive reinforcing feedback loops because they make current accounting weaknesses public. The publicity means that changes must be "visible" or noticeable to a layman audience. Consequently, small technical changes may be insufficient to satisfy the public's expectations about what change is sufficiently big to prevent future scandals or failures. Accordingly, in attempts to both repair legitimacy and address actual or perceived weaknesses, accountants feel pressured to make conspicuous changes. They may also be emboldened to propose radical modifications they previously felt anxious voicing out loud (A1-2; A4-6; P5-6; R2-4; T3; T5; T7; U2):

> "people are more receptive to drastic change during and after a crisis and for many reasons. This may be to ensure a particular stakeholder sees you are being reactive and enacting substantive change or it may be because you have a genuine belief the change is needed and will provide useful information. And a crisis provides the opportunity to have those types of ideas taken seriously" (T7).

T7's last words are informative. Many potential changes to accounting are developed, but getting those ideas, especially drastic ones, "taken seriously" is challenging and a daunting task for any individual accountant. Without crises, the general resistance to change is often too great to surmount.

Talking to a similar point, A4 used recent South African scandals (Tongaat, Steinhoff and VBS) to illustrate that the public relies on the financial position and performance of companies presented in consolidated financial statements. When those financials are misleading, it "touch[es] the human element, which it invariably always does, [and] then [society] start becoming a really significant stakeholder" with a powerful voice (A4). In this sense, many interviewees agreed that society tends to act on crisis and demand visible changes from the accounting profession to present an image of being proactive and responsive to society and the real or perceived weaknesses of the incumbent accounting standards (P1-7; A1-6; T1, T2-7 and U1-3).

The prior literature implicating court cases as a key driver of the motivation to develop formal asset valuation rules may serve as an example (see 2.2). The financial statements of groups

with loss-making subsidiaries which mislead investors and helped initiate an entirely new branch of accounting may be another (see Section 2.2.1).

As more stakeholders demand change, accountants become more willing to accept suggested changes, even if more radical, to ensure legitimacy is restored (A1; A4-7; P5-7; R2-5; T3-7; U2). As Eaton (2005) notes, institutions and actors have little incentive to change their modus operandi. Those interested in changing the rules must overcome substantial inertia. Crises – like Enron and the GFC – call into question the modus operandi or status quo and create important openings for substantive change which can lead to reinforcing feedback loops with significant consequences for the trajectory of accounting.

The feedback loops discussed until now have been primarily internal feedback loops. Looking outside the immediate accounting sphere, there are more feedback loops. Accounting is an open and dynamic system which is both impacted by and impacts a variety of other systems (see Hopwood, 1987; Bryer, 2000a). These provide other feedback mechanisms. Here, chaos theory and the existing literature on accounting history which investigate isolated periods or events complement one another. Scholars investigating, for example, how rules- versus principles-based standard setting impacts accounting (Schipper, 2003) can also be analysed from a feedback loop perspective. Schipper (2003, p. 71) argues that the US' standards

> "are in general based on principles… but they contain elements-such as scope and treatment exceptions and detailed implementation guidance-that make them also appear to be rules-based".

The US' legal culture and regulatory structure may constitute a feedback loop. As corporate, and other, failures and scandals arise they may be pushing accounting standard-setters to incorporate more "detailed and complex" guidance and implementation guidance in response (Schipper, 2003, p. 63). As these "rules" are incorporated, they create a path-dependency for *more* "rules" and what legitimate accounting standards ought to look like. Simultaneously, aggressive preparers can use detailed implementation guidance as a road map to structure transactions to avoid being "captured" by them, exacerbating the original problem.

Another key issue is that not all feedback loops may play key roles all the time. To illustrate, specific events may lead to the periodic "flair-up" of a specific feedback loop. For example, the IASC's early years were primarily aimed at obtaining compliance with, then, IAS. One method to do so was to aggregate the then-current practices of key targeted constituents as alternatives. Effectively, constitutes would "comply" merely because their practices were

allowed by early IAS standards. This made claiming compliance with IAS easy with the view to, as the IASC's legitimacy strengthens, reduce alternatives and improve the quality of IAS/IFRS accounting standards (see Walker, 1978).

Larson and Kenny (2011) offer another potential example when they investigated the funding structure of the IASC and IASB. Initially, raising funds was an important and difficult endeavour for the IASC/IASB. Many researchers worried that pressure from donors would influence the IASC/IASB to make decisions which were in the donor's best interests. A possible feedback may have been at work during that time. As decisions benefited certain types of stakeholders, funding may have increased. Conversely, decreased funding may have arisen when decisions didn't benefit specific stakeholders (McLeay et al., 2000; Zeff, 2002; Stenka and Taylor, 2010; Larson and Kenny, 2011; Giner and Arce, 2012; Kerr et al., 2014).

Yet another feedback loop may come from how professional accountants are trained at universities. The massification of tertiary education and pressures to standardise it may lead to "spoon-feeding" strategies (Raelin, 2009, p. 401). These strategies impact how accountants will interpret and apply accounting during their careers. Because accounting requires consensus about what the "right" rules or principles are, the relative strength of specific ideas gained during formal education will impact accounting's future trajectory via support for, or opposition to, different accounting prescriptions.

Section 5.1.1 has demonstrated that accounting's future state is dependent on its current state and the presence of feedback loops within accounting's development. These characteristics indicate that accounting can be viewed as a chaotic system. A key characteristic of accounting as a chaotic system is that not all feedback loops are present and impact accounting's development to the same degree consistently. New feedback loops may develop as society and accounting evolve while other feedback loops may disappear altogether. In line with organisational management literature, at different times in an organisations life-cycle, different feedback loops may be necessary (Thietart and Forgues, 1995; Dolan and Garcia, 2002). Where change is required to respond to crisis, positive feedback loops may be supported while when more stability and normality is required, dampening feedback loops are consciously or unconsciously prioritised. This feature of accounting's evolution, in itself, adds a dimension of complexity to accounting's evolution.

As accounting is a social science, how accountants, themselves, learn, apply and modify accounting is crucial to understanding accounting's development through a chaos lens. The impact of accountants' finitude and historicity (see Section 3.1.1) is discussed next.

5.1.2: Impact of accountants' finitude and historicity

Interviewees discussed how, ignoring nefarious motivations, well-educated, experienced and honest accountants can analyse the same transaction and set of circumstances using IFRS yet come to different views on the appropriate accounting treatment. When asked why, interviewees mentioned how a person's motivation for studying accounting, formal education, training, work-experience and their current job play significant roles in shaping how accountants interpret and apply accounting standards.

No two accountants have an identical historicity (upbringing, ontology, understanding of accounting, motivation related to accounting, formal education, training and work-experience). Consequently, few accountants always select and apply accounting prescriptions in precisely the same way. Nevertheless, the accountants must still reach relative consensus on how to treat transactions and events in financial statements (A1-7; P3-7; R2-5; T2-7; U2-3). This last quality is vital to keeping accountants and accounting's development from genuine chaos (see Section 3.1) but adds a layer of complexity in itself. Details on how a person's motivation, education, training, work-experience and their current job affect accounting's development are discussed in more detail below.

Motivation to study accounting

Starting with students' motivation to study accounting at university, interviewees felt that:

> "in a lot of instances, I think people are just trying to get through [their qualification] so that they can get a CA(SA)[65]. I don't think the aim as part of this is to be the best quality accountant. … [the result is that] they're going to be rubbish. They will not achieve fair presentation" (P5).

Becoming an accountant, especially a professional accountant, is difficult for even the best and most dedicated accountancy students. As you look at students with weaker academic backgrounds and / or levels of motivation, the difficulty rises (A1-A3; A5; A7; P3-P6; R4-6; T1; T3; T5-T7). There is a strong tendency to resort to rote learning strategies "just to keep afloat" (T7) of the intense workload CA(SA) students are required to complete. All academics emphasised that students who rote learn accounting may pass qualifying examinations but may struggle to deal with transactions which do not align perfectly with the examples used when studying (T1-7):

[65] Chartered Accountant (South Africa)

> "Students tend to think that consolidation is like the simple numerical examples that they have to work through [at university]. These numerical examples very often have been written so all the numbers work out nicely but it's not really what you have to deal with in practice" (T5).

R2 and T2-5 highlighted that countries differ in their approach to training accountants. On the one hand, students study technical accounting for four years in countries like South Africa. They must then pass qualifying technical examinations while completing mandatory work-experience for three years at accredited training institutions. On the other hand, students in the UK first obtain a degree in fields as varied as mathematics and art history. Only then do they train to become accountants while simultaneously working at audit firms. How students become accountants can affect whether they develop a practical or conceptual approach to accounting:

> "If you've gone through [the UK] study approach, your knowledge tends *not* to be conceptual. It tends to be more practical. How do I actually apply the individual standards? How do I think about the standards? What are the implications of that? … If you have gone through a classic university-type education [South African model], very often it is a conceptual basis that you've actually used and so you always think back to what the definition is and so you learn first the Conceptual Framework and build your way up from there" (R2).

The culture at universities was also raised as something which affects whether students acquire a rules- or principles-based approach to applying accounting standards and developing new accounting treatments when in practice (A5; A7; P5-7; R2-5; U2-3):

> "The English-speaking universities tend to be on that kind of principle-based approach, whereas the Afrikaans[66] universities follow the more Germanic of these - [these] are the rules and we need to stick with them[67]" (A5).

On the one hand you have students with a practical approach who tend to focus on prior experience and examples closely related to the accounting problem at hand. Students who adopt a rules-based approach often read accounting standards in a legalistic or compliance manner. They tend to focus on the words used and whether their transaction or event fits perfectly into the rules or not. These students may struggle to deal with how to account for

[66] An official language in South Africa based largely on the Dutch language.
[67] The prior literature highlights and illustrates examples of the impact of culture on accounting (McKinnon, 1984; MacArthur, 1996; Meeks and Swann, 2009; Baker et al., 2010; Macve, 2015). As this was a purposive sample, there is an inherent risk of sample bias. The distinction between English- and Afrikaans-speaking universities should be used with caution as more research is required to understand this better.

transactions where no rules currently exist as they do not necessarily understand the underlying rationale for the accounting rules they know. Consequently, they have a weak foundation upon which to develop an accounting treatment.

On the other hand, conceptual and principles-based approach students draw heavily on the CFW and principles established throughout the suite of accounting standards. Some interviews described the way these types of accountants think about accounting as something akin to the *spirit of IFRS* (A5; R4-5; T7) as opposed to always referring to exact words in accounting standards. Where IFRS doesn't provide an accounting treatment for a specific transaction or event, these accountants find it easier to use the principles in similar standards and the fundamental and enhancing qualitative characteristics to ensure any accounting treatment they develop is conceptually sound and provides useful information.

How universities position themselves in the market to respond to pressures to give access to professional qualifications and comply with accreditation rules are also important. Demands for "throughputs" may manifest themselves via strategies aimed at training students to pass exams as opposed to training them to be high-quality professional accountants. A5 emphasises the eventual outcome of different teaching strategies:

> "[University X] at the time probably had the best results [highest marks and number of high-performing students] in the final [CA(SA)] qualifying exam but [their students] actually didn't feature afterwards. So, although they had the highest results, they didn't get posts and I *do* think it's because they were spoon fed; they were taught *how to write exams*. Not cheating, but you're taught how to write and how to answer questions and so you do well but you don't understand it [IFRS] and if you don't understand, ultimately doing well in exams is nice but you don't get the job or you get the job but then fail at the job because you can't think".

While accountants' formative years are important, some interviewees felt that as accountants gain experience, the impact of their education has a decreasing impact on their application of accounting. Experience, mentorship and an accountant's current job become as, or more, important to how they interpret and develop new accounting treatments. This adds another layer of complexity to accounting's development as applied by varying accountants (A1, A3-6; P3-6; R2-5; T6-7; U2-3):

> "… maybe after 10 years. I know from having dealt with lots and lots of young CA[SA]s. Some of [the newly qualified accountants] couldn't actually debate at all. Zero. Couldn't contribute to the debate at all. … it wasn't their fault because they weren't developed in that particular way. To have to think out the box or go one centimetre out… and it was to their detriment and a couple of them told me that it took them years to catch up to the Wits[68] graduates. Not in terms of their technical knowledge, they had all of that, but in terms of just being able to think naturally and problem solve themselves … and these are the best students. It was not your average student. These were the best students who came out in those days [from other universities]. … but it was a very structured, narrow approach. Very much like a technician" (R5)

and

> "I think it's also maybe the experiences that you've had as you've worked because I think over time maybe your education becomes less important in what influences your thinking" (A4).

The factors discussed reflect how an accounting student's education-historicity can have lingering implications for how they understand and apply accounting prescriptions. It also influences how they will develop accounting treatments for new transactions and events throughout their professional careers. Because accounting is a social construction, these differences, however slight, can have great impact on accounting's trajectory *when compounded* over time and because of path-dependency. After a student's university education, how students observe experienced-accountants applying accounting greatly impacts how they learn to apply it themselves in real-world settings – also discussed as the socialisation of accountants (see Fogarty, 1992; Ferguson et al., 2011). As no two accounting students are alike, no two work colleagues are alike either in how they think about accounting and apply it on a daily basis. Similar to students, there are a variety of accounting professionals who each have different levels of competence, preferences and experiences from their seniors.

Informal training, work experience and access to IFRS expert colleagues

How junior accountants are socialised and learn to operationalise accounting in real-world settings is heavily influenced by informal training, work experience and the accounting competence and preferences of the senior accountants juniors observe (all interviewees, Fogarty, 1992; Ferguson et al., 2011). In addition, whether junior accountants primarily

[68] Wits is a prominent South African university with English as the primary language of instruction.

observe only a few accountants or one with similar competencies and preferences versus observing a diverse range of seniors accountants with varying levels of competence and preferences is also relevant. Junior accountants "interweave [their] habits, preferences and ways of thinking" (T7) about accounting problems with those of their senior counterparts (see also DiMaggio and Powell, 1983). In the words of Ravenscroft and Williams (2009), the process can lead to a "hodgepodge" of rules-of-thumb and inconsistencies in the application of accounting standards and assumptions.

In practice, no effort is made to pair junior and senior accountants with similar or different backgrounds, universities or competence levels. The resultant pairing is arbitrary and leads to a further mixing of factors which impact how accountants think about, understand and apply accounting in real-world settings, complicating accounting practice even further. This impact is especially important if the senior accountants under whom juniors train have deficiencies in their own understanding and application of accounting practice. For instance, A7 highlighted that

> "if you tend to work for one person who might have got the wrong end of the stick[69] on an interpretation, that person, *and whoever works for them*, is doomed to getting the wrong end of that interpretation forever" (emphasis added).

It is not only junior accountants who are influenced by senior accountants. Senior accountants may look to junior accountants as being more technically up-to-date and learn the latest accounting changes from them (A5; R5). In these cases, newly qualified accountants must struggle and figure out, themselves, how to operationalise the theoretical knowledge they've acquired in the context of the company/client the find themselves working for/at. This may lead to the rapid development of key critical thinking competencies themselves or inaccurate and inconsistent application of accounting that may, in time, become the "norm" at that company/client due to path-dependency. In addition, even the most highly regarded and seasoned accountants are influenced by others, both accountants and non-accountants alike:

> "if I look at the analysts that the IASB deals with, often it's the technical or the accounting committee of the CFAs[70]. They're all rabid fair value enthusiasts and so you start seeing this [fair value logic] coming through in the standards. … [why], because **[the analysts] think** fair value is the *only answer*" (A5, emphasis in original).

[69] Common South African phrase meaning that someone has misunderstood or interpreted something.
[70] Chartered Financial Analyst.

From a chaos perspective, had the IASB not engaged at all, or as frequently, with CFAs, it is possible that accounting may have taken a different trajectory. This is because of chaotic systems' feedback loops which may amplify or dampen disturbances, such as the influence of CFAs and a fair value logic.

The results indicate that the composition of accountants involved in determining the accounting treatment for new transactions and events influences accounting's evolution. Firstly, the historicity and ideas of the accountants who happen to be making the decision about how to account for new transactions and events is important. Accountants with largely the same reference points, such as context and socialisation, tend to reach consensus fairly quickly and guided by their 'gut feel' (A5) that is similar. At a company level, having very similar accountants in the accounting department can lead to a reinforcing feedback loop where the same key characteristics or paradigms are prioritised by all staff leading to little debate and a lower possibility of diverging from existing preferences (P5, P6). For example, a cost-benefit or ease of implementation consideration may be the fundamental issues which sway the development of accounting treatments for new transactions and events one way or the other. Importantly, reduced debate and challenge among accountants can lead them to become complacent and fail to consider adequately all relevant possibilities and whether the resultant information will meet users' information needs. While the implications of this may be small in the short term, over extended periods the cumulative implications can be significant.

In contrast, where accountants with different reference points or greater expertise engage to determine the appropriate accounting treatment for new transactions and events, there is more robust and challenging debate (see also Fogarty, 1992; Durocher and Gendron, 2014; Maroun and van Zijl, 2022). The debate usually encompasses both theoretical and practical considerations and will draw on previous discussions and conclusions reached by that department to ensure some level of internal consistency. In these cases, it is more likely that external sources will be consulted contributing further to robust discussions. As accounting requires a consensus be reached, there may be one of two different outcomes. Firstly, the accountants may comprise and include a mixture of different people's proposals to get consensus on the way forward – a compromise (see, for example, Walker, 1978). Secondly, one accountant may be convincing enough to get the other accountants to agree to the former's view in its entirety (R2; R4).

Compromises can have complex implications for the future trajectory of accounting. As accountants face new transactions and events going forward, they will consider previous decisions to try and inform new accounting treatments (see Section 5.1.1). Where those were

compromises, the *principles* or *rules* settled on may be opaque, making analogising to them, or ensuring internal consistency, more difficult and prone to misinterpretation. A figurative fork can be created or, using chaos theory's terminology, the system may bifurcate creating an important point of divergence. The IFRIC's SIC 12 may be one example. The interpretation of, then, consolidation's scope requirements created what preparers later interpreted to be the introduction of an alternative (see Section 2.3)

A further complication arises where for different transactions and events, different degrees of comprise ensure (option one) as well as which accountant's view is selected (option two). The subtle compounding of these variations over time can significantly influence the trajectory of accounting (A2, A5-7; P4-6; R2-5; T4-7; U2), leading to potentially diverse accounting paths. Moreover, as new accountants join and leave the profession, they may place a different emphasis on different aspects, further complicating accounting's evolution.

The preceding discussion has reflected how accounting is sensitive about who is involved in its development. It follows that had different people been a part of the IASB, IFRS would have followed a different trajectory. Respondents, interestingly, disagreed. While localised accounting discussions can lead to divergent approaches to accounting, interviewees felt that the IASB's due processes act as a dampening system to re-align divergent accounting proposals (A2, A5-7; P4-6; R2-5; T4-7; U2). Respondents supported their position using three main reasons.

Firstly, which other accountants are employed at a company, or are on an audit team, is based on chance. The result is that accountants may engage with other accountants of varying levels of competence and diversity when interpreting and developing accounting treatments at the *local* level. In contrast, the process to become an IASB member is rigorous where "technical competency …, the spread of backgrounds… [and] **history**" are key to being appointed to the IASB (R2, emphasis added). The IASB's composition rules ensure a sufficiently competent and diverse spread of accountants with experience in many key roles (for example, academic, auditor, preparer and regulator) and from a variety of jurisdictions. When coupled with the IASB's outreach programs which are designed to ensure extensive consultation with a wide range of stakeholders (IFRS Foundation, 2016), the risk of board composition affecting accounting's trajectory is greatly minimised (but not eliminated). The IASB's DP and ED processes further mitigate the risk of board composition significantly affecting the accounting's trajectory (R2). In short, divergent accounting treatments at local levels will eventually be referred to the IASB to standardise the interpretation of existing accounting standards, development new standards and how accountants have developed accounting treatments at

the local level in the absence of existing standards. In doing so, the divergence among companies is stunted and adopting companies must comply with issued IFRS standards. The IASB's annual improvements are also important in this regard.

Secondly, the smaller and more isolated an entity or its accounting function is, the greater the likelihood of accountants developing divergent local applications of accounting standards. These organisations are less likely to have in-house IFRS expert departments. As new transactions arise, or standards are updated, the respective accountant must read and interpret the standards in isolation or with non-IFRS expert colleagues to work through their interpretation with. In addition, the reduced public scrutiny may lead to less effort to discuss the accounting with external IFRS experts to ensure the interpretation and application is correct (A1; A5-6; P1-6; R2; R4; T3-5; T7; U3).

Thirdly, accountants at large corporations who have (a) in-house IFRS experts and (b) large public scrutiny are more likely to discuss new transactions and standards in great detail amongst themselves and with their auditors. They include their auditors in the accounting application process to ensure that both the preparer and auditor are comfortable with the interpretation and that the auditors will sign off the financials at year-end:

> "If the accounts need to be audited by auditors, they'll go to the audit firm and say, 'look, this is what we're thinking of doing, this is new, I can't see any existing accounting pattern that covers this; what do you reckon?' That kind of conversation" (T2).

These accountants are involved in the IASB's standard setting process via meetings, IFRS conferences and the submission of queries and comments to Eds. Consequently, their experiences and issues are discussed at IASB meetings and considered in their standard setting processes (see, for example, Bamber and McMeeking, 2016; De Freitas et al., 2023).

Regardless of the IASB's efforts to update and issue new standards, divergent accounting cannot be completely eliminated because of the human element of accounting implementation. Further complicating the matter, some interviewees highlighted that, as time passes, many accountants rely on their initial conceptualisations of accounting and find it difficult to be open to changing accounting prescriptions and standards (A1-2; A4-7; P3-7; R2-5; T1-7; U2). The problem is amplified as accountants age and run the risk of becoming "out-of-date". Their objections to new accounting developments are not conceptual or pragmatic,

but rather emotional and unsubstantiated. In short, they represent a general resistance to want to depart from how they have always done things:

> "Well, I've seen it certainly with my clients and even some of the audit partners in the firm where they definitely are old school and even when new standards come out, you know IFRS 15, IFRS 9, [they say] 'this is not the way we've always done it, this is stupid, this is silly, how can this be the right answer?'" (A4).

Other interviewees emphasised that there is significant conscious and unconscious self-interest to achieve pre-determined accounting outcomes based on the circumstances and context of an entity and the individual accountants impacted by accounting. This may lead accountants to interpret accounting in a manner which best supports their desired outcome. In this context, an accountant's current job and key performance indicators can play an important role in shaping how they interpret and apply accounting standards (A1-2; A4-7; P1-7; R2-5; T1; T3-7; U1-3). In addition to whether the accountant prefers flexible or rigid accounting prescriptions, their job may demand more or less transparency impacting their accounting preferences *at that point in time*. The current environment can also impact accounting preferences. For example, A7, P5, R4 and T7 used fair value to illustrate their point. During good times where fair values are rising, people are more inclined to accept and support fair value accounting. Auditors are less concerned about scrutinising fair value uplifts and most are favourable to entities and their employees. However, when fair values start decreasing, *then* people begin to raise all sorts of objections to fair value accounting.

Some interviewees raised the point that ethics and what is considered ethical is not objective and universally agreed upon. Ethics is paramount in the accountancy profession and, if what is considered ethical is subjective, how accountants interpret and develop accounting treatments are affected. This adds an additional layer of complexity with regard to how accounting develops (A6-7; R5; T3 U2).

> "Different backgrounds tell you what ethics means in different ways and until you can get a consistent understanding of what ethical behaviour is, you will never achieve a consistent level of trust in an economy and trust the underlying principle or an underlying foundation before you can have a strong economy and be able to do business" (A7).

There are also different ethical and corporate cultures which socialise how accountants think about accounting in the context of their jobs. A6 proudly recounted stories where his technical team was not yet comfortable with listed clients' accounting and withstood significant pressure

to sign off on the relevant account treatments prematurely to ensure the client meets analyst presentation dates. Importantly for A6 was that his department knew that he would not sign off until they were comfortable. Consequently, A6, as a technical partner, never had any of his clients' financial statements questioned by the listing authority's monitoring panel[71]. In the year after A6 left the department, it did have some of their clients' financial statements questioned.

The prior research deals extensively with resistance to new accounting prescriptions (see Broadbent et al., 2001; Jermias, 2001; Carlin and Finch, 2010; Tremblay and Gendron, 2011; Maroun and van Zijl, 2016; 2022). The current research adds another dimension to this body of work by describing how accountants' finitude and historicity impact and shape accounting evolution and resistance in chaotic but deterministic ways.

In summary, the interviewees overwhelmingly expressed how complex, interdependent and cumulative the processes of learning, understanding and applying accounting in real-world settings is. Despite formalised training, professional normalising examinations, mandatory work-experience and international standards, accounting is an open dynamic and social construction. Its future state is dependent on its current state but the presence of a dynamic array of feedback loops which involve humans creates a chaotic environment. The need to achieve consensus helps to ensure that accounting does not deteriorate into genuine chaos and crash.

In alignment with chaos theory, accounting's short-term future is deterministic primarily because of the IASB's due process and accountants' need to achieve consensus. Accounting's long-term future is unpredictable because of the compounding impact of dynamic feedback loops and the sheer number of interacting factors. Hopwood (1987, p. 207) foresaw this conclusion when discussing how accounting is being "called upon to serve an ever-greater variety of different and changing purposes". This thesis's findings contribute to Hopwood's (1987, p. 207) call not to focus on delineating "the residues of the accounting past rather than more actively probing into the underlying processes and forces at work". In this light, chaotic systems have strange attractors that "pull" the system towards themselves. In doing so, the strange attractors can create a sense or order within the disorder. Strange attractors in the context of accounting evolution are discussed next.

[71] The Johannesburg Stock Exchange (JSE) has a proactive monitoring unit to review listed companies' financial statements for compliance with laws and IFRS. If they feel there may be non-compliance, they can refer the matter to the Financial Reporting Investigation Panel, consisting of independent experts, to review the matter and provide the JSE with a recommendation on whether there is, or is not, non-compliance.

5.1.3: Strange attractors

All expert IFRS respondents frequently referred, inter alia, to the concepts of consolidated financial statements, control and fair value as being central to group accounting. These concepts may be key strange attractors which act subtly on the minds of accountants to pull their perceptions of accounting prescriptions towards specific types of accounting treatments. The prior literature states that ownership was one of the first concepts used for consolidation accounting. That is consistent with the idea of control although the first consolidation accountants did not need such a nuanced understanding of *control* as we do today because most investments led to clear control or were clearly minimal (see Section 2.2).

Control was used to develop the scope of consolidations as new types of inter-corporate structures emerge (see Section 2.3). Fair value is the current "default" measurement method. As key strange attractors, this means that, unless there is a good reason to deviate, accountants are drawn to the ideas of using control to determine which investees to consolidate and to measure assets and liabilities at fair value under a business acquisition.

To support this, interviewees were asked to provide alternate ways to account for groups of companies. Most interviewees intuitively laughed and said that there are not any other ways. However, when pressed and given some time, they could come up with alternatives. These included providing the separate financial statements of all group companies, providing modified separate financial statements which eliminate the impact of inter-company transactions, proportional consolidation and equity accounting. Some discussed how, similar to Section 2.2.3's discussion about the scope of consolidation, there are other techniques which make sense and provide useful information. Some respondents also highlighted that, in certain cases, providing the separate financial statements of group companies may provide more transparency than present consolidated financial statements where the extent of aggregation provides opportunities for preparers to hide issues whilst maintaining compliance with IFRS (A1-2; A3-A5; P1-7; R4-6; T3-7; U2-3). In doing so, respondents lend weight to the idea that preparing consolidated financial statements, control and fair value are strong strange attractors pulling accountants towards them. There are alternatives which have advantages, but they still instinctively and subtly pull towards consolidated financials with control and fair value are key concepts.

Unexpectedly, analysing the transcripts revealed that there may be different levels of strange attractors which coexist to affect how accounting is understood and implemented. Jurisdiction, organisational/industrial norms and personality traits were raised as examples of levels where

codified and uncodified “conventions” (A1) impact how accountants think about and apply accounting (A1-A7; P1-6; R2-R6; T1-T7; U2-3).

Starting with personality, A4 discussed that “personalities will always” play a role in how accountants think and implement accounting. A4 felt that

> “you just don’t know what someone else is going to think … this is where the personality thing comes in. So, with some people, yes, the stronger the personality, I find the less they need to rely on specific support” (A4).

A4, an experienced IFRS technical partner at a Big 4 firm, felt that accountants with “stronger” personalities were inclined to rely on their reputations and assertiveness to convince colleagues that their interpretations or new accounting treatment for a new transaction or event was appropriate and should be adopted. Accountants with less assertiveness often required detailed analyses and worked-examples before they felt comfortable proposing an interpretation or new accounting treatment. These accountants used these tools to convince colleagues for them.

A7 highlighted how those personalities which like to “self-research” will expose themselves to many different types of transactions to learn how to deal with them. This contrasts with those personalities content with only knowing the tutorial and past test examples from school to compliment what they have seen first-hand to draw on. The latter accountants may use what they can remember from their accounting education as a set of strange attractors to which they are drawn. This impacts the way in which they interpret new accounting standards. It may pull them towards interpreting new standards in a way which allows them to reflect superficial compliance while substantively following the same accounting strange attractors as they always have followed.

An accountant’s ethics will also play an important higher-order role as:

> “not everybody thinks that it’s an ethical issue not to deliver your best product when you’ve done the job or has made that link necessary. So, there are people that are just checking boxes and trying to pump out nonsense or not applying their minds and there are others which are really interested in behaving ethically. … as far as accounting standards are concerned, I think the whole point about interpreting standards for your advantage is an unethical behaviour but if you go [into the profession] as a junior, you’d think that’s the way business is done.

> You'd interpret standards to your advantage. Whether or not that tells the truth or not is irrelevant, the truth that you want told is what's relevant and it's what you focus on" (A7).

Different jurisdictions have peculiarities which impact how they think about accounting. For instance, R2 noted that

> "virtually every jurisdiction we went to had a different angle on [incurred but not reported insurance claims in IAS 39]. It resulted in some diversity in practice. So, the UK was much more aggressive in the way they did it, so far smaller number than anybody else. The US was much more conservative, a much bigger number than everybody else but within the jurisdiction it was amazing how greatly correlated it was" (R2).

R2 also noted that South Africa has been applying IFRS for SMEs for many years. Consequently,

> "you automatically think about the parallels between the two sets of standards. If you're from Europe, where they've never used IFRS for SMEs, it doesn't denture your thinking at all. … Emerging economics very often have a slightly different view and, again, that tends to *be about a resource* [constraint]. So, in insurance, the availability of actuaries in emerging economies is a lot less. So, you start focusing, you start *trying to pull back on anything that you think might be too actuarial* intensive. That's not just insurance because that comes into, for example, the IFRS line impairment test. There's an actuarial aspect to it. So, you start thinking about *building in simplifications*" (R2, emphasis added).

The extent to which regulations are enforced also plays a role in shaping how accountants practice accounting. Those operating in countries with poor enforcement may gain a habit of applying the principles and rules very loosely while other countries' accountants are accustomed to applying them strictly (T3):

> "You have subsidiaries let's say in Sweden where people are really responsible… subsidiaries in Greece where you can get away with murder…" (T3).

> "Australia as an example of more progressive financial reporting which probably comes with regulator-driven in a particular point in time… they were comfortable

enough to put fairly hard to measure intangible assets on the balance sheet way before other jurisdictions" (R3).

The laws of each jurisdiction also impact accountants' daily application of accounting:

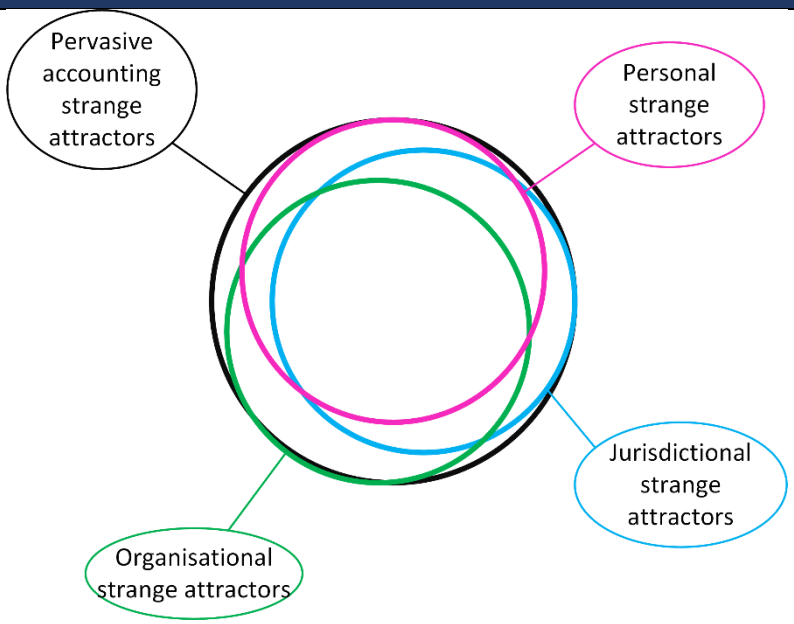
> "For example, in Hong Kong you might not be able to own a flat, a residential flat because the land belongs to the government and they lease whereas here it's different" (A3).
>
> "I think you get it more in legal differences across legal jurisdictions. You have some legal jurisdictions who are more inclined to put everything in the same company particularly if you start getting to things like group taxation areas … and are you in a jurisdiction that prepares stand-alone individual company accounts and under what framework" (A5).

Another factor is how developed a jurisdiction's securities market is. T5 recounted how

> "the ways in which financial reporting have developed in different contexts is very much nationally specific and we can see how countries that have a very well-developed stock markets at an early stage tend to focus much more on provision of information for owners of the business, shareholders and the information that's going to be more useful in capital market-type decisions. Whereas other countries where, perhaps, the main initial driving force behind corporate financial reporting was creditor protection or assessing tax liabilities and to provide information that is much more a matter of written rules" (T5).

The key message is that differences in jurisdictional and organisational/industrial culture impact accountants at a macro level. These can be considered distinct types of strange attractors which pull accountants towards specific types of accounting treatments, routines and disclosures. The interplay between the various different types of strange attractors is visualised in Figure 8. The overlap of all circles marks where the accountant is likely to ultimately be attracted to.

Figure 8: Venn diagram presenting different types of strange attractors



(Self-constructed)

The assertion that there are multiple, and sometimes competing, strange attractors acting on each accountant and impacting how they apply accounting is supported by management accounting literature on the interaction between multiple institutional logics. This literature states that there may be multiple coexisting institutional logics and discusses how people resolve these conflicts (see Besharov and Smith, 2014). The current thesis adds to the depth and richness of this body of knowledge by suggesting new logics which may be important in the accounting context (for example, personality traits and pervasive accounting logics). The prior literature may also benefit from considering the idea of feedback loops and how they impact the short- and long-term trajectory of dynamic systems under an institutional logics framing.

In Figure 8, examples of pervasive accounting strange attractors may include the stewardship or neoliberal objectives of accounting (see Section 2.1), the accrual basis of accounting and the time-value-of-money concepts. Examples of organisational strange attractors may be whether the priority is interpreting IFRS to present the most favourable image of the company or focusing on providing a faithful representation of its economic phenomena to users. Jurisdictional strange attractors may include those cultural characteristics often associated with specific countries. For instance, the UK is generally regarded as prioritising principles whereas the US is often associated with a more legalistic approach to many disciplines like law and accounting (see Schipper, 2003). Finally, personality strange attractors may be those traits discussed in Section 5.1.2. For example, accountants who rote learnt accounting may

generally approach accounting in a different way from those who focused on acquiring an understanding of how and why various accounting principles and rules provide useful information.

Figure 8 helps to understand why two competent accountants may come to different conclusions about how to account for a new type of transaction or event, ignoring nefarious reasons. The pervasive accounting, personal, organisation and / or jurisdictional circles of the two accountants may differ. The result is a different overlap with a consequential difference in the relative strength of different strange attractors which attracts the respective accountant towards certain types of accounting recognition, measurement and disclosure treatments. More research identifying, categorising and determining the categories of strange attractors and their hierarchy, if any, is required and is identified as an area for future research.

5.1.4: Implications of accounting as a chaotic system

Concluding that accounting's development can be viewed through the lens of chaos theory, a number of important implications can be drawn. Firstly, accounting can reach states of temporary equilibrium where it will resist changes in response to various disturbances. In response to a disturbance, the system's *status quos* may experience temporary fluctuations but settle into its original equilibrium (Figure 9, section 2). The system may settle into a new, but slightly modified equilibrium position or its structure may change entirely. The different options are represented by section 3 of Figure 9.

Figure 9: Accounting's evolution under Chaos theory

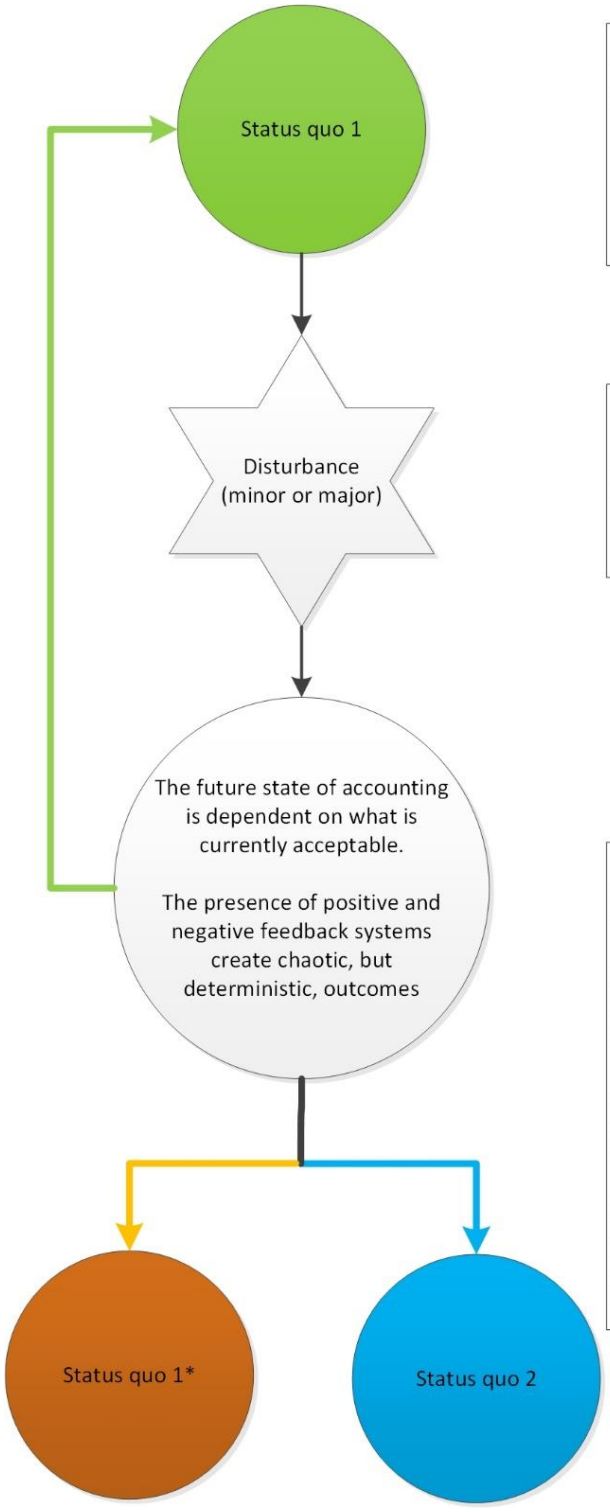


Diagram Section 1
This is the currently accepted accounting practice for a specific transaction or balance. It will not change unless disturbed.

Diagram Section 2

A new transaction, event or change in society or technology disturbs the status quo.

Diagram Section 3
One of three outcomes may arise following a disturbance to the status quo.

Green route: The disturbance may be small, or large but rendered small due to negative feedback loops. The Status Quo 1 remains.

Orange route: The disturbance is sufficient to result in a slight modification to the existing Status Quo1 and is represented by Status Quo 1*.

Blue route: A small disturbance is amplified by positive reinforcing feedback loops, or is a large disturbance, and results in significant changes to the status quo and is represented by Status Quo 2.

(Self-constructed)

Understanding the parameters of the present status quo can help accountants understand the immediate trajectory of accounting. In addition, it may help us understand what response to

different disturbances are likely (short-term prediction). This is illustrated using the case of consolidation accounting.

Consolidation accounting developments in the UK are used to provide a basic illustration of the application of Figure 9. For pragmatic reasons, the analysis begins with the classification and initial and subsequent measurement of assets as the relevant starting Status Quo 1[72]. As discussed in Section 2.2, assets were initially not categorised into current and non-current assets. The first disturbance arose because of several court cases dealing with the calculation of distributable dividends and whether depreciation should reduce the amount available as a distribution. Dicksee developed a book in 1892 to suggest formally a distinction between current (floating) and non-current (permanent) assets, and prescribed different measurement rules for each type (Walker, 2006). This disturbance appears to have followed the orange route (see Figure 10).

An entirely new accounting system was not invented but assets were merely categorised into two different types of assets. Different, but existing, measurement techniques were applied to each category of asset. This does not represent a significant change to the Status Quo 1, but a modification of existing techniques and principles. By using existing techniques and principles, this type of change is readily acceptable and implementable by existing accountants and became the *generally accepted accounting practice*. The resultant accounting system can be categorised as a *simple reproduction* system (Section 3.1.2) which resists change and strives to settle back into its original equilibrium state.

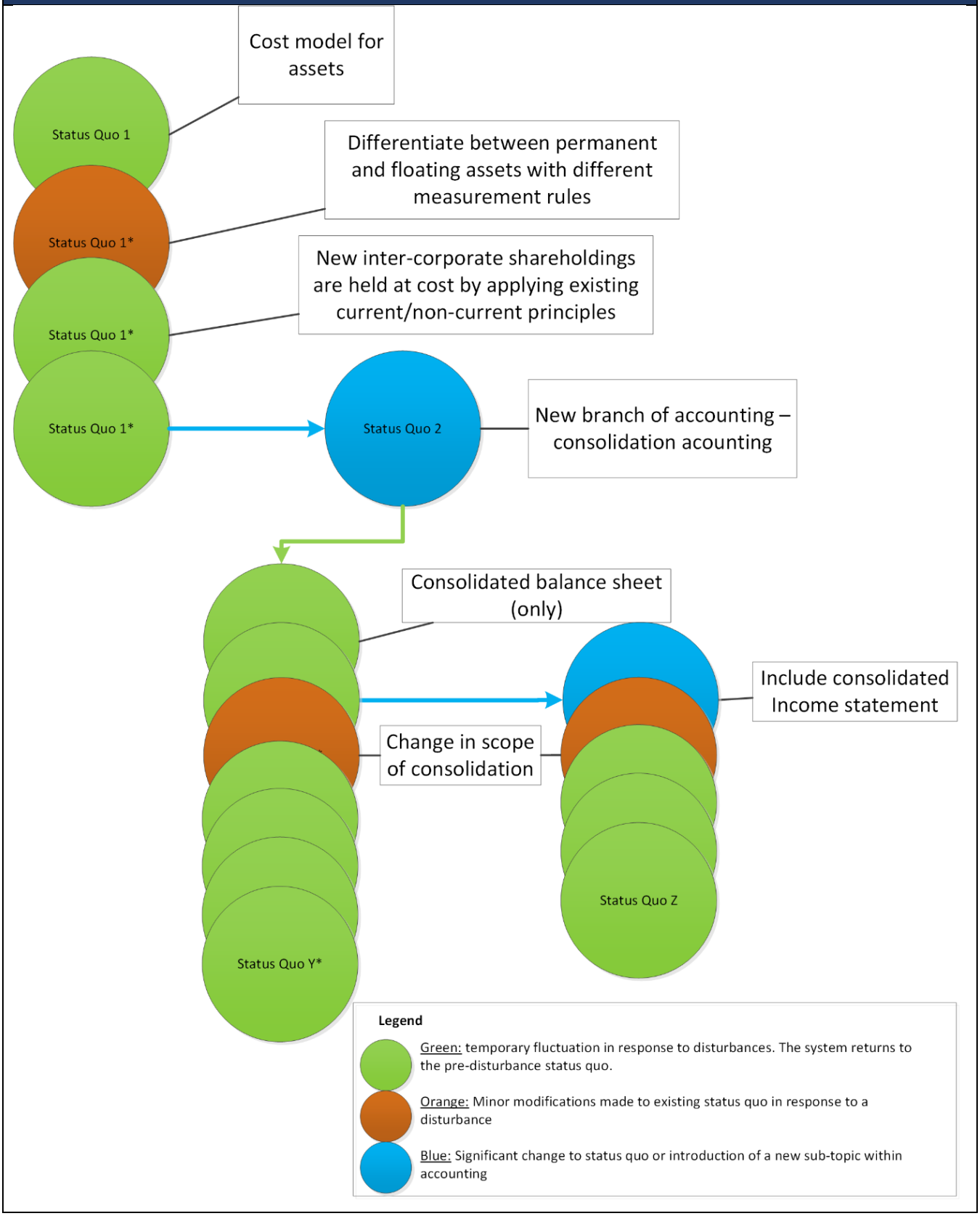
The next relevant disturbance was the introduction of a new type of transaction being inter-corporate shareholdings. This disturbance arose because on the one hand this type of investment is economically similarly to many other non-current assets. On the other hand, it may lead to the control of another company, representing an economically different and distinct type of asset compared to typical non-current assets at the time. At firstly, the disturbance followed the *green route* illustrated in Figure 10. The normal rules were applied to inter-corporate investments regardless of whether the investment conferred control over the investee or not. These investments followed the existing non-current asset measurement norms and were held at cost. In terms of chaotic system classifications, the system can be viewed as a simple reproduction system. No changes result from the disturbance despite the

[72] Use of “1” in Status Quo 1 is not implying this is the first iteration of accounting change but is used merely for convenience’s sake in this thesis.

disturbance representing a significantly different type of asset from the normal assets held at the time.

The introduction of the 1907 Companies' Act disturbed the system again. This time, the disturbance led to a change in how business people structured their operations. Many businesses used group structures to resist the impact of the new legislation. This was primarily because of the focus of UK accountants to preserve company privacy and, so, they restructured public companies into public holding companies with private subsidiaries which carried out the operations of the group. Again, the *green route* was followed and subsidiaries continued to be carried at cost with dividends recognised as income as declared (Section 2.2.1). There were temporary fluctuations as accountants considered various other accounting treatments but the generally accepted accounting practice remained.

Figure 10: Development of consolidation accounting as a different sub-topic



(Self-constructed)

Because of the significant increase in the use of group structures, the shortcomings of using the cost model to account for subsidiaries were highlighted. Loss-making subsidiaries were not impaired in the holding company's books, resulting in inflated investment figures. Moreover, if subsidiaries had sufficient distributable reserves to declare dividends, the income recognised in the holding company's books presented the misleading impression that subsidiaries were profitable (Section 2.2.1). The resultant financial statements were deceptive with investors and creditors believing that the group was profitable and in a good position financial position when that was not necessarily the case.

Eventually groups with loss-making subsidiaries could no longer keep up their profitable appearance and this led to losses. These investor and creditor losses caused a disturbance such that the *blue route* (Figure 10) was followed in response. Existing accounting prescriptions were not merely modified to, for example, disclose loss-making subsidiaries or to require the submission of the subsidiaries' separate financial statements. Accountants began to prepare something quite new, they began to prepare consolidated balance sheets. This represented an entirely new type of accounting treatment and became the new status quo for inter-corporate shareholding accounting (Status Quo 2, Figure 10). This new accounting treatment would be the start of an entirely new "branch" of accounting with its own sub-topics.

As group structures gained popularity, business people began to experiment with varying ownership levels and structured arrangements. These structures were aimed at, for instance, optimising the tax, risk and management of large groups of companies (all respondents) and are examples of further disturbances. Interviewees discussed how consolidation accounting created opportunities for entirely new ways to engage in creative accounting and create favourable, but misleading, consolidated financial statements. For instance, inter-company sales could be used to fictitiously, but legally, inflate group figures by reporting larger sales figures. While these transactions had no commercial substance, they made groups appear as though their sales volumes were significantly higher than the reality. Other transactions were also used to distort the financial position and performance of groups of companies with no substance. As these arose, they also led to disturbances as people realised the implications of the accounting for these transactions.

Many of these disturbances followed the *orange route* in that they resulted in modifications to the existing consolidation accounting techniques without creating an entirely new type of accounting or stopping consolidated financial statements altogether. For instance, inter-

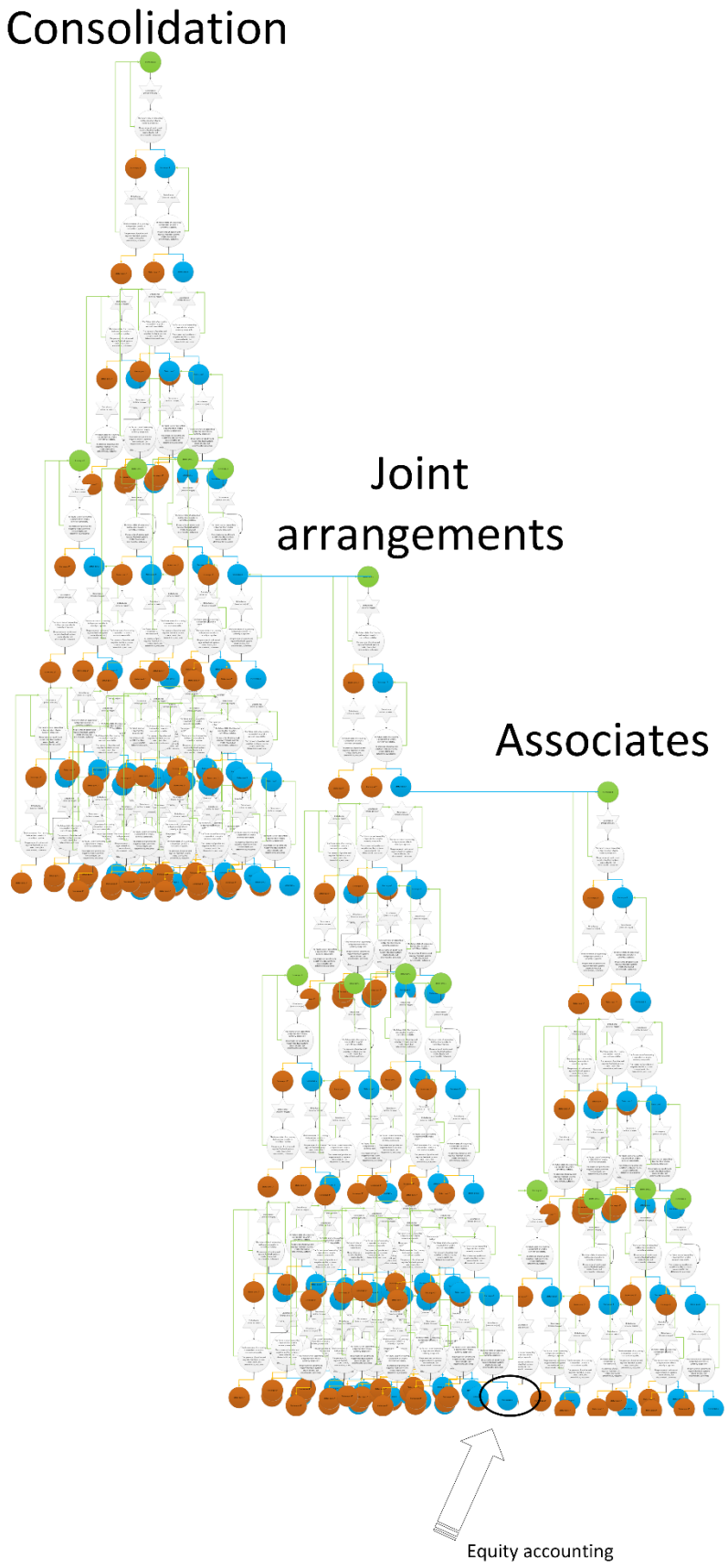
company sales of inventory needed to be reversed. Later, all “unearned” profits on inter-company transactions were required to be reversed (see Section 2.3).

Some extremely important and notable modifications were to the scope of consolidations (see Section 2.2.3). As Bryer (2000a) notes, the accounting began to impact how accountants operated. Business people saw that different levels of control and ownership can be used to achieve different degrees of risk exposure and co-operation. For example, subsidiaries sit on one end of the control spectrum with absolute control while passive investments sit on the other end of the spectrum. In between these two extremes is, what today is known as, joint arrangements and associates (see Section 2.3). These new sub-topics developed in a similar fashion to consolidation accounting. They began as simple modifications of existing treatments and became more complex with their own “branches” as accounting both affected history and is affected by it (see Figure 11).

The similarity in how different sub-topics have developed, such as consolidation, associates and joint arrangements, highlights the fractal property of chaos theory. Figure 11[73] presents a simplified illustration of the evolution and differentiation of different types of control structures, namely: consolidation (full control), joint arrangements (joint control) and associates (significant influence). Note that associates and joint arrangements developed as off-shoots from consolidation accounting and not in isolation or independent from consolidation accounting. In addition, the accounting for various levels of control over investees reflects how accountants look at borrow existing accounting treatments to deal with new types of transactions. The accounting treatments fluctuate as accountants learn what the consequences of their accounting treatments are and modify them in response. To illustrate, at one point joint arrangements were proportionally consolidated to reflect that the investor did not control the investee but had joint control. This accounting method was endorsed until as late as 2013. After 2013, the equity method was mandated to account for both joint ventures and associates (see Section 2.3 & Figure 11). The divergence and then convergence is reflected in Figure 11 below and highlighted with an arrow.

[73] Note: Figure 11 is meant to illustrate the pattern of how accounting evolution. The text within is not meant to be legible.

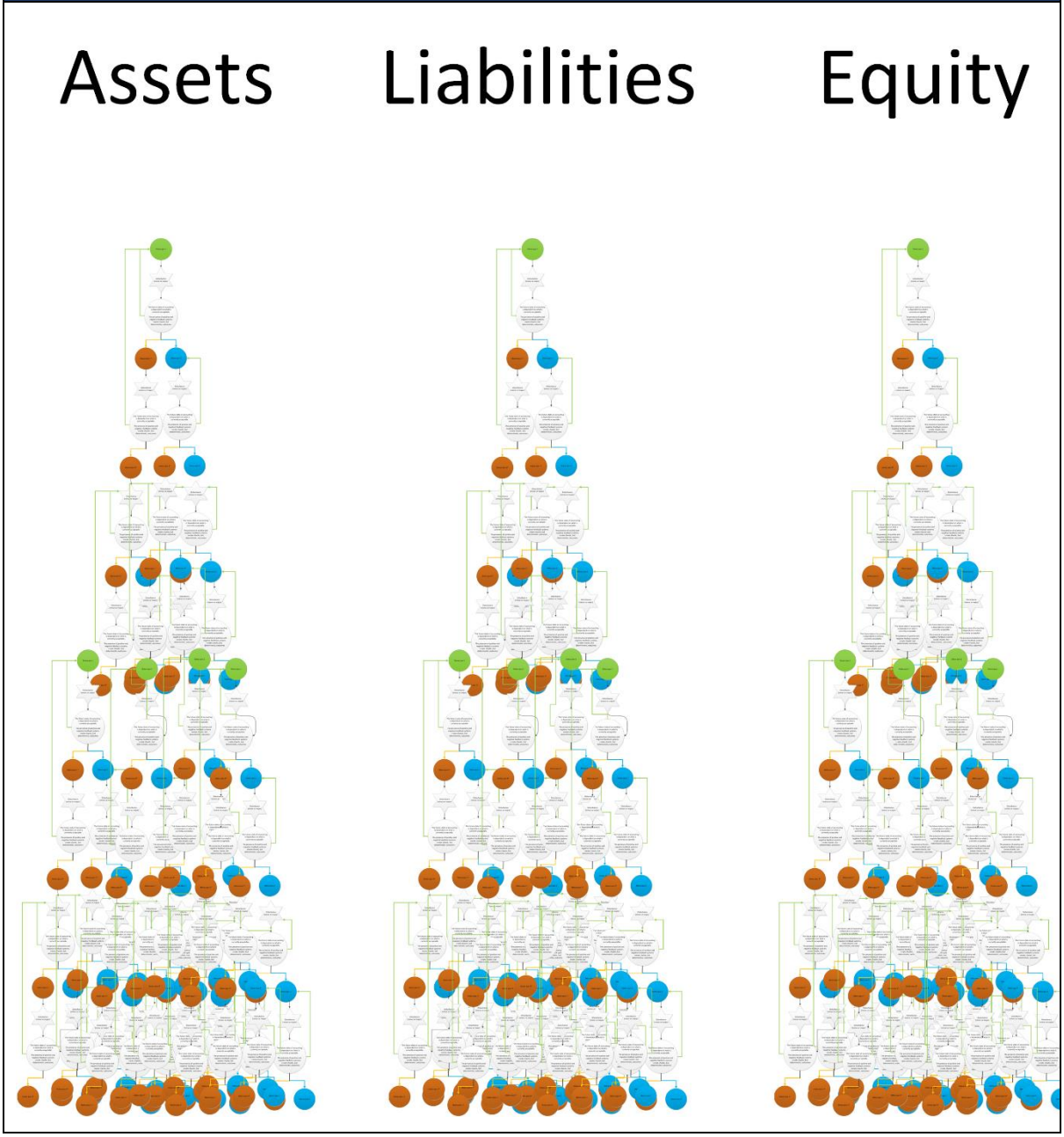
Figure 11: Fractals in varying levels of control transactions



(Self-constructed)

The fractal quality of accounting can be see and is presented in Figure 12. It reflects how assets, liabilities and equity each evolved according to *similar patterns* at different levels of scale. Assets, liabilities and equities become more complex and more diverse classes are created as accounting, society and business co-evolved. Put differently, Figure 10 can be seen as a zoomed in snapshot (fractal) of a type of asset shown in Figure 12[74].

Figure 12: Representation of evolution of the elements of accounting



(Self-constructed)

[74] Similar to Figure 11, Figure 12 is provided to illustrate the pattern. The text within is not meant to be legible.

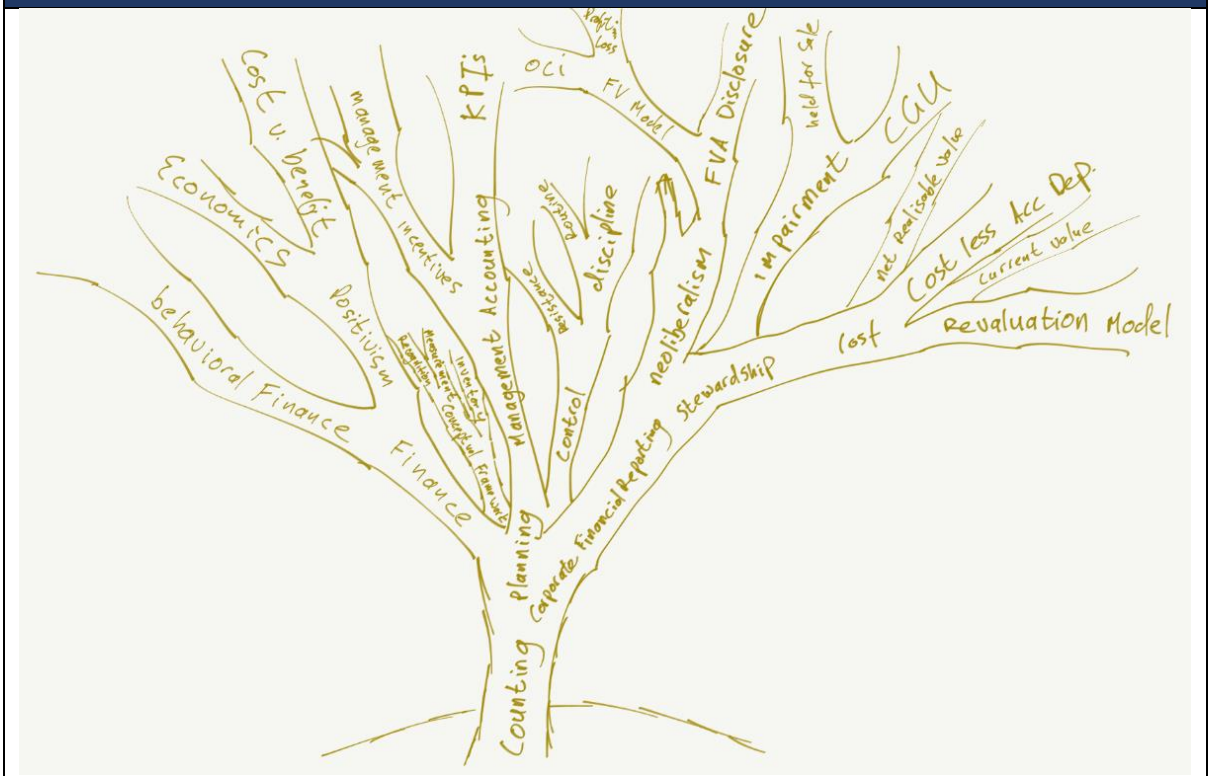
The implication of accounting's fractal property is that researchers can focus on specific aspects of the evolution of a topic and may be able to make valid generalisations about the accounting evolution of other topics and at other levels. Because access to all aspects of the accounting evolution process may be impractical, the fractal characteristic of accounting is an important assertion that future research projects can use to justify analysing one aspect and making suggestions about other aspects.

Another implication of accounting's fractal property is that accounting evolution can be visualised as resembling the development of a tree (see Manson, 2001). The initial trunk develops. Branching from it are sub-branches (sub-topics) with their own sub-structures. The development of all branches is impacted by the overall health of the tree, which is also a function of the number and quality of branches (feedback loops). Disturbances affect tree branch development in deterministic but chaotic ways. For instance, if an object blocks light from reaching one branch, it may wither and eventually die. Alternately, it may initially wither until the obstruction is removed and then flourish but following a different trajectory. Importantly, this other trajectory can impact other branches of the same tree. Some branches may become the dominant branches with their own sub-branches absorbing more nutrients to the detriment of other branches and their sub-branches. A crise, such as a fire, may allow for new growth where previously there was insufficient light and nutrients to sustain strong development or the fire may destroy branches which were previously the dominant branches. The concept path-dependence in chaotic systems can help academics improve thier understanding of dominant "branches" according to the path our lived history has actually followed. Doing so removes the temptation to assume blindly that all current accounting prescriptions "obliviously" represent the most "appropriate" means to recognise and measure different assets, liabilities and other transactions (see Deegan, 2014).

Figure 13 presents an illustration of accounting's early agricultural beginnings with basic counting as the main trunk. As society evolved and became more complex, so, too, did the accounting tree. Offshoots, such as finance and management accounting, developed as disciplines in their own right with their own sub-branch structures. Similarly, environmental factors affected the tree's development. For instance, the emergence of the neoliberal political agenda and the influence of neoclassical finance and economic theory on accounting disturbed the tree and affected its branch structure and growth. Consequently, a new main branch of the accounting tree developed and influenced the development of other branches via shadows and starving them of essential nutrients. The emergence of group structures resulted in the development of a consolidation accounting sub-branch with associates and

joint arrangements as further sub-branches all of which affect one another in deterministic but chaotic ways.

Figure 13: Illustrating accounting's development as a tree



(Own illustration)

While chaos theory is a useful lens through which to view consolidation accounting's evolution, it does not sufficiently explain the micro-level mechanisms by which the high-level functioning of the accounting evolution discussed so far develops. For instance, this section presented how accounting's future state is dependent on its current state, but it does not explain why this is the case and that a fresh start to each new topic cannot arise. In addition, it provides only a high-level discussion about why current accounting techniques should not be assumed to be the "best" of "correct" accounting treatments. In this light, consolidation accounting's evolution under an evolutionary game theory lens using memetic evolution is discussed in Section 5.2.

5.2: Accounting's evolution by natural selection

Early forms of accounting and record keeping were not complex. On the contrary, the seminal works by Brown (1905); Hopwood (1987); Mattessich (1987; 1998); Bryer (2000a; 2000b); Maltby (2000); Basu and Waymire (2006); Walker (2006); Waymire and Basu (2008); Basu et al. (2009); Deegan (2014) and Lee and Parker (2014) point to the humble beginnings of

accounting and its evolution towards an increasingly complex and sophisticated discipline. Before modern written and numerical systems existed, tokens and pictographs were used to keep track of assets and how they were rationed (Mattessich, 1987; Englund, 2001).

Accounting began as an inventorying tool and a basic system to track stores of wealth and the movements of goods such as wheat, wool and oil (Mattessich, 1987; Englund, 2001; Soll, 2015). The accounting "craft" was not used to inform capital markets but served far simpler needs. It served to keep track of important assets and, later, record economic transactions between parties. The detail could be used to determine how much foodstuffs were held, rationed and required to last the family unit or village through winter or lean times. Accounting has even been utilised by the military and impacted the success of wars within and between countries (Cooper, 1945; Cobbin and Burrows, 2018).

Accounting became important to facilitate trade as it was an "immutable" historical record which enabled accountability between agent and merchant (Brown, 1905; Basu and Waymire, 2006; Ravenscroft and Williams, 2009). People cannot keep track of and recall the details of every transaction with complete accuracy. This introduces the possibility that parties mistakenly remember past transactions or the details of trades leading to conflicts and mistrust. These lapses in parties' memory of past transactions and the risk of fraudulent attempts to misrepresent past dealings can lead to a breakdown of confidence and mutually necessary or beneficial trade. Consequently, a neutral record of facts was required to facilitate continued economic exchange and substitute for the absence of complete trust between the respective parties (Basu and Waymire, 2006).

Archaeological records provide evidence of different accounting and recording techniques being invented and applied by dispersed groups of people working independently at different points in history (Brown, 1905; Mattessich, 1987; 1998; Englund, 2001; Walker, 2006; Soll, 2015). A review of this history is beyond the scope of this thesis which uses the simple practice of recording quantities of goods as a general starting point (Brown, 1905; Soll, 2015). For example, Ravenscroft and Williams (2009) discuss how early civil administration required records to facilitate accountability and impacted accounting's development. Macve (2015) provides a comparable history drawing on ancient China and Mesopotamia. These early counting systems are the building blocks for modern accounting which now, for instance, range from using simplistic measurement methods like cost to sophisticated techniques such as marked-to-model fair values (Haswell, 2006; Haswell and Evans, 2018).

The lineage from counting heads of cattle to the allocation of costs to cost objects and the fair valuing of financial instruments is long and complex. Changes are often attributable to exogenous shocks such as the initiation of the capitalist mentality (Bryer, 2000a), the influence of finance-centric accounting research (Ravenscroft and Williams, 2009), political lobbying (Zeff, 2002) and ideologies and financial crises (Zhang and Andrew, 2014). Some researchers have pointed to the potential for endogenous change. For example, Hopwood (1987) demonstrates how accounting has frequently become what it was not meant to be in response to environmental as well as entity-specific factors. What is unclear is exactly how endogenous and exogenous changes are enabled because the mechanisms by which the accounting building blocks, or memes, are changing is not fully addressed.

Detailed interviews with financial accounting experts and users reveal a process akin to biological evolution of organisms. Accounting memes are shaped by the concurrent processes of inheritance, two-step accumulation and evolutionary selection in an open and dynamic AEG. While these processes are highly interdependent and interrelated, each is presented separately to provide an understanding of the AEG.

5.2.1: Principle of inheritance

Through observation, imitation and, later, the reduction of techniques in writing (Brown, 1905; Blackmore, 2001), accounting memes are transferred to, or inherited by, new host accountants in a process akin to the inheritance of genes by offspring (all respondents). In other words, the methods, principles and techniques which are now generally accepted features of contemporary accounting are transmitted, formally and informally, from one generation of accountants to the next. Examples of inheritance processes provided by interviewees include institutionalised training at universities; observing and replicating the actions of experienced accountants; reviewing financial records and statements of companies; and adhering to generally accepted rules, conventions and codes of best practice. These activities give rise to a set of knowledge templates or interpretive schematics which reflect inherited ontological assumptions and formalise technical practices, accounting principles and day-to-day workflows (see Durocher and Gendron, 2014; Roussy and Brivot, 2016; Baudot, 2018).

Inheritance processes are fallible and can lead to variations or mutation. Many different factors affect the probability of inheritance processes being accurate or inaccurate. In addition, while each instance of inheritance provides an opportunity for variations to arise, not every occurrence results in variations sufficiently important (material) to represent a new meme. Similarly, as the accounting memes are applied and passed on to the next generation of

accountants, they can be inherited in largely unaltered forms. For example, depreciation has changed little since its original conceptualisation centuries ago (Kuter et al., 2018). The idea (meme) of allocating the cost of "permanent" assets as period costs as the asset is used remains intact, albeit that more memes dealing with the techniques to allocated that cost have arisen over time (T7).

There is evidence of this in the early accounting research examining how accounting, as a type of routine, remains stable as it is enacted and re-enacted by human agents. However, different contexts, facts and circumstances can lead to what organisational theorists refer to as performative variability (Feldman and Pentland, 2003). Not every application leads to a significant change in how the routine is understood and operationalised but the routine is not completely stable. To illustrate, organisations apply the requirement to prospectively account for a change in the estimated useful life of an asset either from the beginning of the financial year in which the change is identified while others will choose prospective application starting from the end of the financial year (T7). The fundamentals of depreciation are unaltered and both methods are consistent with how IFRS is applied in real-world settings but they result in slightly different expenses being reported.

Other changes are more significant. The memes can lead to a reflexive reconstitution of the routine akin to a recombination of existing genes inherited by offspring which are different from their parents but are clearly related to their parents (Dawkins, 2016):

> "Simple methods of depreciation – like the straight-line method – is the starting point. But as we start applying depreciation in different settings, we realise that the straight-line method has limitations. It assumes that the asset is used equally in each year when in fact that may not be the case. So, we start experimenting with different methods of depreciation. *The principle remains the same: we are systematically allocating the economic benefit over its useful life and consumption, but the method by which we do that is different.* We can use the reducing balance method or sum-of-units method. In fact, so many new methods emerged that the IASB modified the accounting standards to tell you that some methods of depreciation are not permitted. You cannot, for example, link depreciation to the number of units sold" (T7, emphasis added).

To better understand the degrees of change which are possible, it is necessary to consider meme longevity, fecundity and copy-fidelity in more detail.

Longevity

When memes are reduced to writing and the instructions for implementing them can be easily recalled and followed, their longevity increases. This is because the meme is accurately reduced to a permanent and unalterable format which any and all accountants can refer back to. In doing so, any number of accountants can review the meme and inherit it faithfully (Blackmore, 2001). Put differently,

> "there's a lot of different ways in which that information is transferred from one generation to the next but the thing is that it is *documented and accessible*" (R3, emphasis added).

Where memes require oral expression, access to the meme is limited the risk of mutation increases as new hosts are further removed from the original host. Reducing memes to writing also enhances the number of potential hosts which can be exposed to the meme and potentially inherit it. As people develop new communication technologies, which further support the longevity of memes as they can be made available to people in far-reaching places simultaneously and at low cost:

> "the important thing is that it's codified in the standards themselves so by codifying it we have, I mean this is essentially the thing that separates humans from other animals is we were able to document and therefore pass from one generation to another generation. … the fact that it's documented opens it up to a number of different channels which can be communicated" (R3).

There is ample evidence of this in the archaeological record (Brown, 1905; Richard, 1995; Basu and Waymire, 2006; Walker, 2006; Waymire and Basu, 2008; Deegan, 2014). Most vital was the transition from oral explanations of accounting memes and recollections of past experiences to the emergence of written memes capable of becoming *generally accepted accounting practices*. For instance, the establishment of accounting journals created a permanent record of "best practice" which can be used by students, practitioners and lawyers to more accurately recall and apply accounting techniques (Walker, 2006). These were not yet the accounting standards which characterise the contemporary professional space but represent the *selection* of what were regarded as the "best"[75] accounting memes at the time and their amalgamation into a set of loosely defined conventions which new and old hosts could refer to and imitate more accurately and completely in practice.

[75] *Best* does not represent the most objectively useful or desirable meme. See *selection* for more details.

The impairment of accounts receivable provides a more recent example of how an accounting meme, because of its longevity, is a long-standing business practice which becomes a generally accepted convention codified in policies and textbooks and then institutionalised by the standard-setters such as the IASB and FASB.

> "Before IFRS 9, there was IAS 39. And before that there was IAS 25[76]. People call this 'Big GAAP' because you have proper standards. And this is the case for IFRS and US GAAP. But these standards are not new ideas. They are building on a long history of commercial experience. In IFRS 9 we have a very complex credit loss model to impair receivables and that builds on what we used to have in IAS 39 which was an incurred loss model. But before then, we just needed to account for the changes in the cash flows we thought we would get from our receivables. The reality is that you would look at your business's book debts and decide what was collectable. And there were rules-of-thumb for doing this that had been shaped by, literally, a hundred years of experience. Because the accountants had been doing this for so long we knew, for example, that if you were in a particular industry anything more than 100 days was probably uncollectable. If it was 60 days overdue, about half was uncollectable and so on. And those rules-of-thumb got written down as accounting policies and then ended up in textbooks. Long before we overcomplicated things with IAS 39 and then IFRS 9 we had 'Little GAAP'" (T7).

Walker (2006) provides a similar illustration citing Dicksee's *Practical manual for auditors* published in 1892. This was the "first major attempt to develop a general framework for asset valuation" and the idea (meme) of differentiating between current and non-current assets recorded in that text survives to this day (Walker, 2006, p. 10, see Section 2.2.1) and has even been extended to cover liabilities.

Meme longevity is further enabled by general technological advances. Accountants do not need to be IFRS specialists with years of formal education and practice experience in order to apply the basic depreciation, impairment and consolidation requirements enshrined in formal standards. A simple internet search (R3) provides examples aimed at the layman, complemented with basic templates to promote the faithful reperformance of what Feldman

[76] Accounting for investments.

and Pentland (2003) call a routine but which, at a more granular level, is a stable memeplex (Basu, 1997; Blackmore, 2001; Basu and Waymire, 2006; Walker, 2006; Finkelstein, 2008).

In more recent times, computer software packages provide another avenue for the layman to produce accounts in conformance with any number of given accounting frameworks with little, if any, training. Technical accountants team up with computer programmers to replicate the relevant memes in machine language, further enabling the memes to impact accountants and non-accountants alike.

Longevity also provides memes with time to become imbedded in many different grand memeplexes. For instance, depreciation and consolidation routines are found in IFRS, IFRS for SMEs, US GAAP, Generally Recognised Accounting Practices, Generally Accepted Accounting Principles and in the Accounting and Auditing Organization for Islamic Financial Institutions' accounting framework. In other words, memes which achieve longevity are inherited by a vast number of grand memeplexes furthering their reach and continued longevity.

Fecundity and copy-fidelity

Similar to biological genes, memes which are short and less complex can be copied (inherited) more quickly (fecundity) and accurately (copy-fidelity) than long complex memes. Accordingly, accounting memes which survive are those which are very small units of information. Any "large" meme is either mis-replicated and ceases to exist in its original form or is broken into smaller memes which may survive. This characteristic also allows memes to be incorporated into many different topics, models and frameworks more easily than if memes were long and dealt with many specific aspects. Consequently, it is in each meme's best interests to be short pieces of information as their only purpose is to be replicated as often (fecundity) and accurately (copy-fidelity) as possible and to be present in a population of memes for as long as possible (longevity) (Dawkins, 2016).

In an accounting sense, memes are defined as the smallest standalone technique, concept, disclosure or feature of accounting. The concept of "cost" is an example of a meme which is a small and relatively simple concept and can be transferred to new hosts quickly and with a low chance of error. It is incorporated as part of the memeplex of many models (for example, cost, revaluation and some fair value models), topics (for example, inventory, intangible assets and property, plant and equipment) and frameworks (for example, IFRS, IFRS for SMEs, US GAAP) demonstrating its longevity and success.

From an AEG perspective, the sole determining factor is not the desirability or utility provided to hosts by an accounting meme. For example, cost does not always provide the most useful information compared with fair value. However, cost's stability in terms of fecundity, copy-fidelity and longevity means that it is difficult to eliminate from the accounting grand memeplex. This point has been well made by prior literature detailing the inability of fair value memes to displace historic cost accounting memes as the sole measurement method selected in the IFRS grand memeplex (see Whittington, 2008; Ravenscroft and Williams, 2009; Maroun and van Zijl, 2022; van Zijl and Hewlett, 2022).

Accounting inheritance

Prior research usually focuses on formal education as a mechanism by which accounting is institutionalised (Rodrigues and Craig, 2007), as an instrument of disciplinary power (Walsh and Stewart, 1993; van Zijl and Maroun, 2017) and as a source of normative isomorphic pressure (Maroun and van Zijl, 2016). In the AEG, schooling is about authority (see Table 4), fecundity and copy-fidelity because it selects which memes are inherited by students and optimises the rate (fecundity) and accuracy (copy-fidelity) of accounting meme inheritance, promoting their continued longevity.

> "I think university obviously is one way that we transmit knowledge" (T2).
>
> "It starts at school or university level where educators are trying to teach you how do you apply particular [accounting techniques] and then they give you illustrations and examples [to practice]" (A7).

As far back as the mid- to late 1800s, when various Institutes of Chartered Accountants were developed, members were encouraged to prepare materials for students to use to prepare for normalising examinations (Walker, 2006; van Zijl and Maroun, 2017). These materials spread accounting memes more rapidly (fecundity) and allowed them to be inherited more accurately (copy-fidelity) as students and practitioners developed a routine of consciously inheriting (learning) memes from *authoritative*[77] sources. Schools and discipline journals also provided people interested with access to the latest *authoritative*[77 above] memes in a permanent format which can be carried with them and referred to as required.

[77] Authoritative is not used in the context of these being legally mandated, but rather in the sense that memes from these sources carried more weight with regard to which memes should be used to prepare accounts which would stand up to scrutiny by auditors and courts.

But not all practitioners and students are equally diligent in their studies and throughout their careers (as discussed in Section 5.1.2). This has critical implications for accounting memes and which are ultimately selected. Interviewees emphasised how an accounting student's primary and secondary education, aptitude, diligence and motivation for studying accounting impact the replication and inheritance of accounting memes (T1-4, T6, A1-7, P1-6). Those who merely want a qualification as the end goal as opposed to acquiring the knowledge and competencies usually accompanying it may adopt rote-style learning practices resulting in:

> "the application of the accounting standards would probably be fundamentally incorrect. Maybe not across the board but probably [on] key fundamentals. The core issues which should've been treated appropriately won't be and produces incorrect presentation of financial results and performance" (P6).

On the other hand, some students prioritise understanding the concepts and develop a very conceptual approach to accounting (A4, A5-7, P3, P5, R4-5, T5-7, U2). Complicating meme inheritance even further is that there are students and practitioners who lie on a continuum between these two extremes. Students are also not consistent in how they approach their studies, with the result that some memes may be inherited more accurately than others.

Respondents A5, R2 and R5 went further to state that the teaching style of a university plays an important role in informing how student hosts will operationalise the accounting memes they inherit during tertiary education. These respondents felt that graduates from universities who follow a rules-based teaching approaches end up with "a literal interpretation of the [IFRS] standards". Students from universities which adopt a principles-based approach to teaching often have "concentrated more on what [the IASB is] trying to achieve" (A5). Consequently, some young accountants will be better at replicating memes dealing with principles while others will have a propensity for remembering and applying rules in a legalistic manner. This implies there are also subtle memes informing "accounting behaviour" such as how accounting memes should be applied to accounting transactions and events in the real-world.

In the consolidation accounting context, Section 2.3 conveyed how SIC 12 was issued to clarify that certain SPVs should also be consolidated. However, this interpretation document inadvertently led to some accountants concluding that there are two "models" to determine when to consolidate investees: either a *control* or *risk and reward* basis (see IASB, 2011). Having some accountants with inherited memes which advance legalistic interpretations and applications of IFRS while others adopt a principles-based approach may help to explain some

of the divergence in practice. Another factor may be the co-operation or result of co-existing memes unrelated to accounting specifically (discussed in more detail in Section 5.2.2). In the case of SPVs, it may also be convenient to interpret the amendment in a way that either results in companies consolidating or excluding certain subsidiaries from consolidation depending on what they feel is in the company's and their own self-interests (A7).

Broader cultural and jurisdictional factors are an additional consideration about the inheritance of accounting memes at the formal education level:

> "[In a] number of countries you don't study accounts, you study something else and you get into accountancy at a later point. If you've gone through that particular study approach, your knowledge tends not to be conceptual; it tends to be more practical. How do I actually apply the individual standard? How do I think about the standard? What are the implications of that? And that you'll very often find with regulators, you might find to a certain extent with auditors, you'll definitely find with investors. Almost no investor out there, if we get them from the buy-side, has been trained as an accountant. So they [are] not thinking about the conceptual framework, [the] conceptual framework is not relevant to them. If you have gone through a classic university-type education, very often it is a conceptual basis that you've actually used and so you always think back to what the definition is and so you lean first on the conceptual framework and build your way up from there and so that matters in terms of the educational process that you follow" (R2).

Some respondents felt that education for formative training have a "forever impact" (A5) where, for instance, accountants trained via a rules- or principles-based approach are likely to adopt legalistic or interpretive applications of accounting memes throughout their careers (A1, A3, A5, A7, R4-5, P4-7, T1-4, U2).

> "Practically, on-the-job training is difficult in a pressured environment. So on-the-job learning in an auditing context where you've got profitability at stake or the business, the audit business, and you've got deadlines and client pressure and all the rest of it, the coaching element of on-the-job training can be lost and

> [accounting] trainees are at risk of never learning or understanding principles by the end of their articles[78]" (A7).

Others felt that formal education has a decreasing effect as a junior accountant's experience grows and their context and roles change over time (A2, A4, A6, R1-3, P1-3, U3). Any gaps or errors in their IFRS grand memeplex inheritance can be corrected via inheriting the correct meme as their careers progress and they gain experience and the motivation to correct them. In addition, as IFRS evolves, old memes are rejected in favour or newly selected memes. Accountants can inherit these new memes via *continuous professional development*[79] training. What all interviewees agreed on is that on-the-job training effects the inheritance process in important ways.

Informal interactions with colleagues can amplify the effects of on-the-job training on meme inheritance. All interviewees agreed that the people you surround yourself with shapes how you think about accounting, even at very established levels:

> "if I look at the analysts that the IASB deals with, often it's the technical or the accounting committee of the CFAs. They're all rabid fair value enthusiasts and so you start seeing this coming through in the standards. … because **[the analysts] think** fair value is the only answer" (A5, emphasis in original).

While interacting with colleagues, accounting memes interact, recombine and may be replaced with newly formed memes and those replicated/modified from observing colleagues. When memes which accounting students have only seen in textbooks or lecture examples are observed in practice, they may be modified slightly based on new understanding and an appreciation of their practical application (A1; A4-7; P3-5; P7; R3-4; T3-6; U2).

Respondents felt that recently qualified accountants may be "more open" (P7) to new and modified memes they observe in the workplace. This is often because these accountants do not have the confidence which comes with experience to stick resolutely to their original inherited memes or suggest that apparent deviations observed are incorrect. As a consequence, newly qualified accountants are more susceptible to modifying their inherited memes according to how they observe them being applied in practice. Sometimes this will be

[78] Articles refers to SAICA's mandatory 3-year professional training before being able to register as a Chartered Accountant.

[79] Continuous professional development is required by many professional bodies to ensure members routinely undergo training to remain up-to-date.

appropriate as there is a difference between theoretical examples and their real-world applications. In other cases, it may be to the newly qualified accountant's detriment as they observe outdated (previously accepted but now rejected) memes which senior accountants still apply (A1; A4-7; P4-5; P7; R3-4; T3-7; U2). At the same time, A1-6, P2-6, R5, T3 and U3 felt accountants working outside of technical departments or academia are more inclined to remain faithful to the memeplexes acquired during the formal training and early working stages of their careers throughout their lives. These accountants often find it difficult to replace *their* "original" memes with new ones.

> "Well, I've seen it certainly with my clients and even some of the audit partners in the firm where they definitely are old school and even when new standards come out, you know IFRS 15, IFRS 9, [they say] this is not the way we've always done it, this is stupid, this is silly, how can this be the right answer? … I can rationalise [the new treatment] for you and I can explain it to you … but sometimes you're just not listening, and I've got to say to you [as the IFRS technical partner], 'Well this is the way it is. I'm sorry. Do it.'" (A4).

As people subscribing to different memes interact, there are opportunities for memes to mutate further. Mutations can be the result of mistakes during transmittance-replication processes and when accountants actively modify and recombine memes to satisfy new or changing needs.

> "People come up with different thought processes so it's that diversity of views [which] becomes important and that you can see how other people have thought through the issue which means your view is challenging and can be defended or you start thinking about, 'Actually someone else said something that's actually quite smart and let me think through that'" (A5).

This can be in the context of individual organisations (local memeplexes) and at the accounting standard level (grand memeplex):

> "being part of a global firm, we also then over time have also developed our own guidance and our own views and there's also a drive for consistency around some of these things but I think consistency doesn't necessarily mean that everyone does exactly the same thing the same way, it means that people apply the standards in a consistent manner and if the standards are allowing for some flexibility, well then that leaves scope for that application but if the standards are

> clear in certain respects, well then you won't necessarily get any consistency" (A4).

and

> "IFRS 9 didn't develop in isolation. It was designed to address weakness in IAS 39, highlighted by the Global Financial Crisis. There was a pooling of minds among the standard setters and the final version of IFRS 9 was also the result of feedback being received from different constitutes. For example, there had to be specific changes in [certain of the accounting for financial instruments] to get everybody onboard including the European community who were refusing to adopt parts of IFRS 9 unless those changes were made" (R4).

Organisational theorists focus on how routines are a concurrent source of structure and control on the one hand, and performative variability on the other. They attribute this variability to the fact that a routine, at the policy level, cannot be all-encompassing and the people implementing that routine have agency (Feldman and Pentland, 2003). The accounting research argues that IFRS compromises (see Walker, 1978) are a product of, inter alia, lobbying (Zeff, 2002), the quest for legitimacy (Pelger and Spiess, 2017) and how it has been financed historically (Larson and Kenny, 2011; De Freitas et al., 2023). An evolutionary framing provides a complementary perspective. Institutional considerations and the implementation of routines are still valid. But what is also happening are memes interacting and recombining in the prevailing context, leading to changes either at the level of the firm (local memeplex) or at the respective accounting standard level (grand memeplex). A game is being played where selection is the payoff.

Similarly, Fogarty (1992) explains how large accounting and auditing firms use professional behaviour and training to "socialise" new accountants.

> "[T]he professional training, however it's done in a particular jurisdiction, is a good way. I think there are elaborations on those requirements in their application particularly by the bigger accounting firms so I think that also now with these international networks brings some consistency although not necessarily uniformity across the different accounting firms but there is, you know, I think the accounting firms play a big role in keeping that information and transferring it particularly their more detailed application manuals" (R3).

Framed in this way, each is a powerful source of isomorphic pressure which homogenises practice. Accountants are forced into doing something (coercive isomorphism) or to replicate the behaviours of colleagues (mimetic isomorphism) or to choose to align with already

legitimised behaviour (normative isomorphism) (see Maroun and van Zijl, 2016). This logic, grounded in DiMaggio and Powell's (1983) work, has been applied extensively in accounting and is not in conflict which an evolutionary perspective. The selection factors (see Table 4) of the accounting meme are the vectors by which the isomorphic pressures are transferred from the source to the individual host accountant. Continuous professional development, technical updates and audit firms' technical manuals safeguard the copy-fidelity of accounting memes. This enables an accurate reproduction of the sequence of steps being taken each time the meme is implemented and, at the same time, allows the meme to remain largely unchanged (longevity) as it is transferred to different hosts both at a point in time and over time. As a result, the meme provides the blueprint for how to account for something, how to evaluate conformance by individual auditors and how to identify "mutations" in the accounting. Put differently, it is the meme which makes isomorphic pressures work (as summarised by one technical partner):

> "we provide written guidance and that written guidance is restrictive. It's designed to be restrictive so that in these scenarios, this is what you are supposed to do" (A5).

Isomorphism is never complete. There can be resistance, errors and changes in circumstances (Maroun and van Zijl, 2016). Similarly in an evolutionary setting, accountants can actively oppose changes to prevailing memes as A1 notes in a common conversation he encounters:

> "'Our users have been accepting this [method] for years! So why do you now suddenly want to start changing these things'" (A1).

Even if this is not the case, memes can be implemented incorrectly, or may not be used frequently leading to their deterioration and distorted applications. As hosts' memories of the meme in its current form fade, there are three likely possibilities: firstly, accountants may revert to their original memeplex acquired during their formal education:

> "So, 20 or 30 years ago there were three standards, three AC triple something, and I think those were very conservative-type of standards. … Some of the older generations, for example, said to us, 'It's really very difficult to meet the requirements of internally generated intangible assets.' And I was like, 'In this day and age, how? How and why?' And it's a much older person who gave that feedback" (P5).

Secondly, accountants may resign themselves to the fact that they are outdated and, instead of updating themselves, look to newly qualified accountants for the answers:

> "The person who is 40, 50 [in a small company], he/she won't have the type of technical knowledge that's required, like real deep, of all these little things going [on] [in] IFRS 3 … there's no chance of a 40/50 year-old knowing those things unless they really kept up-to-date, which they won't have because their business is running the operation on this. So they will rely on the junior, more recently qualified persons to do that correctly" (R5).

Thirdly, accountants may, unknowingly, recombine fragments of different memes, effectively creating new memes (Blackmore, 2001). This may explain the "hodgepodge of concepts and assumptions" making up contemporary accounting standards which Ravenscroft and Williams (2009) observe. The standard setters are not deliberately "mixing" their accounting metaphors (see Murphy et al., 2013), but are drawing to different extents on the accounting memes which constitute their knowledge templates and recombining those with current contexts (social, environmental and technical) and are a function of their limited intellectual capacity and rationality (Colman, 2013; Baudot, 2018; Maroun and van Zijl, 2022).

This subsection presented the characteristics of accounting memes, how they are inherited and key factors affecting inheritance. Memes are the smallest units and must be aggregated with others to form topics (memeplexes), standards (high memeplexes) and disciplines (grand memeplexes). The next subsection discusses how memes become complex disciplines through two-step accumulation and, later, selection processes.

5.2.2: Two-step accumulation

To understand how accounting becomes more complex and diverse, interviewees were asked to discuss how they would deal with a situation where a new type of transaction or event has developed which no existing standard deals with. Interviewees described how existing practice is used as the starting point to make incremental changes when new transactions or events are encountered and an accounting treatment is required.

> "Well standard setting is an incremental process. It is not a revolution, it is an evolution" (R3).

No interviewees used a "fresh start" approach to develop the accounting for new types of transactions and events where they would imagine a genuinely new accounting treatment.

This reflects the fact that, as is the case with biological evolution, single-step evolution is not occurring. Similar to biological genes, currently accepted memes are modified and aggregated to create the diversity of accounting topics and techniques we see today in a two-step accumulation process.

Which modified techniques are accepted (selected) and become a part of the accounting grand memeplex is complex because of the variety of macro-level (see Section 5.1 on chaos theory) and micro-level factors which impact accounting evolution. Memes compete against one another but, paradoxically, must also co-operate to increase their chances of "winning" consecutive games and being retained as part of the IFRS grand memeplex. Although two-step accumulation and selection are closely interrelated processes, each is discussed separately for the reader's understanding.

When interviewees were asked for detailed processes of how they determine the accounting treatment for new transactions, all respondents (except U1[80]) described a similar process. Step one is to identify existing accounting memes and memeplexes dealing with similar transactions or events. This process includes discussions with colleagues, reviewing competitors' financial statements (especially those with the same auditor) and referring to the technical manuals of Big-4 audit firms. The purpose is to determine whether a solution already exists and how acceptable or pervasive that solution is (P1, P3-5, A1-5, R1-3). Where no acceptable solution exists, step two is to modify (recombine) existing memes to create an appropriate new meme to account for the transaction or event:

> "It's easier to take something that we know and adjust it than it is to… completely [do] something new. Accounting is a language, so you don't want really to invent a completely new word. For example, you have to create a new word for something new so you're [dependent] on the language conventions to use. You don't come up with completely new rules for this word" (T3).

What accountants will ordinarily call the general "heuristics" in accounting practice are actually each accounting memes in their own right. Long-standing heuristics are not just "undone and replaced with something completely different" (T7). Any "new" accounting practice must be grounded in the existing memeplex to have technical integrity and be accepted as legitimate (Maroun and van Zijl, 2022). This is because accounting is both a rational economic activity *and* a social construction (see McKinstry, 2007; Ding et al., 2008). Any derived accounting

[80] U1 is not an accountant and has never prepared financial statements. Consequently, U1 was not asked this question.

practice which addresses only the former will not achieve longevity because it cannot be integrated into the existing knowledge templates of the hosts who must internalise it so that it can be applied in practice and transmitted to other accountants in substantially the same form.

Step three is akin to calibrating the modified meme. All respondents explained how they determine if a derived accounting practice or policy will be acceptable to the community of accountants using an iterative process similar to a type of qualitative Delphi. The proposing accountant presents the solution to a group of peers who support some aspects of the accounting but may challenge others. The disputed elements are revised and re-presented until a sense of consensus is achieved. This process is similar to the IASB's due process where outreach initiatives, consultations, DPs and EDs are issued and re-issued until the Board is satisfied with the usefulness and *acceptability* of the accounting memes proposed (see IFRS Foundation, 2016).

One outcome of the Delphi-like derivation of new memes (i.e., two-step accumulation) is that radical changes in accounting knowledge templates tend to be rejected in favour of minor modifications to existing memes (Lee, 2006; Deegan, 2014). For example:

> "I think it is relevant whether something is radical or not. … If it's radical, I will literally be someone who is a bit averse" (A3).

The moderating mechanism is just as present in IFRS standard setting as it is for individual accountants. Because the IFRS is voluntarily adopted by countries, the IASB must ensure all constituents find all new accounting memes acceptable. In trying to satisfy the preferences of over 160 countries adopting IFRS, the IASB is likely to implement minor modifications to already accepted accounting practices than to propose radical changes and piggyback off of the acceptance of existing memes.

> "[O]bviously, the IASB has got to make the ultimate decision but, you know, they also can't go and propose something that's completely radical because, as we say, then the stakeholders will sit there and go, 'no well we'll drop [IFRS]' and therefore [the IASB will] leave it" (A1).

Some "radical" variant memes are useful but they may be premature. Put differently, it is often the case that a greater number of smaller variations are required to get to a point where the "radical" meme is similar enough to existing memes to be accepted (Deegan, 2014).

> "[T]here was a report by ICASS, a Scottish chartered accounting institute called 'making corporate reports valuable', this was about 1987 a long time ago, and it worked towards producing a conceptual framework project. I don't know if you've seen this document but some of the ideas that were discussed in this document were, certainly at the time, seen as being highly controversial. Just lots of crazy, crazy ideas and yet actually now many, many years later some of these techniques that we thought were, I say we I was young I was a teenager, but the ideas that were exposed then have become more or less the techniques that we might use today" (T4).

Lastly, the concept of a "radical" or genuinely new treatment may be moot because, with accounting memes having longevity (see Section 3.2.2), any current development is, to at least some extent, just a modification of the existing collection of memes:

> "I don't think that someone can just come up with something completely new…" (T2).

Technological advances mean that accounting memes can be transmitted globally instantaneously and at almost no cost. The accumulated knowledge base can be readily and freely accessed. Consequently, even what appears to be the emergence of a new principle, convention or practice may more accurately be described as a reconfiguration of existing memes.

> "Everybody says that fair value accounting is a radical development. And it looks very different to cost accounting with a different income statement and balance sheet. But the core idea is still there. You are trying to account for the 'value' inherent in an asset and communicate why that asset is important to someone. With cost accounting, we do this by recording the asset at cost and then depreciating it. With fair value accounting, you record changes in the fair values. Yes, there are important technical differences, but when you take it back to first principles, you're still telling someone that you have an asset balance and that that balance changed during the year. The definition of an asset and income didn't change and you still have an income statement and balance sheet and the double-entry system didn't change. So, it's not like we went from binary computing to quantum computing. I didn't come up with something to replace the concept of an asset or an alternative to the income statement and balance sheet" (T7).

While the construction of the memeplex relies on the aggregation of incremental changes to the existing memes, a diverse and complex grand memeplex results. A single meme modification is unlikely to be significant, but the accumulation of a large number of incremental changes to multiple memes coalesce. The outcome is more memes dealing with different aspects of accounting for a particular class of transactions and balances and each sub-set of accounting becomes more intricate. In other words, a greater number of accounting standards (memeplex diversity) each of which is more intricate (memeplex complexity) follow because of the two-step accumulation of small variations over time.

The development of the accounting grand memeplex resembles a biological process, but it is an inherently human one. Because of humans' ability to use their intellect to modify memes for specific purposes, memetic evolution can occur over much shorter time periods in comparison to biological evolution (Blackmore, 2001; Finkelstein, 2008). Moreover, when memes are modified through two-step accumulation, it is not only the specific meme which is examined but also the host proposing it.

A4, an IFRS technical partner at a Big 4 firm with over 20 years' experience, discussed at length how determining the accounting treatment for new transactions or events still makes her feel anxious as her personal reputation is at stake. This is because

> "you don't know what someone else is going to be seeing … there's an interpretation that you could make and the anxiety that I always have is: What is the JSE[81] going to say? What is IRBA[82] going to say? Are they going to come back and say 'That was **clearly** wrong'" (A4, emphasis in original).

The anxiety reinforces the propensity of accountants to try to relate new accounting treatments to existing memes as far as possible (A1-7, P3-5, P7, T2-5, T7). This finding is important not because "anxiety" is a requirement for memetic evolution but because the outcome of the evolutionary process proposed by this thesis aligns with an earlier body of work drawing on unrelated theoretical frameworks. For example, Hoskin and Macve (1988), Cowton and Dopson (2002), Rodrigues and Craig (2007), Maroun and van Zijl (2016) and van Zijl and Maroun (2017) clearly demonstrate how processes of review and examination work on accountants' minds and become a mechanism of disciplinary power. For example,

[81] The Johannesburg Stock Exchange (JSE) is the main stock exchange in South Africa.

[82] The Independent Regulatory Board for Auditors (IRBA) is the South African audit regulator.

> "Having this second review you definitely do your job. You're definitely more focused on making sure these are right and I think the same thing applies for an audit firm. To know that there is another review coming will also make sure that they do their part of the assurance part better" (P7).

While accountants may feel "anxious", the systematic two-step accumulation by which memes are modified contributes to their longevity. It acts as a control mechanism which identifies "dangerous mutations" such as those which are illogical, vulnerable to manipulation or impractical to apply (R4, T7). This is similar to the peer review process relied on by academic journals to test the validity and reliability of new research before findings are published. Only the most robust academic findings are disseminated, often resulting in marginal contributions being favoured over research which appears to be radical – even if ultimately correct (R4-5; T4-5; T7; U2). Similarly, only accounting memes which can withstand the rigour of the due process of standard-setters, scrutiny by seasoned professionals and reviews by watchful regulators are permitted to be accumulated into the IFRS grand memeplex and be transferred to new hosts as authoritative memes.

In summary, there is no *Accounting Meme God* or single consciousness directing the evolution of accounting memes (Blackmore, 2001; Dawkins, 2016). Instead, the two-step accumulation process is focused on selecting variations which confer an immediate advantage relative to the other memes at play. Memes are not working *towards* an ideal accounting grand memeplex or end point. This explains why early accounting is described as developing in an atheoretical manner (Walker, 2006; Deegan, 2014). The early variations in accounting memes were primarily pragmatic solutions to problems as they arose (Walker, 2006; Deegan, 2014). The shortcomings in accounting memes identified were refined slightly, but repeatedly, in an iterative process. The complex process by which one accounting meme is selected over another is discussed next.

5.2.3: Accounting meme selection

The prior research reflects accounting and society impacting each other's development, that they co-evolve (Hopwood, 1987; Bryer, 2000a; Blackmore, 2001; Dawkins, 2016). As new accounting memes emerge, through error or active modification, they are either selected to form part of the accounting grand memeplex or are rejected. The process (assimilation, retention and expression) by which accounting memes become part of the grand memeplex can be viewed as a complex game between accounting memes. Each meme acts "selfishly" to be replicated as often as possible. Each accounting meme is a player in a game where the

payoff is its survival via increased inheritance to account for more transactions or events and being used in more accounting frameworks (for example, IFRS, US GAAP, UK GAAP).

Assimilation and retention are very subjective processes. What a host assimilates and retains is a function of how well a meme's strategy satisfies the various selection criteria (see Table 4) and the extent to which it resonates with the host's existing knowledge base (see Heylighen, 1997; Illeris, 2009). A host's perceived utility of a meme is subjective and dependent not only on existing inherited memeplexes but also, inter alia, on the current environment and their job (Heylighen, 1997; Blackmore, 2001; Dawkins, 2016). For example, if a potential host's grasp of financial mathematic concepts is weak (existing knowledge base), that will negatively impact their ability to assimilate, retain and express accounting memes which rely on underlying financial math concepts.

From an environmental perspective, hosts may be more receptive to assimilating and retaining accounting memes which take advantage of general asset uplifts during prosperous times, such as fair value memes. Compare that situation to one where asset prices are decreasing during a recession. If fair value memes competed against cost memes during a recession, they would have a lower likelihood of being selected. This is because many accountants are less likely to select fair value memes which may result in even poorer financial results. Lastly, accountants' jobs (duties and responsibilities) impact their perceived utility of different memes. Accountants who want to complete their accounting tasks and go home are more likely to favour very precise (often rules-based) memes because they reduce the effort required to complete tasks and lower the risk of making mistakes. In contrast, accountants who must rally investors and creditors to provide financial support may prefer less precise memes. Principles-based memes, for example, may be interpreted in ways which allow the company to apply their judgement and present a more favourable image of the company's performance while claiming compliance (see Heylighen, 1997; Blackmore, 2001; Dawkins, 2016).

Another strategic factor is the extent of a meme's co-benefit with other memes. The greater the co-benefit, the more the assimilation and retention of those co-beneficial memes will be enhanced (Blackmore, 2001; Dawkins, 2016; Rutherford, 2020). For instance, the *cost* accounting meme is used (co-beneficial) in many memeplexes ensuring its "embeddedness" within the IFRS grand memeplex. This may be part of *cost's* strategy and explain why it is so successful. It has not only been existing in an identical form for hundreds of years (see Brown, 1905) but it is still used by many accounting grand memeplexes (IFRS, US GAAP, Cash Accounting, UK GAAP) and memeplexes (property, plant and equipment; inventory; intangible assets; investment property).

Many factors render accounting meme games highly complex and dynamic (see, for example, Section 5.1). The environment in which memes operate and evolve in is, itself, continuously evolving (all respondents). For instance, whether global economies are thriving or struggling, war, laws, a country's state of development and sophistication, societal norms and even pandemics affect the AEG[83]. In addition, there are multiple selection forces which are often in direct competition with one another because the hosts which determine the winners are diverse with competing self-interests (see Section 2.1). For instance, different countries, cultures and even religions may want accounting to evolve in different directions, causing a direct conflict. Consequently, the AEG is often political (all interviewees).

> "At the end of the day, standard setting is at its heart a political process. You are trying to match the needs of different parties and you are trying to figure out what's acceptable at a point in time" (R2).

The issues discussed impact the accounting game played between memes and which memes will ultimately be selected at a point in time (see Heylighen, 1997; Blackmore, 2001; Dawkins, 2016). No one strategy is dominant and always selected.

At the heart of general-purpose financial statements is the ability to compare the financial performance and position of different companies. This requires that all constituents ultimately agree on which memes are selected to be included in the accounting grand memeplex used by constituents despite varying self-interests and motivations (including the IASB's) (A1-7; P1-7; R1-5; T1-7; U2-3).

> "[Accounting] has to be implementable and it has to please our constituents and there is a political game, a massive political game that sits at the IASB in terms of if you look at where their funding comes from" (A1).

The current IASB's due process means that accounting meme selection is a conscious process. Papers discussing various positions and options are prepared and discussed at length. The IASB's tentative decisions are then published to gauge constituents' acceptance and comments before a final decision and position is taken (all interviewees). But, before formal standard-setting bodies were incorporated, accounting memes were selected in a more unconscious fashion. However, the key selection pressure was, and is still, linked to how much of an advantage or utility the accounting meme can produce for its host and the costs

[83] See, for example, the fast-tracked memes adopted by the IASB during the COVID-19 pandemic regarding leases.

associated with assimilating, retaining and expressing them (Darwin, 1859; see Dawkins, 1986; Heylighen, 1997; Blackmore, 2001; Dawkins, 2016).

In human societies, financial wealth is often an important indicator of a person's success. People envy and want to imitate those who display wealth (see Jones, 2008). Wealth impacts people's choices about whom to have children with. In other words, wealth impacts mate selection and procreation because it indicates to potential mates that there are sufficient resources available to facilitate the continuation of each mate's genes (Blackmore, 2001; Dawkins, 2016; Hou et al., 2020). Consequently, memes which facilitate better wealth generation have a utility selection advantage. This leads to higher frequencies of children with those (their parents') wealth-generating genes and a tendency to select the same wealth-generating accounting memes (see Section 3.2.2 and Blackmore (2001)).

While we cannot say with any certainty what the first accounting memes were, we can make an educated guess based on the prior literature that they involved conscious noting and, later, recording of basic economic facts. These facts may have included the number of livestock at different points in time and the number of bushels of crops required to feed the family through winter. Later, comparisons probably emerged to, for example, compare the number of livestock taken to pasture and returned home leading to the concept of accountability (see Brown, 1905; Mattessich, 1987; 1998; Ravenscroft and Williams, 2009). These memes are noticeable, understandable, believable and, consequently, easy to assimilate. They are also simple (copy-fidelity) and easy to replicate (fecundity) and provide high survival utility to the hosts leading to retention. Those memes were *useful* and would increase the host's wealth allowing that family to prosper (multiply). In doing so, the genes and memes which gave rise to the wealth would prosper (Blackmore, 2001; Dawkins, 2016). The point is that in accounting's earliest days, the selection process was mostly unconscious (Dawkins, 1986; Blackmore, 2001; Dawkins, 2016).

As human intellect developed and societies became more sophisticated, humans became more capable of *consciously* incorporating selection factors into accounting memes games. To illustrate the change, consider an isolated family homestead relying on subsistence farming to survive. There would have been little, if any, conflict between the needs of different family members in so far as wealth accumulation is concerned. It was in everyone's best interests that the family performed well as a unit and did not differentiate or favour one member's needs over another's. Compare that to a situation where people from different family units, villages and then companies begin trading with one another. This introduced incentives to maximise one's own family unit's wealth even if it comes at the expense of another (see Bryer, 2000a).

In doing so, conscious thought seeps into people's thinking about how to interact with, and document, trading between family units, villages and then companies.

In the late 1800s, accounting meme selection was operationalised by accountants through informal consensus (Walker, 2006; Deegan, 2014). Put differently, selection was the result of how most accountants generally accounted for specific transactions and events. What complicated the matter was that some investors wanted to extract the maximum dividend possible from companies while others were interested in protecting companies' continued success and expansion (see, for example, Walker, 2006; Ding et al., 2008; Lee and Parker, 2014; Nobes, 2014; Toms, 2019). The latter would encourage their accountants to reduce distributable reserves and dividend declarations to enhance reserves. The accounting meme preferences for the calculation of distributable profits for the different investors were in conflict.

Pressures to avoid accountant and auditor liability (see Section 2.2.1) also incentivised accountants to consult one another to identify and agree on *best practice* which could be defended in court and by fellow accountants (Walker, 2006; Deegan, 2014). This reduced the risk of accountants being found negligent or wrong by the courts in the case of dividend declaration disputes and being required to pay fines and damages reducing the accountants' personal wealth.

In a consolidation context, there are incentives for companies to want to maintain cost-based accounting treatments for loss-making subsidiaries to be able to present a favourable depiction of the company's performance and position. This may be to secure financial gains for the management personnel or to be able to raise additional financing to rescue distressed subsidiaries (see Walker, 2006). But these accounting preferences are to the detriment of investors and creditors who would be better served with a more faithful reflection of the economic phenomena of the group and subsidiaries.

Later, members of accounting institutes were encouraged to set questions and develop materials for students to learn from. This initiated the creation of a more formalised (precise) set of accepted accounting memes (GAAP) and concentrated the selection processes in specific people or bodies. Accounting journals were also initiated to publish the latest *best practice* and to try to encourage and distribute generally accepted (or selected) accounting practice more widely (Walker, 2006; Deegan, 2014). Again, this tactic seeks to entrench the accounting memes being adopted by the authors and institutions, reducing the risk they would be found deficient in some manner and lead to fines and damages being paid.

At present, the IASB is one global standard-setting body which decides which accounting memes are "winners" and are included in the *IFRS* grand memeplex. But the IASB's due process requires that it engage with its constituents. It must release DPs and EDs for comment in order to maintain its legitimacy as an accounting grand memeplex selector (IASB, 2003; Bamber and McMeeking, 2016; De Villiers and Maroun, 2017). Failure to do so can result in accountants looking elsewhere for acceptable accounting memes or modifying IFRS:

> "if you look at IFRS 17 for example, it's a clear example of the insurance companies just have got so much power that the IASB will do tooth and nail, within in reason, to kind of please them because if they start dropping IFRS, well then the whole of Europe is just going to drop IFRS because they'll just conference EFRAG to drop it and that's the end of IFRS. Look at IFRS 14 for example, that was something that was written to bring the Canadians onto our IFRS" (A1).

The European Union's "carve out" of certain IAS 39 provisions is a relatively recent example of a constituent modifying IFRS before it would accept it based on its preferred accounting memes and context (see EFRAG, 2022). Nevertheless, the key feature of accounting development is still based on *consensus* and *wealth enhancement*. Society has merely outsourced the final decision-making to a board of "experts" in the name of efficiency and independence to mediate the vast number of competing interests in accounting meme selection by parties whose interests are not always aligned (A1-7; P1-7; R2-5; T1-7 and U2-3).

5.2.4: The Accounting Evolutionary Game

In order to "win" games, memes play their inherent and unalterable strategy. Memes cannot update or modify their strategy as their environment changes. This is because any modification leaves the original meme intact and is rather the emergence of a new meme with its own strategy (see Section 3.2.2). A meme's success is dependent on how well its strategy creates a benefit for some or all hosts or how well it "scores" on the selection criteria relative to competing memes (see Blackmore, 2001; Vincent and Brown, 2005; Finkelstein, 2008; Dawkins, 2016). This is because of the co-evolution of genes and memes where genes will favour selecting memes which improve the gene's success. Often what enhances an accountant's or users' success will enhance their genes' success (Blackmore, 2001).

Healthy, strong or resource-rich hosts will have improved reproductive (and gene) success (see Section 3.2.2). Consequently, memes which increase a person's financial wealth will lead to increased offspring with the genes which will replicate those same wealth-enhancing memes (Blackmore, 2001). In addition, people will look at wealth, which is often made highly visible through flamboyant displays, and seek to replicate the behaviour and actions in the hope that they, too, will become wealthy (see Jones, 2008). This also enhances the replication of wealth-enhancing memes in a more direct fashion. In times where accounting selection is outsourced to accounting standard-setters, the meme success is also impacted by which hosts benefit from a meme's strategy. Memes whose strategies benefit hosts will have more power and an advantage in the AEG as demonstrated by the power of the European Union's "carve outs".

To simplify the AEG, we can view the success of accounting memes in terms of whether they increase or decrease potential host's financial wealth. Allocating numerical payoffs to memes in order to solve meme games is beyond the scope of this thesis and is deferred for future research. Instead, this thesis discusses the qualitative characteristics of accounting meme games to explain AEG dynamics and inform future research.

An important complexity of the AEG is that a meme's strategy may have conflicting wealth creation potential when viewed from different jobs and roles (for example, auditors, creditors, preparers of financial statements, regulators and investors). Consider that what strengthens a preparer's wealth may reduce an investor's wealth and vice versa (see Jensen and Meckling, 1976; Shapiro, 2005). On the one hand, preparers may prefer accounting memes which accelerate the recognition of income in order to portray their management of company resources in the best light. Doing so attracts greater financial incentives in the form of bonuses, salary increases and new offers of employment (see Haswell and Evans, 2018). Investors, on the other hand, may prefer a prudent approach which delays the recognition of income until it is *virtually certain* or *more likely than not* that it will be received (see IASB, 2015c). This is because of agency problems created where there is an incentive for management to overstate assets and income for their own benefit but to the detriment of investors. Accordingly, investors may prefer accounting memes which require prudence so as to reduce this risk for their own benefit (Jensen and Meckling, 1976; Maltby, 2000).

The objective of consolidated financial statements is another example (see Section 2.2.3). Some view financial statements as providing information about the management's stewardship of company resources. This has implications for the types of accounting memes preferred. Conversely, many passive and capitalistic investors see the objective of accounting

as being to provide decision-useful information to make buy, hold and sell decisions about equity and debt investments. These, so-called neoliberal, investors often prefer fair value memes (see Whittington, 2008; Ravenscroft and Williams, 2009; van Zijl and Hewlett, 2022). The level of transparency provided by accounting memes is another case where different accountant roles may have conflicting accounting meme preferences (all interviewees).

From a more pessimistic perspective, P1 argued that auditors have a vested interest in supporting complex memes for their own financial self-interest creating yet another conflict about what will enhance different hosts' wealth:

> "I'm [the auditors] now doing all these other things as well [consulting services] and that's really complicated [because of] these new rules so I've got to charge you [the client] more. Everything starts with me, not me personally but the me in everyone. Got two routes, I can make this easy for everyone or I can make a lot of money. Hmmm maybe not make it that easy - sorry. So those are my two soapbox moments. Is it actually doing the end users of these things any good? Not at all" (P1).

P5 and P6 highlighted audit committee members and that they are primarily focused on "understandability" (P6) and want

> "something that's simplistic. Obviously, your audit committees are comprised of people who potentially are not pure, deep, technical accounting experts but they are also trying to, almost, view things from the side of investors and … as soon as there is something that's too complex, it actually causes a concern from an audit committee perspective" (P5).

Table 8 presents a summary of what interviewees felt accountants in different roles generally prefer in accounting memes. This is useful for informing what characteristics and meme strategies each role probably prefers in the AEG. Interestingly, some interviewees explained that *within* certain roles there is also divergence in the preferences for accounting memes (A5-7, P1-2, P5-6, R2-4, T3-7, U1-3). Auditors and preparers were sub-categorised into the those which must apply accounting memes "on the ground" (R2), and those which must present the financials to the public or are technical audit partners.

Accountants who must execute the preparation or audit of financial statements were viewed as typically preferring accounting memes which are simple, rules-based (precise), reduce the need for judgement and lower the effort required to comply with the meme and the host's risk

of making errors (utility). These are linked to the wealth of accountants fulfilling these roles. Mistakes are likely to result in penalties or having their employment terminated, reducing their wealth. In addition, “people are inherently lazy” (T1) and want to reduce the cost or effort required to earn the same rewards (simplicity and utility):

> “[auditors] are going to want to make [accounting] as auditable as possible” (P5);
>
> “we [auditors] are risk-averse meaning I want the easiest option even though it doesn’t really give you the best business results” (A3);
>
> “[execution auditors want] black and white” (A2);
>
> “[they] like that level of certainty [and] says, ‘I work my finger down this line and, oh, there’s the answer’ … because then they would be able to say to the regulator, ‘I followed the standard. I worked my way down that line and that’s where I ended up at’” (A6);
>
> “So when you look at auditors in terms of general auditors, I think they want to make their lives easier but they’d like the standards [accounting memes] to be simpler because the more complicated the more difficult [auditing] is. … I think as a group they don’t have particularly strong views as to which way it goes, they just really want it to be simple and interpretable. Technical [auditors are concerned that] the standard has got to be right” (A5).

For preparers of financial statements it:

> “depends who. If it’s a big place, the accountants just want to do the work, they don’t care about transparency. They just want to do it according to whatever IFRS wants. It’s only the much, much higher level where they may have sensitivity to particular disclosures or the wording but the people actually preparing… they don’t care” (R5);
>
> “I think most listed companies do not present what they think an investor would want to see. They project what **they** want an investor to see” (P7, emphasis in original);
>
> “someone who is dressing up the financial statements for the public is looking for principles versus the accountant on the ground who is trying to implement standards is looking for rules just to make it easier … the one that’s dressing up the financial statements has a lot of self-interest versus everybody else who has some sense of public interest. It depends on what your self-interest is too. So,

> the person who is actually on the ground doing the debits and credits, their self-interest is *their time and irritation* versus the CFO who has got financial self-interest and reputational self-interest" (A7);
>
> "CEO and CFO would want principles-based because they want the flexibility of using it to present the company [at] its best" (A6).

Even within academia, some interviewees see differences in accounting meme preferences:

> "In fact, I suppose you get two types of academics. You get the research academics who would want to follow the principles and want the research done to prove it and I mean then you get the teaching academics. And I think they would prefer some more simplicity as well because it makes their life easier" (A5).

Teaching-focused academics are "probably looking for understandability mainly of the standards that are set, *not of the financials but of the standards themselves*" (A7, emphasis added). Key preferences are summarised in Table 8.

Table 8: Summary of key preference characteristics		
Category	***Sub-category***	***Preference in accounting meme strategy***
Academics	Teaching-focused	Slow, incremental change (low effort to update teaching notes and lectures) Easy to apply and explain *to students* Prefer new memes that resemble existing memes closely
	Research focused	Pursue conceptual and / or theoretical correctness Provision of useful information in financial statements
Auditors	Operational staff	Rules-based memes to reduce the judgement needed and risk of non-compliance due to interpretation errors Easy to apply memes that have low complexity Low cost to implement Low knock-on consequences of new memes Pragmatic Prefer new memes that resemble existing memes very closely
	Technical accounting partners	Right conceptual answer Consistency across member firms and within firm Provision of useful information
Preparers of financial statements	Operational staff	Rules-based memes to reduce the judgement needed and risk of non-compliance Easy to apply memes which have low complexity Resist changes Low knock-on consequences of new memes Pragmatic memes

		Prefer new memes which resemble existing memes very closely
	Investor-facing staff	Principles-based Flexibility to tell a (favourable) story Some prefer reduced transparency Memes which allow financials to differentiate between core and abnormal items
Regulators and standard setters	N/A	Rules-based Easy to regulate. Consequently, easy to apply with little judgement required Provision of consistent (and useful) information Protect stability of capital markets
Audit Committee	N/A	Simplistic Rules-based to reduce the judgement needed and lower the risk of non-compliance
Users of financial statements	N/A	Prudent memes that address agency costs Enhanced transparency Consistency to avoid needing to update models Avoid disclosing immaterial information that may obfuscate material items[84]

[84] There appeared to be a general contradiction in what interviewees think users want. Interviewees felt users would generally want more information. This allows them to choose what to look at. In addition, any information not used this year may become useful in future years. However, respondents also highlighted the need to reduce the length of financial statements and avoid hiding material information by disclosing too much immaterial information.

Accountants' meme preferences can be related to accounting meme strategies to understand memetic selection in the AEG. Put differently, meme strategies which cater to accountants' preferences (assimilation and retention factors) are more likely to be selected by those accountants and proliferate within the accounting grand memeplex. To illustrate, consider the "cost" and "fair value" memes. The "cost" meme is one of the oldest memes which is still common today in a variety of IFRS standards as well as in other accounting frameworks. Cost's primary strategy can be characterised as being simple to understand and copy. It is easy and cost effective to implement from a preparing accountant's perspective. From a user's perspective, the resultant information presented in financial statements is simple to understand and use. This strategy generally appeals to operational accountants who want to prepare or audit accounting information with as little effort and risk of error as possible, regardless of what image the ultimate financial statements present.

Cost's strategy "scores" well on understandability, preciseness, fecundity, copy-fidelity and longevity (see Table 4). In other words, the concept of cost is easy to understand, which means it can be transmitted to new hosts quickly and with very little effort and expense (fecundity). Cost also has a low chance of being mis-replicated (copy-fidelity) because of its simplicity. Its straightforwardness means it is easy to remember for extended periods of time with little, if any, degradation enhancing its longevity. It is used often, enhancing its recurrence "score" and coherence within many different accounting grand memeplexes. When used to account for simple and tangible assets such as inventory and property, plant and equipment, its utility is at least as good as fair value's, if not greater, but with low assimilation and retention costs (Whittington, 2008; Ravenscroft and Williams, 2009). Consequently, it is selected for such assets. However, using cost memes provides ineffective information (too low utility) when used for *at acquisition* consolidation accounting, as demonstrated by early consolidation accounting practices (see Section 2.2).

In contrast, fair value is complex as it relies on many memes in order to be applied. For instance, the concepts of *highest and best use*, *primary market* and *hypothetical market participants* are examples of memes in their own right which must also be replicated by a host before they can apply fair value to transactions and events. In comparison, cost only requires the concept of an invoice price or cash paid to be applied. Accordingly, fair value's understandability, acceptability, fecundity, copy-fidelity and longevity are lower relative to the cost meme. However, fair value provides more relevant information about the current financial position and performance of many financial assets and liabilities, especially where their values are volatile (see Pandya et al., 2021; see Maroun and van Zijl, 2022). This often translates into greater wealth generation potential (utility), increasing the net assimilation and retention

"score" and being selected over cost memes for specific elements. In addition, some accountants generally prefer fair value memes based on their historicity and job (see Ravenscroft and Williams, 2009; Durocher and Gendron, 2014).

The cost meme's strategy helps to explain its persistence in contemporary accounting despite pressure to supersede it with memes such as fair value (Whittington, 2008; Ravenscroft and Williams, 2009; van Zijl and Hewlett, 2022). However, in an increasingly complex business environment which is becoming increasingly dominated by financial and intangible assets (see Zhang and Andrew, 2014; Lev, 2018), cost's strategy is unable to out-compete with fair value's strategy for more complex transactions and events, especially financial elements. The result is that for some transactions, the cost meme wins and is used to account for those transactions, while for other transactions, the fair value meme wins and is applied.

The fair value meme's increased utility for specialised transactions and events means that despite having a lower understandability, fecundity, copy-fidelity and preciseness "score" compared to the cost meme's, its *overall* "score" is still higher leading to its selection. For example, fair value beats cost in the accounting for traded financial instruments. In a consolidation context, fair value is used to account for the initial acquisition of a business in consolidated financial statements as using cost memes provides ineffective information (see Section 2.2).

Table 9 summarises the common meme strategies gathered from the interviews conducted. Illustrative advantages and disadvantages are also suggested. The list is not exhaustive as this was not the objective of this thesis.

Table 9: Examples of strategies and their advantages and disadvantages		
Strategy	***Advantages***	***Disadvantages***
Simplicity / easy to understand	Easy and quick to replicate (copy-fidelity and fecundity). It is also easy to remember for long periods of time (longevity) with the result that accountants tend to revert to the meme concept.	May not be able to provide as useful information as more complex memes, especially for complex transactions or events.
Complexity	May be more capable of providing useful information, increasing the wealth of users and, consequently, the support for this meme. The complexity, itself, may help to maintain niche professions as it is a barrier to entry.	Reduced copy-fidelity and fecundity. May have reduced longevity.
Avoid auditor liability / Auditable	Great acceptability by auditors who have historically had a significant influence over the AEG.	May provide less useful information. This reduces its attractiveness to users and some preparers of financial statements.
Rules-based	Relatively easy to replicate and imitate (copy-fidelity and fecundity) as it requires little, if any, judgement and can be applied blindly	Does not always provide useful information and can be abused leading to reduced usefulness and wealth generation.
Principles-based	May provide more useful information in more situations as resultant application is context specific. This is attractive to presenter-preparers[85].	Reduced fecundity and copy-fidelity but may have increased longevity.

[85] Interviewees noted a difference in the preferences of those preparers that execute accounting tasks and those presenting the accounts to users. Those executing accounting tasks typically desired easy, rules-based or straight-forward accounting memes while those presenting accounts preferred flexible, principles-based accounting memes so that they can present their company in the best possible light.

Table 9: Examples of strategies and their advantages and disadvantages		
Strategy	***Advantages***	***Disadvantages***
Conceptual	More ideologically acceptable and consistent with other memes, especially in modern accounting which seeks increasing theoretical grounding.	Reduced fecundity and copy-fidelity but may have increased longevity.
Pragmatic	Attractive to practitioners who have multiple pressures on their time and resources. Early accounting memes can be considered pragmatic.	May be in direct competition with conceptual memes and those prioritising consistency among different memeplexes.
Flexibility	Attractive to client-facing practitioners who want the flexibility to present their company's performance is the best light.	Less acceptable to operational practitioners who find the flexibility administratively burdensome to interpret and defend to auditors. Auditors may reject this strategy as it increases their audit risk.
Conservative	Valued by early accountants and users where stewardship was the primary objective of financial reporting. Importantly, this illustrates the complexity of AEG. This meme is mutually beneficial to the stewardship meme as the objective of financial statements.	As the stewardship meme has been displaced by the neoliberal meme, this meme may be incompatible with the neoliberal meme.
Aggressive	Valued by some practitioners wishing to present their company in the best light. It may be mutually beneficial with fair value memes. Its success will be linked to the success of the fair value meme.	Difficult to justify conceptually and may not be compatible with other accepted accounting memes, especially the stewardship meme.
Increased disclosure	Appeals to user groups which, generally, see more information as a positive. It is mutually beneficial to societal memes calling for increased corporate transparency.	Competes with strategies to reduce transparency.

Table 9: Examples of strategies and their advantages and disadvantages		
Strategy	***Advantages***	***Disadvantages***
Less disclosure	Appeals to many preparers of financial statements which bear the cost of increased disclosure and may feel less transparency protects strategic and competitive information.	Competes with strategies to increase transparency.
Timely	Is mutually beneficial to memes with simplistic strategies.	May reduce accuracy of resultant information
Forward looking information	Is mutually beneficial with neoliberal memes (Zhang and Andrew, 2014) and fair value memes.	Competes with stewardship and, possibly, accuracy and reliability memes.
Backward looking information	Is mutually beneficial with stewardship, simplicity, reliability and verifiability memes.	Competes with memes following a neoliberal strategy
Understandable	Strategy of appealing to the layman. It is mutually beneficial with simplistic strategies.	May result in diminished usefulness of information as complex businesses may not be able to be faithfully represented to non-experts in an understandable manner without losing accuracy and detail
Anti-abuse	Appeals to regulators who wish to protect capital markets and the confidence of investors.	Can result in the accumulation of conflicting memes within the same memeplex and grand memeplex.

Many interviewees explained how accountants often revert to simple concepts which are "tangible" like cash and cost in practice (A2, A3, P1-3, P5-7, R3-4, T1-2, T4, U1 and U3). A6-7, P5-6, R4-5 and T5-7 highlighted that accountants who are not motivated to "be the best accountant they can be" (P5) may have an affinity for memes with *simple* strategies. These types of accountants prefer to rote learn memes with little to no attempt to understand them nor focus on the provision of useful information to financial statement users. Consequently, as time goes by, more complex memes may be forgotten while simple memes remain intact despite IFRS requirements.

Similar to the illustration of the structure of soccer teams in Section 3.2.2, an important outcome of the memetic evolution of accounting is the tendency for specific groups of memes to formulate a high memeplex (or accounting standard). These categories are *objective*, *scope, definitions, recognition, measurement, derecognition and disclosure*. Put differently, this combination of memes is most successful in containing the memes necessary for accountants to accept and implement the underlying memes to account for a particular transaction or event. They provide sufficient detail for accountants to feel comfortable assimilating, retaining and, importantly, expressing the memes to prepare financial statements. Just as with soccer teams, not every team sticks strictly to the structure. Various high memeplexes deviate with sufficient success. Notable examples are the Conceptual Framework for Financial Reporting, IFRS 9 – Financial instruments and IFRS 12 – Disclosure of interests in other entities. These standards deviate from the typical *objective*, *scope, definitions, recognition, measurement, derecognition and disclosure* structure of an IFRS standard.

The preceding discussion presented key complexities related to the interaction between how memes provide benefits to different hosts and the resultant trade-off between those benefits and the meme's longevity, fecundity and copy-fidelity. The next sub-section uses the introduction of inter-corporate investments to illustrate meme strategies and accountants' preferences for memes in the consolidation context.

The consolidation accounting meme game

At the time inter-corporate investments began, existing accounting memes required non-current assets to be held at cost. As the interviewees noted above, the accountants at the time would have first used these memes to account for inter-corporate investments. At first, cost-based memes appeared successful and were selected. These memes worked well as preparers knew

how to apply them and investors knew how to use the resultant information. Loss-making subsidiaries disturbed the status quo when accountants realised they could easily be hidden when using cost-based memes (see Section 2.2.1). Consequently, as investors' wealth was threatened by hidden subsidiary losses new memes emerged which entered into a game with the incumbent meme to hold subsidiaries at cost.

A meme's success is linked to its wealth generation potential for the parties applying it and using the resultant information. On the one hand, the meme to hold subsidiaries at cost is attractive to preparers of financial statements because it is easy, cost-effective to apply and obscures subsidiary losses (Walker, 2006). Hiding subsidiary losses provides the preparer with time to try to restore subsidiary profitability without drawing investors' and creditors' attention to the problem. Had investors and creditors been alerted, they may have decided to terminate the preparer's employment, reducing the preparer's wealth accumulation capacity.

On the other hand, the meme to hold subsidiaries at cost reduces investors' and creditors' wealth potential by concealing unprofitable subsidiaries. Without this knowledge, investors and creditors may continue to hold their equity and debt positions allowing their wealth to deteriorate further or they may not take adequate steps to replace weak management teams and non-performing subsidiaries. In response, two new memes emerged. The first was to require holding companies to publish the subsidiary's separate financial statements in addition to the holding company's financials. The second was to prepare a consolidated balance sheet.

In the UK iteration of this game, UK companies were preoccupied with protecting corporate transparency (Walker, 2006) reducing the attractiveness of the meme to publish the separate financial statements of subsidiaries for preparers. This is because publishing the separate income statement, balance sheet and notes was perceived as providing too much transparency of the operations of the group. We can state that the meme to publish separate subsidiaries' financials with the holding company's strategy is to provide *enhanced transparency* into the group's operations. For users, publishing the separate subsidiary financials addressed the problem of hidden loss-making subsidiaries. However, it also significantly increased the volume of financial statements to work through and the administrative and printing costs to provide this information (which investors ultimately bear). Some interviewees noted how providing too much information is, paradoxically, also a useful technique to hide information (A1, A5-7; P3-6; T2, T4-7; U2-3) reducing the attractiveness of this new meme to users as well.

The meme to prepare a consolidated balance sheet also addressed the misleading nature of loss-making subsidiaries without providing too much additional transparency into group operations. It also did not overload users with information as only a single additional statement is provided – the consolidated balance sheet[86]. We can state that this meme's strategy is to provide *balanced transparency* about the group's financial position. The new balance sheet is understandable, has relatively low complexity and represents only a slight modification to existing accepted memes. We know, with hindsight, that the meme to publish a consolidated balance sheet won this game and was accepted into the accounting grand memeplex (Walker, 2006).

The AEG outcome in the US was similar, although the factors influencing the game were slightly different (see Section 2.2.2). The US was not preoccupied with protecting corporate transparency. In contrast, the first documented US consolidated financial statements were published voluntarily by US Steel. This group was the amalgamation of large, prominent existing businesses. Financial commentators had amalgamated the financial statements of the former companies to speculate about the likely financial position and performance of the new group. In addition, industrialisation was rising and competition was fierce. Preparers may have understood that US Steel was a "pure" holding company and cost provides little enticing information to potential investors. Accordingly, the management team may have been motivated to portray the financial position and performance of the new group genuinely to boast about its success and stimulate share trading and prices.

The conclusion is not that consolidation accounting was inevitable. It is that similar mutant accounting memes can arise independently in different regions with slightly different contexts. In addition, it is that cross-border communication and interactions can spread accounting memes and accelerate the rate at which memeplexes evolve (see Walker, 2006). But, ultimately, what enhances host wealth is a strong evolutionary pressure (Blackmore, 2001; Dawkins, 2016).

As with nature, the weaknesses of new mutations become evident after time. The flaws of the UK game to publish only a consolidated balance sheet started becoming apparent. Group companies could trade with one another, artificially inflating their gross sales figures. Moreover, for both the UK and the US, the introduction of a meme to consolidate subsidiaries created a need for memes to describe and explain which companies should be consolidated. This was especially needed as

[86] At this stage, a consolidated income statement, statement of cash flows, statement of changes in equity and notes was not required.

societal contexts changed and partial subsidiaries became popular (Walker, 2006). With no guiding accounting meme describing the objective of the consolidated financial statements, many different memes regarding the scope of consolidation accounting arose (see Section 2.2.3).

> "Part of the issue is what's the definition of the boundary of the group? Should it include material associates? Should it be including joint ventures? Should you only be waiting until you've got that threshold of control that takes you into ownership control? I think there are a lot of grey areas in there. So supplementary information is important, but consolidation has to be the central backbone" (R5).

At this point, the examples introduce the next sub-section discussing how memes co-evolve and must co-operate in order to survive. In other words, the meme to prepare a consolidated balance sheet necessitated the creation of co-beneficial memes which defined which companies to consolidate, how to deal with partially owned subsidiaries and with inter-company transactions. Without these co-beneficial memes, the original meme to prepare a consolidated balance sheet cannot survive.

5.2.5: The co-evolution and co-operation of accounting and other memes

Social norms, culture and even the ways of doing business are also examples of memes which evolve in their own right (Blackmore, 2001; Finkelstein, 2008; Dawkins, 2016). The memes of these different areas interact and co-evolve (see Blackmore, 2001). As the 1907 UK Companies Act required public companies to publish their financial statements (Company Law memes), the use of group structures increased significantly to maintain corporate privacy (see Section 2.2.1). In the US, anti-trust, Sherman and enabling laws coupled with rapid economic expansion led to a rapid increase in the use of group structures (see Section 2.2.2). These regulatory meme changes led to the modification of existing accounting memes to create a new high memeplex dealing with this new and pervasive type of business structure.

As groups became more prevalent, new memes for how to utilise groups in ever increasingly complex structures developed (co-evolution). For example, companies began to use group structures not only to maintain corporate privacy in the UK (Walker, 2006), but also to manage risk, reduce tax liabilities and grow their businesses through acquisition (all interviewees).

> “By having different parts of the business incorporated in different companies in different legal entities. It means that if one part of the business runs into difficulties, it's largely protected. The rest of the business [group] is largely protected” (T5).
>
> “There is always place that people try and structure things, and that is specifically from a legal or a tax perspective” (A1).
>
> “I mean simply one is limited liability. So to be able to conduct operations that may be riskier without impacting the rest of the group” (A5).
>
> “Well there's other reasons. Because they're separately managed, so you want separate reporting and each company may have its own particular way it's managed and the way you motivate the people. So, you've got an asset management subsidiary and you've got an insurance company, you can't put those, they're like so different that the way you restructure and the way you reward them is very different. So, you want to give a proper divorce and it makes it quite clean when you've got different corporate structures as opposed to divisions. Divisions come with its own problems. It's harder to hive off, tax purposes and all kinds of things” (R5).

The most common reasons for adopting group structures are to reduce risk by operating risky or innovative business ventures in separate legal subsidiaries to protect the assets of the rest of the group (all interviewees). Shifting profits to tax havens and taking advantage of each jurisdiction’s tax laws (all interviewees) and regulatory enforcement weaknesses (T3) through the use of groups is also common.

Interviewees also provided examples of bespoke reasons for group structures. P1 discussed how they have a “regulatory vehicle” which owns a licence other group companies make use of. The only reason this group structure exists is because the regulator refused to issue more licences for new ventures:

> “There are legislative [and] regulatory reasons why you might have different vehicles. We've got a group subsidiary that sits underneath all of our companies that is a regulatory subsidiary. So, it participates in a regulated market … we could have had an individual regulated subsidiary for each [property company] but we went to the regulator and said, ‘Right, we've got one that matches one, we're going to create three others, can you give us three more? It will all be the same, they work the same,

> it's fine.' And he said, 'No, because we don't want to have four things on our register, we only want to have one so find a way to just do what you need to do with the one you've already got.' So sometimes there are external factors that force you to create [group] structures" (P1).

The dynamic and open environment means that people are constantly reacting to and impacting other factors. Evidence of accounting being both a "product and producer of history" is reflected in how group structures are used to minimise tax liabilities (Bryer, 2000a, p. 131). Most interviewees reflected that groups structures inspired and allowed prepares to shift profits from high to low-tax jurisdictions:

> "if I go back maybe 20 years ago, there was a lot more tax structuring that took place around transactions and that often led to special purpose entities being formed to accommodate those" (A5);
>
> "[another] reason may be for fiscal reasons that having subsidiaries in different parts of the world means that revenues and profits can be perhaps transferred into subsidiaries based in countries that have low tax regimes" (T5).

P1 has also used:

> "blocker vehicles where you're deliberately inserting a vehicle in the structure for a particular reason" (P1).

T1 dealt with a company which started to gain a bad reputation in the market. In response, they simply incorporated a new holding company with a new name to start with a clean slate but continued with business as usual in the, now, subsidiary operating company.

Interestingly, T3 discussed how groups will consider the laws in various jurisdictions as well as how strictly those laws are enforced. They then "push these subsidiaries in countries where management is more easily done … So you have a company in the UK having subsidiaries in Greece where you can get away with murder". T3 referred to this as "regulatory arbitrage".

In South Africa, separate SPVs are used to operationalise Black Economic Empowerment (BEE) laws and regulations[87]:

> "We saw a wave of splitting as a result of BEE so you often see particularly for global groups what they would be doing is taking their South African operations and sort of splitting it out into a separate area or where they need the BEE credentials and putting that into a separate company so that they need to empower that company or that business and then they don't need it on others. So very commonly that was done particularly with international operations where the BEE credentials don't make any difference to that operation [internationally] so they isolated the South African operations. This was a strong wave around the initial BEE push. Once that was done a lot of them were structured. You see it coming up again but it's not as big a push as it was. So that goes the other way. So it's those sort of factors that, why do I need a separate company or a separate part of the business" (A5).

Interviewees highlighted that the use of groups is:

> "… cyclical. … you go through phases where you seem to see a lot of people now taking the assets and liabilities and operations out of an entity and put it into a separate entity" (A5);
>
> "There was a time when it was very useful to have vertical structures, then there was a time when you get horizontal structures. Those are all tax-driven things, particularly from property companies. CGT and all of that. There was a time when it was very popular to have [many, many subsidiaries] and current thinking is very flat structures and don't have those long vertical structures" (R5).

Despite how much time has passed since the first consolidation meme emerged and the extent of resources consumed to develop accounting memes, they are still evolving. Interviewees discussed areas where the consolidation accounting, in their opinion, can still be improved or requires modification. For example:

[87] BEE relates to South African laws designed to redress the consequences of the Apartheid regime. Under this regime, Black people were not allowed to own or meaningfully participate in capital markets, among other exclusions. BEE compelled companies to obtain minimum ownership percentages by Historically Disadvantaged South Africans. This is also known as *empowerment*.

> “Well I think that although the current accounting standard basically says that it doesn't matter whether they're in dissimilar businesses or not I think that that's somewhere where I would say that if they are genuinely dissimilar businesses then that might be a case where consolidation would be inappropriate and misleading but it's difficult these days given the diversity of multinational companies to say that particular activities are so dissimilar that they should pull them out from the consolidation. So I think it's one of those things where I wouldn't rule out the possibility of using the dissimilar businesses argument to exclude an entity from the consolidation but I think that cases where it is genuinely dissimilar would be quite rare” (T5);
>
> “If all companies are doing the same thing in the same way then you just need to see the aggregate picture. If each of the different SPBs is doing something different or doing it in a different way then you probably want to see them spit out. So if you've got Company A selling apples and Company B selling bananas and Company C selling chipolatas, there's no point in aggregating the three sets of data because those three markets will all be subject to different market forces. I'm trying to look at the recurring nature of the revenues and what kind of things would impact the recurring nature of that” (P2).

Interviewees acknowledged that segmental reporting (IFRS 8) does help but that there was still more to be done to improve the accounting. P5 highlighted how consolidation can give the wrong picture in certain industries where solvency and liquidity of separate legal entities are concerned. In these cases, consolidating all controlled subsidiaries does not provide useful information. This may be an example of a situation which gave rise to the development of a new memeplex called segmental reporting. For example,

> “So, the thing is if you've got a group structure where you've got a bunch of regulated entities and you've got an entity that's not necessarily an insurance or a financial service entity and now, from a group supervision perspective, you’re saying, ‘OK, well is this group solvent or not?’ But you have no way of regulating this funny entity on the side that does something different, you don't want to say, ‘Well that's cash generative and that's got big balance sheets so from a group supervision perspective I can look at this whole group and say things are solvent.’ You want to look at the things that you can control from a regulator perspective” (P5).

Further complicating the consolidation accounting high memeplex is that not all reasons for creating groups are rational. This point links back to Section 5.2.1 which deals with people's attitudes and motivations. Employees who were never interested in becoming the best accountant, CEO or CFO but were interested in their own power and status may be inclined to create structures with no obvious economic benefit except for themselves. Along these lines, R4 stated that groups:

> "can also be done for egotistical reasons. The more companies that you've got, the more directors that you need, the director title gives employees status" (R4).

The manner in which group structures develop is also not constant but changing in response to prevailing laws and "ways of doing business". For example,

> "It's probably quite common in the property industry because of the way the tax laws of property investing in the UK have developed over the last twenty years. So yeah, it's not unusual for a big enough company [to have many subs] and then the particular issue with that group of companies is when you started to dig into it and you find out it was only worth about GBP100million its pointless [to] have 27 [subsidiaries]" (P2).

These examples illustrate how accounting, business and regulatory memes co-evolve. As groups increasingly were created on the back of different motives and adopted different structures, weaknesses in the existing consolidation accounting memes were, again, highlighted. The identified weaknesses led to the evolution of new consolidation accounting memes to deal with real and perceived weaknesses.

Looking at the extent of ownership, initially most subsidiaries were either wholly owned or were objectively insignificant meaning that no scope meme was necessary. The introduction of foreign, vertical and triangular groups illustrates specific faults. For instance, people began to question the usefulness (wealth enhancing potential) of consolidating profits from foreign subsidiaries which could not be repatriated to the group's holding company.

> "If the organisation is structured in such a way that there are liquidity restrictions, and that could occur, for example, because it's got a large amount of cash in a particular country and either the exchange controls are preventing taking the money

> out or there are economic and political pressures that would not smile favourably on the local operations if they paid the money out or it could be more typically that there are outside shareholders, significant outside shareholders, in these different parts of the group but the consolidated financial statements, if they're prepared correctly, would then give a picture to say that we have surplus cash, we have cash as an asset and we have significant amounts of debt, both short- and long-term debt, and the fact that the two are not being offset is an indicator already that the financial leverage, if you want the liquidity, is constrained in some way. I think more information could be given about the nature of debt and the nature of the cash and the assets but we don't seem to have that motivation right now. I mean little use is made of a term called 'restricted cash', which is cash by definition but because you can't get your hands on it, perhaps more use ought to be made of that" (R4).

Doing so created the false perception that there were more distributable reserves available for dividend declarations than was actually the case. It also can distort creditors' perceptions of credit risk. Similarly, consolidating the profits, assets and liabilities of vertical groups with low effective ownership were raised as being potentially misleading, especially to layman investors. T7 used a three-company vertical group to illustrate. Assume each company held 60% of the shares in its subsidiary. If the bottom subsidiary made a ZAR100 profit, only ZAR21.6 of it would be available for distribution as a dividend to the holders of the ultimate parent company. Yet the consolidation income statement would reflect the entire ZAR100 as profit. This makes sense to expert accountants but would not to non-expert users. While using different examples, this point was raised by most of the preparer interviewees as well.

At least 5 difference consolidation scope memes emerged and competed for selection (see Section 2.2.3). Accountants who saw consolidated accounts as amplifying holding company financial statements to overcome the weakness of loss-making subsidiaries required only substantially owned subsidiaries to be consolidated. This better reflected the holding company's earning capacity, assets and liabilities. Goodwill was not an asset and was identified as merely a balancing figure (see Table 3, scope objective 2).

Other accountants were more concerned with assessing a holding company's credit worthiness. These accountants wanted consolidated balance sheets to understand a group's assets and claims on those assets. This scope meme co-operated with a number of additional new memes

which required, for example, the elimination of inter-corporate loans, ranking subsidiary loans by seniority and deducting minority interests from shareholders' equity to strengthen users' ability to assess credit risk (see Table 3, scope objective 3).

Scope objectives 4 and 5 were similar and difficult to differentiate between (see Table 3). In essence, these are similar to today's scope which aims to present a group's financial position and performance as that of a single economic entity. These objectives led to the use of control as the test to determine which subsidiaries ought to be consolidated. Although these memes started in the late 1800s, they have developed into a complex high memeplex which is still evolving over 100 years later because of the interactions between accounting, regulation and society (see Section 2.3).

For example, the IASC defined control as the key feature determining the scope of consolidating (IASC, 1976, para 4). At the time, this was based on ownership. Using ownership as the basis for determining control allowed preparers of financial statements to take advantage to enhance their own wealth. By using complex financial instruments which, for example, give holders the option to purchase additional shares from a set date or under certain conditions, meant management could structure entities and agreements to ensure they were not consolidated despite being economically similar to consolidated entities. Businesses even structured SPVs on "autopilot" to achieve the economics of controlled entities whilst avoiding the need to be consolidated (see Section 2.3).

Similar to the emergence of the original consolidation meme, users' wealth may be diminished by excluding certain subsidiaries and a new modified meme for the definition of control emerged to challenge the then-existing scope meme in a game. The new meme won with the definition that control is where a company has "the power to govern the financial and operating policies of an enterprise so as to obtain benefits from its activities" (IASC, 1994, para 6).

Wealth is key to meme and gene co-evolution (see Section 3.2.2 and Blackmore, 2001). If preparers can increase their wealth by misrepresenting their company's financial position and performance, there is an incentive to do so. This may explain the rise of SPVs to shift debt off balance-sheet.

> "I encountered one or two companies that they had an exception for something which didn't fit into the group, which is a financing operation, and at the end of the accounting year, they would give instructions to the bank to transfer a huge amount of debt out of the operating companies into the finance company. It wasn't consolidated and nobody actually appreciated just how much debt was just floating around in the group because all of the external debt had been moved into this subsidiary" (R4).

The preparer's own wealth potential is enhanced by hiding a negative fact which may lead to heightened scrutiny or job loss. This risk is exacerbated if the respective accountant's accounting meme-inheritance is legalistic in nature (see Section 5.2.1). This allows the person to more easily justify the "loop-hole" as still being compliant with the IFRS grand memeplex while also maximising his personal wealth potential (T7). Enron is a prime example and is synonymous with using SPVs and a creative application of accounting memes to book revenue and inflate group profits (see Haswell and Evans, 2018).

In response to the disturbance created by off-balance sheet financing vehicles and global scandals, the IASB issued SIC 12 adopting a *risks and rewards* approach to determining control. The IASB wanted to cast a wide net to include many types of structured vehicles which the IASB felt ought to be consolidated. Examples included where entities were set up on autopilot to make it appear as though no control existed but, in substance, control existed (SIC, 1998). Ironically, and perhaps illustrating the strength of the co-evolution between genes' desire to look attractive to the opposite sex to mate and memes' selfishness, accountants saw SIC 12 as creating two different models to determine control. Consequently, accountants cherry-picked which model to apply to obtain advantageous outcomes, despite not reflecting the underlying economic phenomena of the arrangement (see IASB, 2011; van Zijl and Maroun, 2017). The cycle of modification, a meme-game and re-modification continued when the IASB issued IFRS 10 to supersede IAS 27 and SIC 12 with a new definition of control (IASB, 2011).

The discussion above also serves to bring the earlier chaos discussion into perspective. What chaos theory would describe as disturbances to the *status quo* can also be understood as the emergence of new memes which compete for selection, causing fluctuations. The system may either return to its original *status quo,* transition or transform. As memes develop and need co-beneficial memes to support one another, they create new branches on the accounting tree with their own sub-branch structure (see Figure 13). The branches of the tree can be viewed as the

trajectory of specific accounting sub-topics or high memeplexes. While chaos theory provides a macro perspective of accounting evolution, memetic evolution and the AEG provide more granular detail with which to analyse the micro-level developments in accounting. Where chaos and memetic evolution overlap and how they contribute to an overall better understanding of the pluralistic nature of accounting is discussed in Section 6.

6: The intersection of chaos and memetic evolution

Sections 5.1 and 5.2 present accounting evolution drawing on chaos and memetic evolution theory separately. The sections presented how each theory provides a credible contribution to explaining accounting's evolution, drawing on consolidation accounting's evolution to illustrate the different aspects. In combination, chaos and memetic evolutionary theories provide a more complete explanation of accounting' evolution and its pluralism as demonstrated by the prior literature. Combining the two theories is reasonable from a theoretical level. There are many similarities between the two theories, some of which have already been pointed out. But, most importantly, both theories relate to systems the future states of which are dependent on their current states and are interconnected with a vast array of co-existing and evolving dynamic systems. These common features are crucial for both chaos and memetic evolutionary theory to be able to be used in a complementary manner.

This section discusses the similarities between chaos and memetic evolution in an accounting context. It presents how both theories can be used to provide a holistic theory of accounting's evolution, called chaotic memetic evolution. In doing so, the section also relaxes the focus on consolidation accounting, which serves to reflect how the combined theory can be applied more generally to accounting's evolution.

Chaos theory provides explanatory power from a macro-level perspective of accounting evolution. For instance, applying it asserts that accounting's future state is dependent on its current state. But, chaos theory does not provide an explanation of *why* this is the case. Here, memetic evolution theory provides a convincing explanation and provides detail at the micro-level perspective. Accountants do not create genuinely new accounting memes. Instead, "new" memes are more accurately described as modifications of previous memes (see Section 5.2.1). Modifications are because of erroneous inheritance processes, degradation of memes over time or active modification. The latter emphasises drawing on currently selected memes to enhance the

credibility of proposals and to protect the reputation of proposing accountants when dealing with new transactions and events (see Section 5.2.2).

Chaos theory provides illustrations of how the accounting systems can respond to disturbances (see Section 3.1.2 and Figure 9). Memetic evolution theory provides more detail about what constitute disturbances. Disturbances do not only emergence because of new transactions and events. They also arise from the inaccurate inheritance of accounting memes, their degradation or through their active modification by accountants (see Section 5.2.1). The presence of dampening feedback systems (see Section 5.1.1) result in a general tendency for a disturbance to result in temporary fluctuations to the *status quo* or incremental changes. Radical memes are typically rejected in favour of marginal ones.

Chaos theory's concept of strange attractors, and this thesis's suggestion that there are different levels of strange attractors, provides an overarching framework to help to understand the order created within the complex and dynamic discipline (see Section 5.1.3). In addition, the notion of strange attractors supports existing literature investigating accountants' epistemic commitment to different knowledge templates (see Durocher and Gendron, 2014; Baudot, 2018; Maroun and van Zijl, 2022). For example, strange attractors help to explain general tendencies for accountants to be attracted to concepts such as prudence, cost versus benefit, cost and fair value accounting. The presence of strange attractors means it is difficult to displace them. Put differently, strange attractors help to explain some resistance to proposals to move away from strange attractors (see Section 2.1). Memetic evolution theory complements chaos theory's strange attractor idea. Strange attractors may be viewed as memes with particularly high assimilation, retention and expression "scores", particularly of longevity.

The stakeholders involved in accounting meme selection's finitude and historicity are both common themes which are important at the macro- and micro-levels for chaos and memetic evolutionary theory. A person's existing knowledge, cumulative experience and current job impact their inheritance of different personal, pervasive accounting, organisational and jurisdictional strange attractors (memes) (see Figure 8). Their overlapping strange attractors (memes) will impact how they subconsciously "score" a meme's assimilation and retention selection factors and, ultimately, their inheritance of different accounting memes. This is where a combined chaotic memetic evolutionary framing of accounting's evolution helps to understand its pluralism and the body of work already conducted into this area.

A weakness of the prior literature is that most studies focus only on analysing how a particular factor or issue impacts accounting's development. For example, positivist research uses the concepts of cost-benefit and political interference to explain the demand and supply of accounting theories (see Watts and Zimmerman, 1979; Zeff, 2002; 2012). Hopwood (1987) provides examples of how the economic status of a country impacts business's accounting information needs while Bryer (2000a) uses the co-evolution of society and accounting to isolate the birth of capitalism and its impact.

Walker (1978) discusses the importance and impact of compromises made during the IASC's development of early consolidation accounting practices. Others, such as Larson and Kenny (2011) looked at the IASC/IASB's funding model and whether that impacted their accounting meme selection. From a more pervasive technical perspective, other academics have investigated the impact of changing pervasive accounting memes on the trajectory of accounting (see Whittington, 2008; Ravenscroft and Williams, 2009; Deegan, 2014; Zhang and Andrew, 2014).

Not all the factors discussed in the prior literature appear to influence accounting's evolution consistently. Why some factors are only impactful at certain points in time and less so at others requires an explanation that a chaotic memetic evolutionary lens can provide.

From both macro- and micro-level perspectives, accounting is a dynamic system which both impacts on and is impacted by the evolution of related systems. These include, for instance, society, regulation, technological and economic status. Chaos theory's path-dependency presents a vivid image to understand accounting's evolution and why certain factors were important at specific times. As different interrelated systems evolve, they disturb one another. The specific disturbance can help to explain why specific factors, such as the birth of capitalism or IASC funding, impact accounting meme selection at certain points in our history. Accountants must modify and recombine existing accounting memes in response to disturbances. But, importantly, those accounting memes must be grounded in already accepted practice in order to be acceptable to fellow accountants and ensure it resonates with existing practitioners (see Sections 5.1.1 and 5.2.1). The assimilation and retention factors discussed in Section 5.2.3, couple with viewing accounting memes as being in competition with one another for selection, are key.

Accounting memes selfishly compete with one another to be selected as the accounting treatment for transactions and events. The assimilation, retention and expression factors impacting accounting meme selection mean that memes already accepted have a selection advantage. This aligns with the concept of path-dependence. The combination of all selected memes at a point in time does not necessarily mean that they are the "best" or "fittest" accounting treatment (see Dawkins, 2016). Neither do they represent the optimal memes or accounting grand memeplex. Rather, they represent the currently selected memes based on the *actual trajectory* our accounting grand memeplex has taken in association with related co-evolving systems.

Recall Roe's (1996) path-dependency illustration from Section 3.1.3. A trader physically walks a winding route to avoid being attacked by predators nesting in the area. The path became well-travelled with dwellings and other establishments being built along it. Looking at the geographical layout at a future point, it may seem that the winding route must have survived because it provides the optimal pathway. This is not necessarily true. The winding road was beneficial at a point in the past. Its continued existence only confirms that the current cost of destroying all that has been built around the winding road merely outweighs the benefit of changing the road and related infrastructure.

In the accounting context, the macro- and micro-level explanatory power of chaos and memetic evolution theory can be applied to different key stages to illustrate. Firstly, at some point in time, people selected currency as the common unit of measurement for trade and reporting (Temple, 1899; Jenks, 1964). From a micro-level perspective, this may be because the meme for currency out competed other barter-related memes. Without needing to go into the history of currency and money, using currency as a standard unit of measurement and then metallic money as small and convenient mediums of exchange (Temple, 1899). Without currency, trade would require people to know the value of a variety of different goods and services with reference to many other goods and services. Currency and money eliminate this weakness (Temple, 1899; Jenks, 1964).

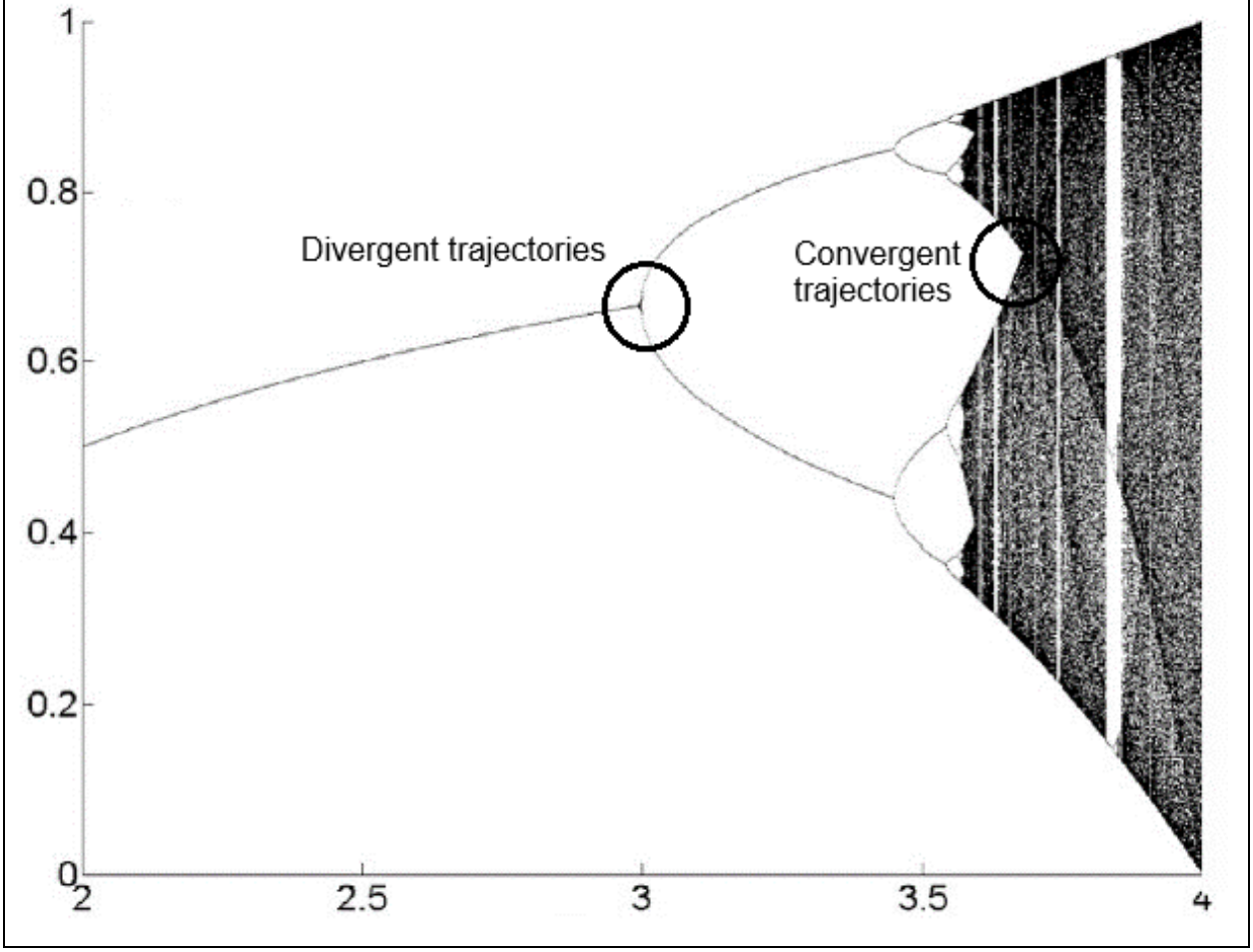
Money's selection as the medium of exchange had the consequence of becoming an important indicator of people's wealth (see Section 5.2.3). The co-evolution between genes and memes, on the back of this path taken may help to explain the economic and short-term profit focus characterised by early accounting and criticised by many contemporary accountants (see Deegan, 2014; Flower, 2015). It may not be that people intentionally consumed environmental

resources recklessly and dismissed the negative social impacts of their business practices in the pursuit of profit. Instead, it may be that genes were driving accounting memetic evolution to favour financial wealth creation via biological natural selection (see Blackmore, 2001). Put differently, our genes, via natural selection, selected mates with high financial wealth leading to more people with a financial wealth accumulation priority. The memes merely co-evolved to support successful genes and, in doing so, their own longevity.

The world may have looked very different had selection pressures focused on, what is now known as, triple bottom line reporting. Had this been the path taken, there would be over a decade's effort put into developing memes to identify, measure, recognise and disclose the environmental, social and economic performance and position of companies. In doing so, perhaps society would have been consciously aware of the impact of economic profiteering on the environment and society.

The logistic maps developed under chaos theory provide a useful visualisation of the various potential trajectories which accounting's evolution could have taken (see Figure 14). Each point on the logistic map represents where accounting could have been. Certain events create important points of divergence. However, Figure 14 also presents that once-divergent trajectories can converge. While accounting initially took an economic-only framing of company performance and position, this is changing. Researchers are experimenting with different types of accounts to provide useful information and empower a broader stakeholder focus. These range from more modest forms such as Tripple-Bottom-Line reporting (see Norman and MacDonald, 2004) and the preparation of integrated reports (Atkins and Maroun, 2015) to more radical examples in the face of the environmental crisis. For example, Atkins et al. (2015) investigate monetising nature while Haslam and Gallhofer (1996) and Atkins and Maroun (2020) consider using pictorial accounts. From a more scientific perspective, Campbell (2005) and Amaral et al. (2016) discuss the concept of "emergy", developed in the 1970s, where energy is used as the common unit of measurement. In doing so, everything from trees, the use of labour to convert wood to inventory and selling costs can be accounted for and presented.

Figure 14: Example of a logistic map



(adapted from Cottam and Vounckx, 2022, p. 2)

Accepting that accounting's future state is dependent on its current state, chaos theory explains how the presence of feedback loops can lead to periods of convergence and divergence. Firstly, accountants must agree on the treatment of similar transactions and events to produce information which is comparable across different companies and industries. The anxiety accountants feel when they need to develop new accounting treatments leads them to rely heavily on existing accepted accounting memes (Sections 5.1.1 and 5.2.2). By drawing on currently acceptable (winning) memes, accountants reduce the probability that their new modified meme or memeplex will be viewed as "radical" by other accountants and rejected. This also avoids raising concerns by auditors, colleagues and regulators about the competence of the proposing accountant (Section 5.2.2). Secondly, during the process of modifying existing memes, accountants feel obliged to corroborate their ideas with fellow accountants. These two mechanisms are dampening feedback loops which push accounting into a state of stability. At

present, the IASB's due process is an amplified and formalised consultation and corroboration exercise that acts as this dampening mechanism.

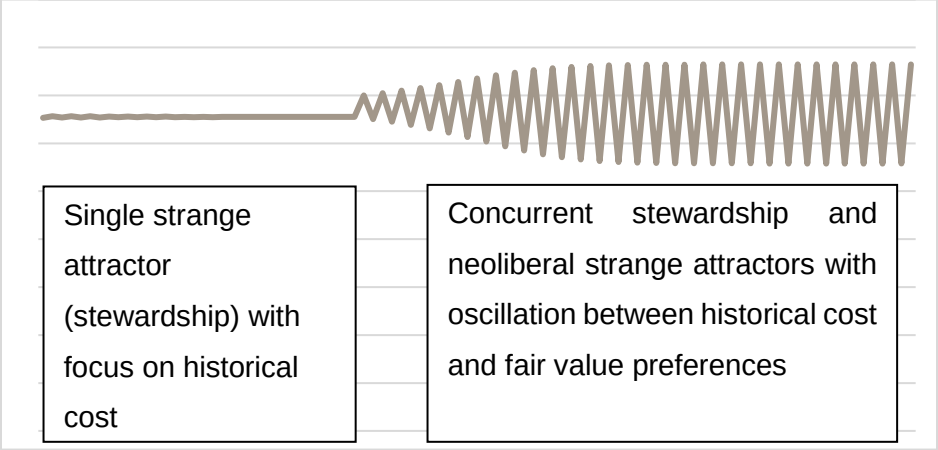
Where dampening feedback loops are more prevalent than positive loops, significant accounting changes are avoided in lieu of minor, incremental ones. Accountants who operationalise accounting memes by preparing financial information feel comfortable to perform their duties and, consequently, are likely to achieve efficiencies (see Dolan et al., 2000). Users, particularly analysts, are also comforted and achieve efficiencies because of convergence or dampening feedback systems. These users can develop models to estimate the value of companies and benchmark performance to form and provide opinions about buy, hold and sell decisions. In chaos theory, the points of convergence are called *strange attractors* and are useful to understand why accountants appear to be attracted to certain features of accounting at a macro-level. In early accounting history, one example of a strange attractor was historical cost and the stewardship objective (see Whittington, 2008; Ravenscroft and Williams, 2009). In the consolidation accounting context, the concept of control is another key feature to which other memes tend.

Crises, political regime changes and major technological and social shifts create opportunities for reinforcing feedback loops to lead to periods of instability or divergence. During these periods, accountants can be more creative and innovative in the extent to which they modify existing accounting memes to respond appropriately to disturbances (see Section 3.1.1). Importantly, accountants may also challenge and amend the very strange attractors of accounting with far-reaching consequences for many aspects of accounting and its future trajectory. This is because the need to respond appropriately to crises reduces the pressure from dampening feedback loops to make only marginal changes to existing memes (see Section 5.2.3). For example, Ravenscroft and Williams (2009) suggest that there was a shift from a *stewardship* objective of accounting to the *neoliberal* objective post World-War II. Under a stewardship objective or strange attractor, accountants were pulled towards historical cost-based accounting treatments, creating order among accounting memes and along a specific trajectory. After World-War II, the neoliberal objective and strange attractor merged where fair value is the primary accounting measurement method or memeplex (see Whittington, 2008; Ravenscroft and Williams, 2009; Zhang and Andrew, 2014).

Neither the stewardship nor neoliberal objective of accounting has managed to display completely the other (Whittington, 2008; Ravenscroft and Williams, 2009). What Ravenscroft and Williams

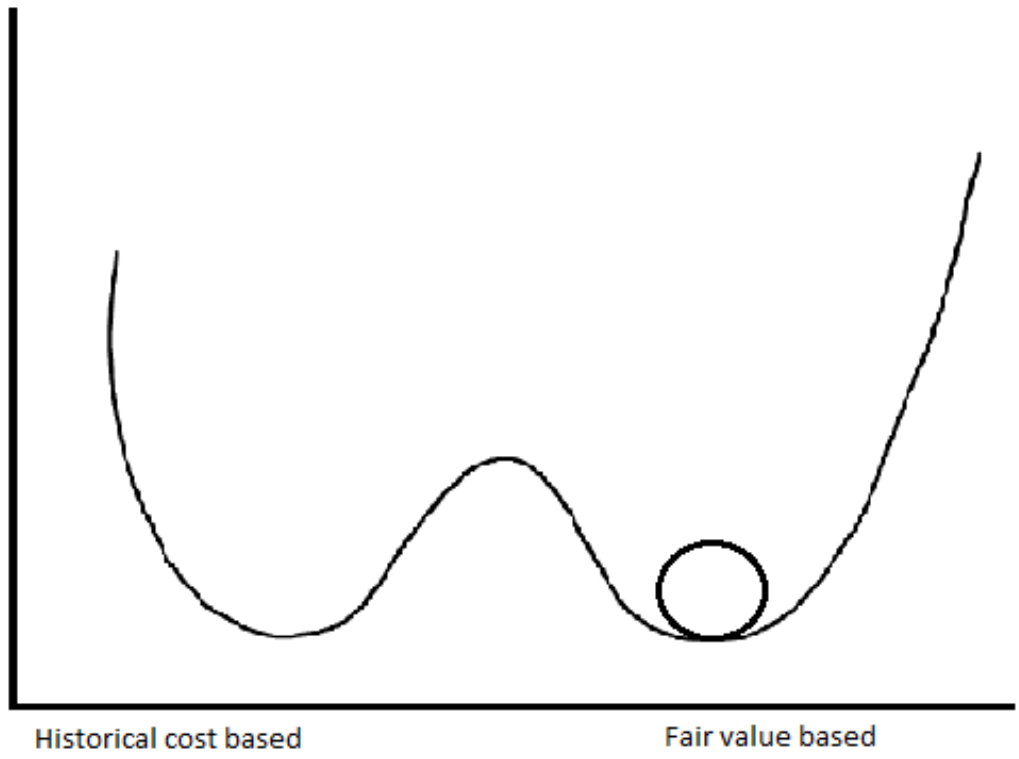
(2009) call the “incoherence” of accounting may more accurately be describing accounting as being in an extended reproduction system between two, often, conflicting strange attractors. Consequently, we can view the objective of accounting as being represented by an extended reproduction system (see Table 10).

Table 10: Transformation of strange attractors in accounting



Again drawing on chaos theory, another way to represent the concurrent presence of both elements of stewardship and neoliberalism is as a basin where certain accounting memeplexes fall into one basin while others into the other (see Figure 15).

Figure 15: Representation of dual basin objective of accounting



(Adapted from Polley, 1997, p. 447)

The shift from a predominantly stewardship view of accounting towards a more neoliberal focus also reveals the presence of chaos theory's fractal property. As winning memes are increasingly based on conceptualisations of fair value, corresponding changes are made to other accounting memes using similar arguments. Memes with similar strategies began to be selected more frequently. For example, the IASB's Conceptual Framework for Financial Reporting was also amended to replace the concept of *reliability* with that of *faithful representation* while *relevance* was made the most important qualitative characteristics. The selection of and prominence given to the qualitative characteristic *relevance* is important as it is crucial (co-beneficial) to fair value memes' increased use. It provided the theoretical grounding for fair value memes to prosper at the expense of, or in conjunction with, cost-based memes.

Crises also allow new accounting memes which were previously rejected as being too radical, regardless of whether they would provide improved useful information, to re-engage the

incumbent memes (Section 5.1.1). Where the winning meme represents a significant change to the accounting memeplex, a transition or transformation (Section 3.1.2) may arise setting the accounting grand memeplex on a new trajectory. This aspect of accounting evolution is made more complex by the interaction between society and accounting (see also Hopwood, 1987; Bryer, 2000a).

Chaotic systems can reach an equilibrium state where it either is attracted to a single point (simple reproduction) or oscillates between two or more points (extended reproduction system). Once in an equilibrium, a disturbance may cause temporary fluctuations until the system returns to its equilibrium state, or original strange attractor/s. Alternately, the disturbance may cause a transition where the system remains a simple reproduction system but with a new single strange attractor. Lastly, the disturbance may cause a transformation, in which case, a simple reproduction system may become an extended reproduction system or vice versa. The system may also crash. While not the objective of this thesis, the shift from a stewardship to a neoliberal objective of accounting may represent a transformation from a simple reproduction system with one key objective to an extended reproduction system which oscillates between two objectives, stewardship and neoliberalism. This may explain why Ravenscroft and Williams (2009, p. 770) question whether accounting "has reached a state of near-total incoherence" as accounting oscillates between stewardship and neoliberalism.

Finally, the idea that systems do not evolve in a linear fashion but rather like a streetcar driving in town is useful (see Hammerstein, 1996). This is because if an investigation uses too narrow a focus, it may appear as though accounting regresses. But, with a longer period of investigation the overall progression can be seen. Accounting (and consolidation accounting's) evolution is not linear. It stops often with plateaus where there is little, if any, change for extended periods (see Figure 4). The result is a trajectory that, at times, appears to be regressive but is ultimately progressive. For example, the idea of current value (fair value) is over a century old but has experienced episodic commitment throughout accounting's development (see Georgiou and Jack, 2011; Durocher and Gendron, 2014; Barker and Schulte, 2017; Baudot, 2018; Maroun and van Zijl, 2022). Another example is consolidation accounting and the emergence of associate and joint venture accounting (see Section 2.3 and Figure 11).

Suggesting that accounting's evolution is progressive should not be confused with proposing that accounting has telos or finality. While not an explicit goal of this thesis, using a chaotic memetic

evolutionary lens sheds light on this under researched area. Because accounting co-evolves with countless other systems (see Sections 5.1.1 and 5.2), it is highly improbable that there is a “perfect” and “final” accounting meme grand memeplex which can be achieved (see Stone, 1999; Seppänen et al., 2007). As long as society, regulation and the business environment continue changing, accounting will change. Consequently, accounting standard-setters should not look to develop standards which will never need to be amended. Instead, standard-setters should aim at setting medium-term standards to ensure that standards align with the present needs of financial statement users.

7: Conclusion

While there are a many papers investigating the impact of various factors on accounting's development, these tend to focus on how only a few factors impact accounting in isolation. This thesis used 30 interviews with financial accounting experts and principles drawn from chaos and evolutionary game theory to propose a framework which explains accounting's evolution using the case of consolidation accounting. The chaotic memetic evolution framework helps to explain both the macro- and micro-level processes involved in accounting's evolution.

7.1: Summary of findings

Chaotic evolution in consolidation accounting is characterised by five observations. Firstly, consolidation accounting is impacted by other systems including business and taxation regulations, social norms and economic circumstances. Secondly, accounting's future is dependent on its current state, creating path-dependency. Thirdly, consolidation accounting remains relatively stable (unchanging) for extended periods. Only when the system is disturbed might it change. The presence and strength of dampening and reinforcing feedback loops contribute much to whether the system is currently stable or likely to make a radical evolutionary shift (see Section 5.1.1). Fourthly, we see the evolutionary pattern of consolidation accounting resembling that of other aspects of accounting more broadly. This indicates the presence of fractals (see Section 5.1.4). Fifthly, what accountants might call "rules-of-thumb" or heuristics may more aptly be described as strange attractors. These concepts, ideas, values and techniques attract accountants and, in so doing, create a sense of order. This is because they limit the countless possibilities about how transactions and events might be treated (see Section 5.1.3).

This thesis found that there are different types of strange attractors acting on accountants. Where accountants' personal, pervasive accounting, jurisdictional and organisational strange attractors overlap is different (see Figure 8). This helps to explain why honest and renowned accountants can look at the same new transaction or event and come to different conclusions about how it ought to be accounted for despite utilising the same IFRS framework. These characteristics improve our understanding of accounting's macro-level evolution. Drawing on biology, we can enhance our understanding of the micro-level changes.

While evolutionary game theory is a biological theory, it has been applied extensively in non-biological settings such as economics, law, mathematics and military theory (see Felsenstein, 1989; Roe, 1996; Finkelstein, 2008). Its application in non-biological systems is called “memetic evolution”.

Memetic evolution in consolidation accounting is categorised by five core observations. Firstly, memetic evolution explains the mechanisms which causes accounting’s future state to be dependent on its current state. No “new” meme is truly original but is a modification of one or more existing memes. Consequently, accounting’s future state is dependent on its current state (see Section 5.2.2). Secondly, memetic evolution sheds light on how and what constitutes a disturbance under chaos theory. Disturbances can arise from changes to interrelated systems. For example, the emergence of inter-corporate investments and group structures (see Section 2.2). Disturbances also arise from inaccurate inheritance processes and through active modification (see Section 5.2.2).

Thirdly, memetic evolution enhances our understanding of the various feedback loops identified by chaos theory. Most often, active modification does not lead to radical changes because of the presence and strength of numerous feedback loops. For instance, basing new memes on existing memes grounds potential new memes in currently accepted practice. Also, that accountants’ protect their personal reputations is another loop. It leads to a type of qualitative Delphi to ensure proposed memes are acceptable to accountants and have some level of internal consistency (association) with other currently accepted memes. In doing so, radical changes are rejected in favour of more marginal changes being selected over a period of time (see Section 5.2.3). The presence of strange attractors also acts to keep the system orderly around specific concepts, ideas, values and techniques.

Fourthly, memetic evolution is about selfish memetic replication. Accountants and society are merely a means to an end as memes replicate for their own benefit and not that of accountant hosts or society at large. This shifts our focus away from blindly assuming all current accounting treatments must be “best” because they have survived. Supporting chaos theory’s path-dependency, memes use different strategies to “win” accounting meme selection games. Co-beneficial memes prop-up one another as assimilation and retention are impacted by how easily memes can be associated and build upon existing memes (see Section 5.2.4). This also raises

the fifth and final point which is that memes, genes and other related systems co-evolve creating a complex dynamic.

7.2: Key contributions and implications for education, theory and practice

The thesis uses two novel and innovative theoretical frameworks in an accounting context. This inter-disciplinary research approach responds to calls for more critical and interpretive accounting research which does not assume accounting is merely a technical and rational progression (see, Hopwood, 1987; Napier, 2001; Botzem and Quack, 2005) and for academics to engage directly with practitioners (see Burchell et al., 1980; Schipper, 1994; 2003).

The chaotic memetic evolution framework provides novel insights into the macro- and micro-level processes at work in the context of consolidation accounting. This is an important contribution because much of the prior research focuses on the inferential analysis of financial accounting outcomes and their market implications at a point in space-time (Watts and Zimmerman, 1979; 1990; see Barth et al., 2001; Deegan, 2014; see Barth et al., 2018). The framework is also different from previous efforts to "map" accounting's evolution history because of its space-time applicability.

Because of the fractal property of accounting evolving (see Section 5.1.4), academics can study different scales and make valid inferences about its evolution at different levels. This is useful as academics often struggle to gain access to all components of accounting evolution and those involved with the selection of accounting memes. It is also impractical to engage with people and organisations cited in accounting's early development. By understanding the intricacies of accounting fractal, suggestions about early development can be made by drawing on current processes of evolution.

The finding that there may be multiple types of strange attractors complements existing literature on the concurrent functioning and interaction between competing institutional logics (see Besharov and Smith, 2014; Cerbone and Maroun, 2019). Using the chaos lens, more "logics" or strange attractors can be identified and their interactions and consequences studied in more detail (see Section 5.1.3).

The thesis reflects that accounting evolution must be understood via memes – the smallest units of accounting concepts, techniques and disclosures. Memes compete for survival for their own benefit and *not* that of their accounting hosts' or society at large's. The accounting discipline becomes more diverse and complex via the two-step accumulation of modified memes (see Section 5.2.2).

The two-step accumulation of selected memes does not guarantee improved efficiency, effectiveness nor desirability. Regarding the desirability, many scholars argue that accounting is inextricably linked to environmental degradation, widening social inequality and unequal wealth distribution (see Tinker et al., 1991; Gray et al., 1996; Sikka and Willmott, 2005; Zhang and Andrew, 2014; Flower, 2015). This is an important assertion as accounting's short-term and economic framing of company performance and position may not be indicative of poor judgement and profiteering by early accountants. Instead, it may be the result of successful meme strategies coupled with the co-evolution between genes and memes (see Section 5.2.5).

From an accounting education perspective, the thesis provides important insights into the selection factors and processes through which accounting memes are inherited during an accountant's formative years. Accountants' intellectual capabilities and ability to be rational are limited with important implications for accounting meme assimilation, retention and expression (see Tsoukas, 1998; Lee, 2006). For example, under-developed linguistic and mathematic knowledge bases have a direct impact on an accounting student's ability to assimilate new memes. This is because memes which can be more easily associated with existing knowledge have a selection advantage. Even if students rote learn specific memes without the underlying knowledge to build upon, these memes are likely to degrade quickly (see Section 5.2.3). Relatedly, all accountants unconsciously recombine memes to some extent during their careers because of our limited capacity and intellectual abilities. Most are identified by colleagues as deviations but some flexibility in how each accountant expresses accounting memes will always be present.

Accountants' historicity plays a crucial role in shaping an accountant's inheritance, interpretation and expression of accounting memes. Put differently, an aspiring accountant's motivation, pre-existing knowledge, lecturers, work experience and their job play important roles in shaping their accounting meme selection preferences. For instance, those taught with a conceptual versus

rules-based approached will differ in how they assimilation, retain and express accounting memes.

Finally, the thesis has important implications for accounting standard-setters. While not an explicit goal, the thesis suggests that accounting standard-setters use a medium-term horizon when developing accounting standards. This is because there is no ultimate or final accounting memeplex that they should strive to achieve. In addition, standard-setters can be made more consciously aware of the strange attractors at play and impacting accounting meme selection. In the IASB's drive for theoretical sound and internally valid set of accounting standards (see Lee, 2006; Deegan, 2014).

7.3: Limitations and areas for future research

The thesis is not without its limitations. The thesis broadly outlines and "tests" the applicability of the chaotic memetic evolution framework and how its components apply to the development of accounting theory and practice. The examples provided are based on the prior literature, only 30 interviewee responses and the researcher's own practical experience. Additional empirics are required to evaluate the chaotic memetic evolution framework.

The thesis considered the proposed framework primarily in the context of consolidation accounting's evolution. Detailed case studies are required to "test" the framework in the context of other significant accounting developments. For example, financial instruments, lease accounting, insurance accounting and share-based payment transactions. In doing so, further refinements to the proposed framework are also required.

For example, the pure biological research goes into great detail about the impact of frequency-dependent and frequency-independent strategies. As the names suggests, some strategies are more effective when they are more or less common. Future research should aim to specifically identify whether frequency-dependent and independent strategies exist in the accounting context. More broadly, researchers should also conduct studies with the explicit aim of identifying and understanding as many accounting meme strategies as possible. Closely linked to this, papers seeking to identify the different types of strange attractors (see Figure 8) and strange attractors more generally will be valuable.

More work is required to tease out the different types of games played among memes. For example, they can consider the relevance of dove-hawk; arms race; zero-sum; non-zero sum; chicken; mixed motives; leader, battle of the sexes, co-operative or non-cooperative and reiterated games relevant in the context of accounting (see Colman, 2013). Studies aiming to gain a more complete understanding of the different strategies currently existing accounting memes play will also be required and can develop the assimilation, retention and expression factors discussed in Section 5.2.3). In this area, the prior papers dealing with specific aspects of accounting's evolution may hold important clues for extending our understanding of meme games and accounting's pluralism. This research is likely to include considerations about how to solve accounting meme games. For instance, are least regret; maximax and minimax tools relevant to understanding accounting meme games (see Colman, 2013).

An application of the chaotic memetic evolution framework to core accounting techniques, such as double-entry bookkeeping, complements the work which tends to prioritise how accounting derived from the use of tokens and imagery (see Mattessich, 1987; see Mattessich, 1998) or from the construction of alternate social and physical realities (see Haslam and Gallhofer, 1996; Sullivan and Hannis, 2017; Atkins and Maroun, 2020; Atkins and Macpherson, 2022) reflecting the prevailing space-time context.

Biological evolution is inextricably linked to gender (see Blackmore, 2001; Hou et al., 2020) and this thesis suggests how it may have impacted the economic framing adopted by early selected accounting memes. More research is required to link the existing literature on the relevance of gender to accounting's evolution with the proposed framework. For example, Apicella et al. (2008) consider the relationship between testosterone and financial risk preferences while Jia et al. (2014) investigate the relationship between testosterone and financial misreporting. The latter is relevant in the wake of the Enron scandal which used group structures and aggressive accounting treatments (see Haswell and Evans, 2018). Parker (2008) considers the role of gender in management and accounting processes. This research provides useful building blocks upon which the micro-level and co-evolution concepts suggested by memetic evolution offer.

The chaotic memetic evolution framework complements the work of Laughlin (1991) by adding more depth to his ideas about inertia, disturbances and first and second order change. This thesis's suggestions that accounting is stable until disturbed supports Laughlin's (1991) inertia

concept. The distinction between macro- and micro-level change processes may extend Laughlin's (1991) first and second order change.

Finally, the thesis has important implications for the current drive for social and environmental reporting (see Atkins and Maroun, 2014; Deegan, 2014; Atkins et al., 2015; De Villiers and Maroun, 2017; McNally et al., 2017; Atkins and Macpherson, 2022). Investigating the co-evolution of genes and accounting memes in more detail will shed more light on the dominance of an economic framing of company performance and financial position. In doing so, it may be able to provide valuable insights accounting standard-setters and regulators should be conscious of when selecting accounting memes. Moreover, the research may better equip interested stakeholder groups with the knowledge of how best to tackle the prevalence of economic-orientated accounting meme strategies and their selection.

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Appendix A: Participant information sheet

INFORMATION SHEET FOR PARTICIPANTS



Ethics clearance number: H18/07/29

Title: The plurality of accounting: Can chaos and evolutionary game theory be used to develop a framework explaining consolidation accounting practice development?

Dear Sir/Madam

My name is Wayne van Zijl and I am a PhD student in the School of Accountancy at Wits University in Johannesburg. As part of my studies I have to undertake a research project. I am evaluating consolidation accounting practices and, as part of this, how consolidation accounting has changed over time. We would like to invite you to participate in this research project. You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, it is important for you to understand why the research is being done and what your participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information.

- In this study, we want to investigate (1) the nature of changes in consolidation accounting practices and (2) the implications of these changes.
- If you agree to participate, a time will be scheduled for an interview that is expected to take not more than sixty minutes to complete.
- There are no material risks posed by participating. Your identity and place of employment will be kept confidential. No personal information will be collected from you.
- There are no right or wrong responses – this research is only interested in your own experiences and impressions.
- Interviews will be audio recorded, subject to your permission. The interview will be transcribed and kept on file by the researcher but your identity and that of your employer and/or clients will be kept confidential and will not be referred to directly in the final research report.

- You will not receive any compensation for participating in the research. There is no direct benefit from participating or not participating in the research.
- Should you be interested, a copy of the final report will be available to you on request.

It is up to you to decide whether to take part or not. If you decide to take part you are still free to withdraw at any time and without giving a reason. In addition to withdrawing yourself from the study, you may also withdraw any data/information you have already provided up until it is transcribed for use in the final report.

If this study has harmed or offended you in any way, you can contact the University Human Research Ethics Committee (non-medical), telephone +27(0)11 717 1408, email hrec-medical.research@wits.ac.za/ Shaun.Schoeman@wits.ac.za. If you require further advice and/or information, the researchers can contacted using the details below:

Details	Researcher 1	Researcher 2
Name	Wayne van Zijl	Warren Maroun
Contact number	+27(0)11 717 8227	+27(0)11 717 8245
Email address	Wayne.VanZijl@wits.ac.za	Warren.Maroun@wits.ac.za

Yours sincerely

Wayne

Appendix B: Consent form

CONSENT FORM FOR PARTICIPANTS IN RESEARCH STUDIES

Please complete this form after you have read the Information Sheet and/or listened to an explanation about the research.

Title of Study: The plurality of accounting: Can chaos and evolutionary game theory be used to develop a framework explaining consolidation accounting practice development?

Ethics Committee:H18/07/29

Details	Please tick or initial
I agree that my participation will remain anonymous	
I agree that the researcher may use anonymous quotes	
I understand that if I decide at any time during the research that I no longer wish to participate in this project, I can notify the researcher involved and withdraw from it immediately without giving any reason. Furthermore, I understand that I will be able to withdraw my data up to the point of submission of my responses.	
I understand that the information I have submitted will be published in a thesis and/or publication and that I can request a copy of the final article.	
I understand that my personal information will not be collected. My identity and that of my employer and/or clients will be kept confidential and will not be referred to directly in the final report.	
I agree that the information I provide may be used anonymously in other research projects	
I consent to my interview being recorded/to may data being used in the research/my questionnaire being included in the final results.	

Participant's Statement:

I, _____, agree that the research project named above has been explained to me to my satisfaction and I agree to take part in the study. I have read both the notes written above and the Information Sheet about the project, and understand what the research study involves.

Signed **Date**

_____ _____

Appendix C: Original interview agenda

Question	Reason for including question
How do new accountants 'learn' accounting?	Introduces the inheritance process without being directly prompted. Will inform whether this process is itself a form of new prescriptions arising without biasing interviewees into offering this. This is analogous to mutation during sexual reproduction in biology.
How do new accounting prescriptions arise?	To understand how 'mutant'/variant forms of accounting arise. This precedes understand how these new prescriptions battle for acceptance and become included in an accounting standard. Is this a formal process, 'random' or other. It also provides evidence of whether this is a chaotic system where accounting's future state is dependent on its current state.
Who are the stakeholders involved in developing accounting standards?	These may be the stakeholders/players whose strategies will be questioned later to understand the game being played when new proposals are being developed.
What do each of these stakeholders want? What motivates them to promote/oppose specific accounting prescriptions?	To understand stakeholders' motifs. This aids unpacking the game being played. This will be explored in great detail and include a discussion of whether these motivations are constant or vary over time or per matter being evaluated; whether it is easy to switch between strategies or whether these are inherited from previous generations of this stakeholder. Whether the frequency of strategies in use affects this consideration.
What are the possible outcomes of discussions by stakeholders over new emergent accounting prescriptions?	Aids in understanding the type of game played when a new technique arises. This could be replacement of old technique with the new, an accounting policy choice between the two or abandonment of both.

	This also helps understand the type of disturbance and what the effect of that disturbance is (transition or transformation). This will also touch on what discussions at the IASB and outside are like. Are these co-operative, competitive or a mix of both. This talks to the type of game/s played.
Why do we have group structures?	To identify how group structures came about (planned/designed or natural evolution), what the disturbance, if any, was and whether group structures are still appropriate or should be changed (if so, why).
What, if anything, changed when IFRS 10 was published? Did it make changes to consolidation practice?	To understand the effect of a crisis on consolidation's evolution and whether anything actually changed It allows the interviewee to offer alternates if/as they see fit.

Appendix D: HREC (non-medical) ethics certificates

Research Office

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)
R14/49 Van Zijl

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER: H18/07/29**
PROJECT TITLE	The plurality of accounting: Can chaos and evolutionary game theory be used to develop a framework explaining consolidation accounting practices?
INVESTIGATOR(S)	Mr W Van Zijl
SCHOOL/DEPARTMENT	School of Accountancy/
DATE CONSIDERED	20 July 2018
DECISION OF THE COMMITTEE	Approved
EXPIRY DATE	31 January 2022

DATE 01 February 2019

pp **CHAIRPERSON**
(Professor J Knight)

cc: Supervisor : Professor W Maroun

Appendix E: Ethical clearance extension

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Research Office

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)
R14/49 Van Zijl

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER: H18/07/29**
PROJECT TITLE	The plurality of accounting: Can chaos and evolutionary game theory be used to develop a framework explaining consolidation accounting practices?
INVESTIGATOR(S)	Mr W Van Zijl
SCHOOL/DEPARTMENT	School of Accountancy/
DATE CONSIDERED	20 July 2018
DECISION OF THE COMMITTEE	Approved Two year extension only
EXPIRY DATE	31 January 2024

DATE 08 February 2022 **CHAIRPERSON**

(Professor J Watermeyer)

cc: Supervisor : Professor W Maroun