THE ROUTINISATION OF MANAGEMENT CONTROLS IN SOFTWARE

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Abstract

Our paper aims to explore management control as complex and intertwining *process over time*, rather than the (mainstream) fixation on rational, optimising tools for ensuring business success. We set out to contribute towards our understanding of why and how particular management controls evolve over time as they do. We discuss how the management control routines of one organisation emerged and reproduced (through software), and moved towards a situation of becoming accepted and generally unquestioned across much of the industry. The creativity and championing of one particular person was found to be especially important in this unfolding change process. Our case study illuminates how management control (software) routines can be an important carrier of organisational knowledge, both as an engine for continuity but also potentially as a catalyst for change. We capture this process by means of exploring the 'life-story' of a piece of software that is adopted in the corrugated container industry.

Keywords: management control, routines, software, organisational knowledge.

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Introduction

A great deal of the management control (MC) literature still concentrates on the design and implementation of 'rational' and 'optimising' solutions, configured to ensure success in business (Baldvinsdottir et al, 2010). The mainstream approach largely ignores the general (or contextual) applicability, the origins, the implementation and much more relating to the (social, political, institutional) life of MC. According to the mainstream MC approach, it is fundamentally the optimising techniques and tools 'per se' that *matter*.

Relatively less has been written about the evolution of MC in organisations *as process over time*, conceptualising and empirically observing the rich, complex and interwoven processes through which MC appears (disappears) and continues (changes) (Burns, 2000). This paper aligns itself to such objectives; its authors subscribe to the view that MC is anything but a precise science from which optimal solutions can be formulated. All organisational change (we contend) is complex, socially constructed, sometimes *ir*rational, and often *sub*-optimal; and as scholars we are interested in understanding more how particular MC configurations become what they are (not), over time and in particular settings.

Thus our contribution here is one of exploring how the MC routines of one organisation, embedded in their bespoke software, evolved into becoming broadly accepted ways of working across much of an industry. We capture this interesting (MC) change process by means of investigating the 'life-story' of particular software that is adopted in the corrugated container industry. Our (mostly anecdotal) evidence provides insight into how MC practices implicated in this particular software became routinised in one organisation but, over time, came to represent the unquestioned 'way things are done' across much of the industry. And, in so doing we also extend our understanding of how management control (software) routines can carry organisational knowledge through time and across various contexts.

The paper begins by introducing the literature which conveys MC as a largely routinised and potentially institutionalised aspect of day-to-day organisational practice (Burns and Scapens, 2000). Next we describe our case study, first with a brief overview of the corrugated container industry sector. This case study is based primarily on interviews with the (now retired) founder of our software (case) organisation, but is also supplemented with evidence from interviews with the current CEO of that organisation. Finally we discuss our case findings in relation to the adopted theoretical approach.

Management Control as Routinised Process

Burns and Scapens (2000) presented a theoretical framework for conceptualising management accounting change as process over time; in particular this framework highlighted the potential inertia embedded in management accounting rules and routines, as well as the potential for such phenomena to become taken-for-granted (i.e., institutionalised), and embody knowledge, over time. Since its publication, numerous MC scholars

have also adopted the Burns and Scapens (2000) framework to conceptualise and understand MC as process over time[1], teasing out and illuminating the complexities of both stability *and* change in cumulative MC practice (e.g., Dillard et al, 2004; Scapens, 2006; Soin et al., 2002).

The nature of routines

Organisational routines are central to evolutionary economic theory which views organisational practice as cumulative phenomena over time (Nelson and Winter, 1982), although as Pentland et al (2010) remarked, scholars are "still struggling with how to conceptualise, observe and compare […] organisational routines" (p.917). There is a growing literature on 'routines', spanning multiple disciplines (Becker, 2008), and offering variety in respect of definitions and more. Becker's (2008, p.4) definition is a useful start, when he suggests that 'organisational routines' refers to a trio of concepts, namely: (1) recurrent behaviour patterns, (2) rules or procedures, and (3) dispositions.

If we start with such concepts it would be fairly easy to see why some scholars have therefore classified management control (e.g., techniques, systems) as being *routine in nature*. Most MC techniques (e.g., budgeting) underpin recurrent and rule-like organisational activity. Similarly, and we argue here, we can view organisational software as comprising and reinforcing multiple characteristics of a routine (and routin*ised*) nature over time. Scapens (1994) was one of the first scholars to introduce the concept of 'routine' into MC-related literature, extended further in the Burns and Scapens (2000) framework in which they defined routines[2] as "the way things are done" (p.6), as opposed to 'the way things ought to be done' (which they claim describes an organisational rule).

It is the (broad) definition of Becker (2008) that we adopt here, but aligned also to an extent with the ideas of Burns and Scapens. However, we also define routines as comprising sub-categories, such as when they are either 'ostensive' or 'performative' in character (Feldman and Pentland, 2003). That is, we highlight that the ostensive dimension of a routine will likely be tacit, and thus mould perceptions of what a routine constitutes, can become codified as some standardised procedure, and may well recur as taken-for-granted norms. They can also represent cognitive regularities or expectations that enable individuals or groups to relate to the undertaking (and outcome) of a routine. On the other hand, performative routines are the specific action(s) of people when engaged in an organisational routine, over particular time and space. In other words, we are making a distinction between the abstract concepts of a routine *per se* (i.e., encompassing multiple subjective understandings) and their associated behaviour.

While extant literature has debated different ways to conceptualise a 'routine', one common trait across the respective definitions is an emphasis on actors being an 'engine' for the momentum in *recurrent* routines

[1] There is an obvious link between management accounting (cf. Burns and Scapens, 2000) and management *control*; not least the tools and techniques (i.e., rules) which they refer to in their paper are mostly (traditional) management *controls*.

[2] Routines here are expressed in relation to groups or organisations, whereas habits are related to individuals (Hodgson, 2008). Routines are the 'organisational analogue of habits', meta-habits, but not habits themselves (op. cit). The interconnection(s) between habits and routines is most interesting, but is left for a different occasion.

over time. That is, whether routines are conceived as being action-centred or structure-centred (or both), the role of actors is essential for understanding the ongoing and processual nature of routines. Thus we would expect the behaviour of individuals (or groups) to be important in any unfolding management control process through time.

MC routines reproduce in the minds and stored capacities of individuals and groups, sometimes as known and reasonably understood propensities to do certain things in particular ways when faced by particular situations. They map out what can be done, sometimes (for example) based on the simple re-enactment of same or similar practices from the past, other times guided by settled procedures (or rules) that have been passed on from person to person. So, let us think of an enduring MC technique which, in many organisations, we could say is budgeting; budgeting techniques are grounded in a portfolio of rules and procedures, they are used, and can usually be observed in-action. But, over time, notwithstanding their existence-in-action, they can also develop associated characteristics of a propensity-like nature, a tendency as to how they will be used in given or similar circumstances – i.e., a MC routine. By definition, these routines will tend to reproduce and remain more or less unscathed over time, although there can still be incremental (and even more 'revolutionary') change.

Routines do not act as such, nor are they the outcome of people's behaviour; they persist usually over time as a platform for actual behaviour, as a mindful rehearsal for future (MC) practices. This is not to say that MC routines are fictitious or unimportant; they impact what individuals and their collectives think and do and, importantly, their outcome(s) can in turn reinforce or change the rules and routines.

The conceptual and empirical exploration of MC as process over time, and also its change at particular points in time, through a lens which places emphasis on routines, is not unique to the MC literature (Becker, 2008). In referring to 'change' here, this is meant to denote some kind of shift at a particular point in time, but not 'optimising' shifts of the rational-actor (i.e., neoclassical economics) kind. There may be shifts that, at particular points in time, agents perceive to be an 'appropriate' option given emergent circumstances, thus triggering a process to do something(s) differently. The underlying and cumulative processes, however, continue to unfold.

It has been said that routines can both change in their own right (i.e., endogenously) and also be a source for change; Lazaric's (2008) work, for instance, conceptualises changes 'within' routines, and the micro-cognitive foundations of routines that might help us better understand the triggers of *routinisation*. Recent works such as Miner et al (2008) and Greve (2008) highlight the importance of learning, search and selection for how routines can become implicated in change processes; though some are also keen to stress that when considering the 'change properties' of routines we should maintain the view of routines being *propensity* to act rather than action per se (Burns, 2009). In other words, changes in routines do not equate to changes in behaviour, although changes in behaviour can have an influence on changes in routines.

There is usually potential for routines to change over time, possibly as new circumstances bring out a perceived inappropriateness of the actions which routines mould, and/or as new triggers alert people of any misalignment(s) between behaviour tendency and what might be alternatively acted-out under new circumstances. It is the *durability* of routines that can be relied upon to a significant degree; although it is behaviours which are more likely to be the primary focus of any investigation into (organisational) change.

Management Control Routines and Organisational Knowledge Embedded

MC routines contribute towards (accumulated) organisational knowledge and skills attainment. In turn, knowledge and skills augment the capacity to address complex organisational problems, as well as identifying ways to address such problems (Hodgson, 2008). MC routines add to stocks of experience (or 'organisational memory' – Nelson and Winter, 1982), and fuel intuition to the extent that it informs agents to identify and respond to particular organisational problems.

In this process of knowledge-skills accumulation, there are inevitably MC techniques, (i.e., rule-like procedures) to learn - often fairly straight-forward mechanical techniques. However, techniques alone are limited in their usefulness for addressing complex organisational problems. What is required also is the repertoire of stored habits and routines which might be drawn upon as situations arise (some of which are exactly the same as previously-experienced situations, some of which are more or less the same, and others which bear no resemblance at all), and which can assist organisational actors to tackle emerging issues. This is a process which avoids full reflection of (i.e., potential paralysis of) minutiae detail when dealing with new organisational situations.

It would be easy to understate the complexity here. Organisations comprise individual actors and groups, multiple and interconnected dimensions, and situations (both potential and real) which interweave through time - cumulatively, consciously, subconsciously, predictably, and unpredictably. But, even this fails to capture a process; what *actually* happens in organisations from one day to the next is to a large extent encapsulated in generative and structured processes, the full and exact nature of which is impossible to precisely conceptualise or explain.

This said, there are some aspects of ongoing process which are relatively less problematic to capture and explain than others. For instance, it would be reasonable to suggest that in some organisations, MC routines are so embedded that, given recurring and similar situations, the actual (emergent) MC practice will more often than not resemble practice from the past. This, for example, would neatly describe the durability and continuity of several traditional MC practices (e.g., budgeting) in organisations, particularly in the absence of any unfamiliar situations or scenarios.

What fosters such continuity in practice over time? The following might be important (but not necessarily) exclusive:

- The extent of embeddedness of rules and procedures that underpin MC practice, such that organisational actors 'just know' who does what, when and how;

- Relative stability in the relationship(s) between the MC routines and other organisational processes;

- Consistency over time in the organisational actors who are implicated in the process, or continuity in the knowledge underpinning the MC process;
- Reasonable stability in situations external to the organisation which have a potential to impinge down on its MC practices.

Case Study: Embedding Routines in Software

Before describing our anecdote for the emergence and diffusion of software in the corrugated container industry, the following briefly describes some of the key features of that industry.

The corrugated container industry

The corrugated container industry is a sizeable subset of the more general paper and packaging industry, situated at the consumer-packaging end of the chain. Corrugated containers are used for the transportation, storage and display of consumer products, so-called because they consist of several layers of paper, some of which are corrugated (i.e. undulated). More commonly these products are known as 'cardboard boxes'. The industry is typically regarded as being a commodity-type, is capital intensive, and highly-automated (Lail, 1999; Quinn, 2010). In recent years, the consolidation and acquisition of organisations has become a predominant feature of the paper industry; however, small and medium-sized producers in Europe still account for approximately 50% of output, whereas this figure is more in the order of 20% in the US market.

The corrugated container industry is significantly affected by the global economic environment. The threat of new entrants to the corrugated container industry can be discussed under three major headings: (1) capital requirements, (2) general economic demand, and (3) existing market capacity. The capital requirement to develop a "green-field" corrugated plant is in the order of €50 million. Such a plant could output 50,000 - 80,000 tons of corrugated board per annum and employ 140 -180 people. Such an investment is unlikely to be made in times when general economic demand is stable or decreasing as demand for corrugated container packaging is inextricably linked to industrial and consumer demand.

The primary raw materials for corrugated packaging (including corrugated containers) are heavy papers called Kraft and Linerboard. Larger (mostly European) corrugated producers make these papers in their own paper mills, thus supply and pricing is typically non-problematic. A combination of numerous paper mills and the fact that major producers control their own mills implies that suppliers' power is relatively weak.

Customers range from large multi-national firms to localised agri-business, where the former tend to exert relatively more influence over their (corrugated container) suppliers. While businesses can choose from many ways to package their end products, corrugated containers continue to be a commonly used packaging solution for bulk transportation. In recent years, reusable plastic crates have become a transportation alternative

to corrugated containers. These crates (or "green trays") have the potential to save a substantial amount of packaging and would seem to be a sustainable and environment-friendly packaging and transportation solution. However, as a substitute product to corrugated containers, the debate on re-usable crates continues. This debate centres on the sustainability of both over the longer term. Overall, the threat of substitute products to corrugated containers would seem to be a relatively weak.

Information Systems in the Corrugated Container Sector

In a growing number of industries, Enterprise Resource Planning systems (ERPs) have offered standardised software and processes that, in turn, promise additional cost and operational efficiencies. A key issue in so doing is seeking "best fit" between the organisation and the software, and reaching such "fit" can sometimes demand that organisational change reflects the best business practices encompassed within the software. As part of this process, ERPs providers offer what they call 'tailored' solutions for many industries[3]; however, such a solution for the corrugated container industry has only been available since 2006.

The corrugated container industry contains what Lail (1999) described as "idiosyncrasies" which pose problems for the adoption of ERPs. A potential advantage from ERPs is a singular integrated system covering all (or the majority of) business processes (O'Leary, 2000). As far back as 1999, Lail remarked that while ERPs had been adopted in the corrugated industry for integrating financial and administrative systems, neither order-fulfilment nor manufacturing systems had been integrated in the same way. One possible reason was that ERP software appears to be more suited to 'A type' industries (where products are assembled from components) rather than 'V type' industries (where products are disassembled or constructed from a common base product) (SAP, 2006).

Lail (1999) summarised some of the main business and management factors which, he argued, distinguishes the manufacturing model of the paper and corrugated industry from other manufacturing sectors (see Table 1).

Paper/Corrugated industry	*Other manufacturing industries*
Capacity management focus	Materials management focus
Process and disassembly environment	Component assembly
Quality relative	Quality absolute
Low standardisation	High standardisation
Inventory managed by order	Inventory managed by item or unit

[3] See www.sap.com/industries where, for example, solutions for more than 50 sectors are offered.

Table 1 – Manufacturing model of the paper industry

First, managing machine capacity is of primary importance to the corrugated container industry, especially given its generally high capital commitments. Traditionally the main focus of ERPs is on raw materials flow. Second, the manufacturing environment is unusual insofar as it is a part-continuous process (i.e. manufacture of corrugated sheets) and part-process disassembly (i.e. turning the sheet into a completed corrugated container). ERPs in general do not support the complex production scheduling associated with such an environment. Third, product standardisation is extremely low. Customer orders are typically made-to-order, with unlimited variations – e.g., variation in product dimension, grade (or weight) and colour. ERPs do not normally provide adequate support for such complex and non-standard product specifications. Finally, products are traditionally not produced for inventory (i.e., in a largely standardised way) in the corrugated container industry, due to the highly-customised nature of customer requirements. And, ERPs would traditionally have difficulties with multiple product (and inventory) variation.

The above factors potentially prohibit corrugated container companies from gaining some of the advantages (e.g., reduced IT support costs, standardised business processes and a single data source) of a single system like ERPs. Thus, the information systems in the industry typically adopt a Best of Breed (BoB)[4] strategy (Krell, 2003). Distinct manufacturing execution systems (MES)[5], sales order processing systems (SOP) and production planning systems are also used widely across the industry. Integration of these systems with ERPs has to date generally proved problematic. One reason for this is that MES software is often based on proprietary standards[6]. Recently, the company SAP - the market leader in ERPs provision - presented an industry-specific solution with potential to link SAP with MES over varying degrees of complexity (SAP, 2006). This development may permit corrugated producers to leverage their investment in SAP in the future.

Despite the idiosyncrasies of the manufacturing methods used in the corrugated container sector, it has not been immune to technological development. Since the mid-1970's, industry specific software has been available to manage and control the 'business end' of the sector, namely production scheduling, manufacturing control and product costing. The next section begins to build up the story of how organisational know-how has (*through* this emergent software) accumulated over some 30+ years, to forge a routinised set of practices that in time have also shaped the control mechanisms used across much of the sector.

Accumulation of Routinised Knowledge in Software

Having described the corrugated container industry (with its numerous peculiarities and barriers in relation to such generic software as ERPs), the following describes how one particular piece of industry-specific

[4] Best of Breed describes where a business selects information systems' components from multiple (rather than a single) supplier.
[5] MES software that enables the optimisation of production activities through efficient use of available machine capacity and automated data transfers between manufacturing machines and information systems
[6] For example Kiwiplan, the leading industry software, offers MES software which is based on proprietary programming code.

software has embedded the routines of its founding organisation, then also (over time) evolved to underpin a more general know-how across the industry.

We can think of shared organisational knowledge as being *expressed* in a currency of routines (Nelson and Winter, 1982), where such expression might be formalised in rules, though not necessarily so. We can also think of shared knowledge (or know-how) as an intangible asset which contributes towards the creation and maintenance of organisational value. Routines as shared knowledge and recurrent 'ways of doing things' create a potential bridge between tangible assets (e.g., buildings, equipment and processes) and value creation. From a MC perspective, it may be difficult to determine the monetary value of such intangibles as organisational know-how, but it does indeed seem plausible that value-creating intangibles will affect MC in some way.

The following anecdote provides a glimpse of how know-how routines can (over time) become embedded in an organisation's (and later, others') software. The anecdote is mostly based on interviews that were conducted in 2007. One of the present author's previous works' experience, and data collected from industry-wide and organisational websites are also used to write this anecdote. One interviewee was the (retired) founder of a software company that provides solutions to the corrugated container sector, while the second interviewee is the present-day Chief Executive of the same organisation. The software has three major components, namely: (1) corrugators-scheduling, (2) conversion-machine-scheduling, and (3) product-management and sales.

Origins

Peter[7] qualified as a Chartered Accountant in the (early) 1970's, and one of his first jobs was as an accountant in the corrugated container industry. He described his early days as follows:

> I worked for a corrugated company called Box Containers. I 'had' been taught about these new-fangled things called computers, although this constituted only a small part of the [education] course. When I went to work for Box Containers, everything was written by hand; everything was hand-written in ledgers – debits, credits, and all that! But I decided that I didn't like that; I didn't want to do that for the rest of my life. I felt that there must be more creative things to do.

Not before too long, Peter realised that his creativity could possibly be put to use in respect of the computerisation of some of the more basic accounting and MC processes. He had appreciated that the hand-written records had become a considerable hindrance to the business. Around the early-1970s, the owner of Box Containers had enforced a new marketing strategy, which was basically to ensure that all orders were delivered within 24 hours. This represented quite a challenging (revolutionary even) approach in an environment where lead times were generally around 3 weeks, and as companies continually tried to optimise usage of their corrugator machines[8]. But the owner of Box Containers was adamant that the advancement in deliveries should happen, as Peter developed:

[7] All names (people and organisations) are anonymised.
[8] A corrugator is a machine which makes cardboard sheets, using heavy papers and starch as a raw material.

> What a corrugated plant would traditionally do was plan their corrugators over the week, to optimise their utilisation, and if they missed a plan then customers would just have to wait (just like they still do at paper mills). But the owner decided this was not good enough, and decided that we would promise customers to make-and-deliver within 24 hours. Now, everything was still manual, and this also pre-dates photo-copiers. So, in those days the product specification was written on a card, with the customer order(s) being written on the other side of the same card. But, as the business became so successful, we just couldn't keep up with things, manually. So, I went to the owner one day and argued that 'these new computer things' can help us get over this problem of paperwork congestion. Put simply, our inability to (manually) process the paperwork was getting in the way of our selling philosophy; the paperwork had become a huge bottleneck for our business.

Peter's acknowledgement of this bottleneck was a catalyst to search for appropriate computing software that could (at least) automate the sales-ordering process at Box Containers. However, Peter soon realised that the market had no suitable software to offer, so began to write a full product-costing and pricing-system. This bespoke software, referred to hereafter as *Boxplan*, covered the majority of business processes comprising the sales function, including: product definition; product costing, using standard costs; sales order quotation; generation of delivery documentation; generation of sales invoice; generation of customer statements; and, customer payment processing.

While the capacity and functionality of Boxplan might seem commonplace nowadays, in the 1970's this was quite advanced, especially because no software could be purchased in the marketplace to fulfil such tasks. While Peter's primary goal was to automate the existing (sales) processes, he also aimed to eradicate negative aspects of existing processes - in his words "to not put back into the system the things which create hassle in the manual work". He was thus seizing the opportunity to 'design out' what he saw as wasteful tasks, although this did also create some resistance from accounting and sales staff, and even from some customers. He recalled what happened when he posted the first ever (post-computerisation) batch of customer-statements:

> I wanted to track each invoice and not just the carried forward balances, although this was previously unheard of. Some customers even threatened to leave us when I did not print carried forward balances on the statements. They argued that they could not reconcile their accounts unless we printed the carried forward balances on their statements. I would say 'sure you can, you have a list of all the invoices!'. But their answer was 'we'll pay them a second time!'.

Moving Beyond the Sales Systems

Peter realised the potential which computers had for automating other processes in Box Containers. Within five years of developing the sales-ordering system, he had also developed software to schedule production to the corrugator machines. A corrugator is costly to run, and the general thinking at the time was that the more efficient the machine, the more profitable the company would be. However, scheduling production on a corrugator is technically quite a difficult task. They have a maximum paper width, and to achieve efficiency on a particular customer order (i.e., to optimise the utilisation of a corrugator's width), complex

algorithms are needed. Moreover, this difficult task had always been done manually, prior to the availability of any software (but was eased considerably by the software which Peter designed).

By the early 1980's, Peter realised that his software was potentially marketable outside of Box Containers. Sales of the corrugators-scheduling software increased as the decade progressed:

> We were told many times that this could not be computerised – 'it was too manual'. But when we entered the market, people saw that it could cover most circumstances, and at some point in time there was an acceptance that a computerised solution could improve the process. It was not unusual for a corrugated plant anywhere in the world to have 3, 4 or 5 planners, so it was not too hard for management to see that this product could lead to a reduction in planning staff, and also achieve better quality manufacturing results. So, relatively speaking, it was an easy sell - management could see the benefits clearly and easily. Momentum for this product was easy, especially since improvements in the manufacturing results could be seen.

As (global) sales grew, its designers continued to upgrade and improve the software, in response to customer feedback, reported bugs and other drivers. This particularly increased the functionality and reporting capability of the (Boxplan) corrugated-scheduling module which, by 2009, was utilised for approximately 80% of all corrugated board produced. Importantly, this indicated not only a significant level of market penetration, but also a glimpse that Boxplan was defining sector-level best practice.

To the rest of the factory

By the early 1990's, Boxplan had offices in Europe, USA and Asia. It had also developed a new software module that expanded its functionality to the rest of the production environment in a corrugated plant. While the corrugator produces flat sheets of cardboard, other machinery can convert these flat sheets to different finished product by folding, printing etc. Thus, this new production-scheduling module created a useful link between the sales/product modules and the corrugated-scheduling module. By this time too, the management at Boxplan had also realised that their main strength lay more with production-oriented modules than with sales; and, consequently the business began to concentrate on the former. Throughput philosophy (Goldratt and Cox, 2004) was incorporated in the production software, beginning with the customer order due date, then planning backwards to ensure that production started on time.

By the mid-1990's, Boxplan had been installed for the first time in a multi-plant site, offering centralised production, planning and scheduling services. By the same time, there was also a new module for managing (paper) raw materials. These changes had not been easy to achieve though, and were subject to some political wrestling, particularly as the factory planners were so entrenched in traditional ways of working, as Peter explained:

> You have to understand the personal profile of a planner. Typically, they have worked their way through the factory, and have been promoted to this position off the corrugators. They have learned

> routines to produce a result that is acceptable to management, and they are in a position of quite substantial power. The managers, on the other hand, are typically sales-focused and do not really understand the complicated mathematics involved; but managers *do* know if the planner does not do his job, because the monthly results will be bad! People in the factory also know that if the planner does not pay attention to *their* needs, factory results will look bad too. So all these people are vying for this guy's [i.e., the Factory Planner] attention, and they want to be his focus of attention. So [factory planners] are in a relatively strong position of power, even though organisationally they are not. And, as a consequence, they are not going to let go of their traditional processes very easily.

However, despite these potential barriers to change, the production-scheduling module still sold well, and by mid-1990s boasted in excess of 300 customers. Furthermore, such critical mass legitimated Boxplan's claims at the time that they had the knowledge to identify production-related problems in corrugated plants more quickly (and cheaper) than any factory planner could do. The main features of the production-scheduling module at this point were:

- Efficient scheduling of all factory machinery
- Automated link to the corrugated-scheduling module, ensuring up-to-date information on the status of cardboard requirements
- Collection of production statistics through operator keying – wastage, downtime, machine speeds
- Reporting of actual production data.

These features provided managers at all levels of an organisation with faster and more reliable information than ever before. It also created a realisation that corrugator efficiency may not necessarily equate to overall production efficiency and, in turn, profitability. Thus, by about 1995, managers in corrugated container plants could, for the first time, get a full view of how the entire plant performed.

Automation

From the mid 1990's and up to the present day, automation has been a key developmental area for Boxplan. First, the reliability of production data was improved, as data relating to machine running times and quantities produced became available electronically. Further improvements were then made when radio-frequency scanning equipment was introduced, increasing accuracy in tracing raw material and stocks of finished goods.

In the 21st century, Boxplan has extended its (consultancy) service beyond merely the installation and support of their software. The main thrust of these services was to harness and utilise the vast amounts of data available within the corrugated- and production-scheduling modules. However, using a detailed historical analysis of customer orders and a simulation exercise, the data can then be re-configured to identify the types of

(paper) raw material which should be held at any particular corrugated plant. This has provided real tangible benefits to corrugated companies in terms of reduced inventory levels, as well as a lesser requirement for human input in this process (due to increased automation).

To summarise, over a period of around 30 years Boxplan has automated many of the planning, sales and product definition processes in the corrugated sector. To paraphrase the words of Peter, 'the planning function has gone from six people in the early 1980's to one part-time job today'. The software is one of the most-adopted across the sector for production control and planning. This success did not 'just happen', and although the transformation did gradually encompass more and more industry knowledge over time, its success or otherwise at a particular organisation can be considered in terms of how the software altered existing routines in that organisation. Put differently, while the adoption of Boxplan may have taken on mimetic-like characteristics amongst much of the industry, there appeared still to be disparities across individual organisations in terms of the interplay between established (localised) routines and the new routines embodied in the new software. We gained some insights in this respect through talking to the current Chief Executive of Boxplan (Paul).[9] Paul had worked at managerial level in a number of corrugated container plants before joining Boxplan. He had previous experience using Boxplan in several companies. He was generally supportive of the software, but was also keen to highlight various difficulties in changing an organisation's existing routines to new routines embodied in Boxplan:

> It needs a change champion, who has got clout and respect. S/he has got an overview, knows where s/he's going, has set some goals, and s/he can get buy-in from people for the right reasons. All of that kind of thing makes Boxplan successful, but inevitably s/he gets promoted or quits! Then, the users [of Boxplan] go back to their old habits because it's easier.

He also remarked on the apprehension amongst some colleagues to adapt to the automation of some tasks in a corrugated plant, in particular the automation of corrugators-scheduling:

> By the nature of the corrugated business, the Planner in every plant is a kind of 'Mystery guy'. He's always been *just standing around* but all the general managers know that every time he's on vacation or sick, the plant goes to 'hell in a handbag'; the schedules become terrible, everybody starts complaining, lateness increases, and so on. Then, when he comes back, everybody sighs with relief; but they still don't have a clue what he actually *does* every day. [Another example:] The automatic scheduling software is now really mature, and works very well – it basically allows you to achieve almost 98% task automation. But, like with a lot of other tools, people just want to get involved and turn the automation off. They want to put their blueprint in there, or put their personal touch onto it; and a lot of times they take out the parts [of the new system] that are working!

Time is an important factor here; if MC routines fail to be triggered for a long period of time, for whatever reasons, and in turn therefore lacks meaningful reinforcement through re-enactment, the structural knowledge embodied in that routine may eventually erode. However, there is always the possibility of a

[9] See Quinn (2010) for a more detailed study of the use of Boxplan at a particular organisation.

reappearance of these 'abandoned' routines in the future, especially if new replacement routines become associated with failure or under-achievement. Or, this might also happen through intentional (or maybe only partial) re-kindling of old ways following non-satisfactory implementation of new organisational tools and structures. The latter might, for example, provide a useful (conceptual) angle on investigating when organisations revert back at least partially to previous MC practices following the implementation of unfulfilling new ones.

And, what does this suggest about the potential recurrence and longevity of 'old' routines and other organisational structures beyond change implementation? In other words, you can replace MC systems and practices in an organisation, with new alternatives; but this by itself will not displace the routines and stocks of knowledge, skills, and tacit thoughts associated with and embedded in the recurrence of such phenomena over time. And, it would also suggest reasons why, even when organisations choose to undergo a radical change in its MC, the stored repertoires or memory of old practices take time to disappear, and may never do.

There appeared to be barriers for some staff in respect of embracing new routines and working ways (embodied in Boxplan and its automation, in particular). The strength of such resistance rests mostly in the power of enduring routines rather than some rational reasons to maintain old ways; Paul was quite clear that automation had brought good effects to the business and this was especially proved in plants where old routines were less embedded for staff:

> There have been some plants which have adapted to the Boxplan routine, and they have made it a habit. The plants that are *most* successful in this respect are green-field plants, where no-one knows any different. You go into a green-field plant, hire people 'off the street' (where a lot of them will have never worked before in a corrugated plant), and they are told 'here's how to do things', 'here's how to use this system', 'here's how to do your day-to-day job', and 'here's the data that you can depend on, and it's what you need to know'. They then pick this up and go forward, and *they don't know any different.*

Discussion

The Boxplan case study is interesting in respect of how it teases out the emergence, design and implementation of bespoke software in (first) one organisation but later also across a large section of an industry. Traditionally, rather rudimentary and basic methods and tools were being used to organise sales-order, production and other key processes in these organisations. There were plenty of manual records, hand-written documentation, and reliance upon experience and informal channels in day-to-day management.

There was an embeddedness to the existing methods and techniques that had been used (for many years) in the industry, for a combination of reasons. First, there was evidence of institutional 'lock-in' whereby any alternative approach would be difficult because of the specificity and peculiarities inherent to the industry - e.g., the corrugator width restrictions and the underlying powerful positions held by the 'knowledgeable' factory

planners. Second, there was a sense in which the preservation of established ways came about because of people's need for ontological security; as Granlund argues "people fundamentally resist change because they feel comfortable with routines, which in turn enhance the feeling of (ontological) security" (2001, p. 160). Third, it would seem reasonable to suggest that existing ways were somewhat *taken-for-granted*, and underpinned a process of 'unquestioned reproduction' (Giddens, 1984). Fourth, there was seemingly (until Peter kicked off significant changes) a lack of influencing agency that might question and 'take on' the embedded ways or, put another way, a setting where agents were bounded in their ability to form new routines (Jack, 2005).

The emergence and establishment of Boxplan conveys two illustrations of the absorption of (new) routine practices within much of the corrugated container sector. First, in the early 1970's, Peter automated the sales-ordering and product-definition processes, stressing how he intentionally changed old ways that he did not approve of, and how he tackled potential resistance *through* the design of the new software. It was Peter's creativity and awareness of 'the (routine) way things are done' (cf. routines in Burns and Scapens, 2000) that carved open an opportunity to *design-in* new (routine) practices, encoded into the new software, and reinforced through recurrent use of the new software. In other words, the new MC practices became routinised through repetition (Feldman and Pentland, 2003), a process of routinisation that was again witnessed a few years later with the introduction of corrugated-scheduling. To reiterate however, such routinisation did not just 'blindly' or effortlessly find its way; key and necessary dynamics to this routinisation process included the creativity and political clout of the change champion (or agent), and his ability to recognise and counter potential resistance to change.

Second, Boxplan was launched into the (external) software market during the early 1980's, at which point their customers had a choice to change their business processes to match or absorb the (routine) ways encoded in Boxplan, or try to change the new software to match old ways. The latter is very difficult to achieve, as others have observed when studying ERP software implementation (Davenport, 2000)), thus corrugated container organisations were more or less compelled to accepting the (routine) practices associated with the Boxplan software. Importantly, however, this process of adopting and developing (assumed) 'best practice' had dual impact on Boxplan's learning and knowledge accumulation. That is, Boxplan learned from its customers, and continually incorporated new knowledge into their software as (global) sales expanded. With over 300 customers by the early 1990s, Boxplan believed that it had, through its software, routinised 'best practice' in most of the organisations within the corrugated container industry. These routines were a cumulative snow-ball of almost 20 years' of know-how within the sector, and are still followed (routinely) by customers today.

The spread of Boxplan know-how (encapsulating routines) resonates with DiMaggio and Powell's (1991) ideas on how organisational (routine) ways of working can become 'isomorphised' across a range of organisations, such that common practices eventually emerge. In DiMaggio and Powell terms, we can view the Boxplan software as an 'institutional vehicle' whereby the diffusion of common practices (or isomorphism) occurred primarily via ongoing inclusion of best-practice into the (developing) Boxplan software and a growing acceptance of this being the 'best' software tool in the market. More specifically, a combination of *mimetic* and *normative* isomorphism seems to underpin (the process of) diffused routinisation for the Boxplan software. As

DiMaggio and Powell (1991) suggested, some organisations will emulate and model themselves on other organisations[10]. They also remarked how some 'pioneering' organisations might prefer not to be emulated, but that for the copying organisation such actions can be as much a matter of convenience as anything, say, 'rational'.

In this case, the creativity and opportunism of one particular agent (Peter) is also key in respect of how the isomorphic process gained momentum over time. In particular, through the software founder (Peter) embedded and institutionalised ways were questioned and changed in a fairly radical way. The case highlights importance of *reflexive agency* to bring about (MC) change – i.e., the ability of certain actors to 'see through' and actively question the (non-)existing practices, and to reflexively understand the conditions governing old established ways. This is an exploratory avenue still in its relative infancy within the MC literature. That is, while there are relatively more studies of how different types of changes in 'external factors' (or, put another way, when the conditions for reproducing the prevailing social order are no longer met) may 'trigger' and shape change, there are fewer studies of more *endogenous* sources of (MC) change (though, for some examples, see Lawrence *et al*., 1997; Ahrens & Chapman, 2002; and Seal *et al*., 2004).

This last point also raises a need to engage in more MC research that explores *embedded agency* in MC change process (Kilfoyle and Richardson, 2011; Englund et al., 2011). Much extant MC literature has been either primarily structure-centred (i.e. have viewed MC as part of largely determining 'macro level' structures) or agency-centred (i.e. focused on how MC practices contribute to shape/construct actors' view of reality) (Englund and Gerdin, 2011). But there is a paradox here, namely: if social structures exert such a powerful influence on behaviour, how can they possibly change; and, if agents are 'free', why is their behaviour so constrained by social structures? Similarly, Lounsbury (2008) recently argued that MC scholars adopting institutional theory should broaden their theoretical lens beyond isomorphism and symbolic conformity, to acknowledge the inherent dynamics of intra-organisational (micro-) processes. And, he adds, 'practice theorists' (e.g., Ahrens and Chapman, 2007) should in turn broaden their focus on micro-processes to take in wider institutional dynamics.

Our case study was useful for illustrating how (MC) routines can be an important 'carrier' of organisational know-how over time. As mentioned already, Burns & Scapens (2000) referred to Nelson & Winter's (1982) notion that organisational routines can function like biological genes in 'passing on' knowledge and skills from one period to another, one person to another, and so on. This analogy between biological genes and organisational routine is useful at least in so far as augmenting our descriptive and conceptual capability (Hodgson, 2008), because both routines and biological genes:

1. represent relatively durable carriers of information through time;
2. have an algorithmic capacity to generate particular outcomes in given circumstances, and;
3. are generative, rule-like structures and potentialities

[10] E.g., it is common practice for industry-level software users to attend regular user-group meeting and conferences.

We can try to better understand the mechanisms endogenous to (MC) routines which generate stability in action. As Becker points out, this cannot simply be a matter of 'external forces'; otherwise "we would not need a concept of routine" (2008, p.11). Schulz (2008) discusses mechanisms whereby prior actions 'select' (follow-on) actions, mechanisms which co-evolve with routines. Such mechanisms, he adds, might include: habitualisation, priming, institutionalisation, value infusion, formalisation, artefacts, calculation and competency traps. This would seem a potentially insightful avenue to pursue in developing our understanding of the longevity and stability of particular MC practices (and routines) over time.

It has been argued that other important aspects of the process by which routines are replicated from one person or group to another, etc., include: (1) incentives and/or constraints, and (2) imitation. Such things can, though not always, help the triggering of routines (and habits) in people's minds, and any subsequent occurrence will further bolster the routines. First, incentives (or, conversely, constraints) can provide logical reasons to repeat something in a similar way given a particular similar situation. For instance, the following of routines associated with budgeting and performance measurement for many organisations is intertwined with a system of bonuses for the workers involved in achieving the measures that are being scrutinised. That said, such situations do not always encourage action that is in the best interest of the organisation but, rather, primarily serves the self-interest and bonus returns of those people managing the process. Organisational groups (or individuals) can also be incentivised to follow particular routines by virtue that they have seen others doing the same things in similar situations. Finally, there can be situations whereby if the incentives in place are ever deemed inappropriate, then groups might decide that they wish to do something different to what might be expected; that is, incentives fail to sufficiently support the triggering of a routine, and a change in behaviour will emerge followed possibly by displacement of old routines.

Second, routines can be passed on, in time, from one group to another, via processes of imitation. Such imitation need not be fully conscious, and will usually involve some element of 'tacit learning' (Polanyi, 1967). As Hodgson argues, imitation may also take place in the absence of incentives, as instincts take over: "the propensity to imitate is instinctive" (2008, p.17). This is not to say, however, that all imitation is pure mimicry, since instinctive imitation will itself evolve for efficacious reasons amongst particular groups (Hodgson, 2008, p.17). In the background of instinctive imitation there will be existing and cumulative behaviours amongst the social group. Otherwise, it might be difficult to see where there is a selection advantage from an emerging propensity to imitate (op. cit.). In future MC research, it would seem interesting to try to identify at least partially-instinctive propensities to imitate amongst organisational groups, though not as pure-mimicry.

The institutional complexity and multiplicity of an organisation's MC practice accumulate from the structured relations and causal interactions between individuals and groups that are involved or implicated in the MC process. We might think of the smooth running of MC practices, resulting from organisational structures, technological (e.g., information systems) and physical artefacts (e.g., management reports) that provide suitable conditions to facilitate and drive a series of conditional, interlocking, sequential behaviours amongst individuals and collectives within that organisation. Such focus directs our attention to the importance at the design stage of

understanding and designing-in the interconnections between (and relationships across) different components of the MC process.

There are no 'templates of success' in MC process, no obvious path towards optimisation; however, we can think of circumstances that will likely help the replication of MC routines (*if* that helps!). For instance, the more decipherable any new procedures, the greater the chance of improving the outcome. The same might be expected when, through education and training, new MC techniques constitute more than just their technical properties but also encompass structural-type knowledge dimensions. It would also seem reasonable to suggest that change implementation stands a better chance of successful outcomes when they are supported by clear and broadly understandable discourse used to introduce and 'sell' the new ways (e.g., presentations, brochures, reports, etc), as well as for easing the potential for (part-)imitation. Future research might contribute, both conceptually and empirically, towards our understanding of how routines-replication unfolds when organisations, groups and/or individuals in some way interact to become (part of) a new way(s) of working.

Concluding Comments

We started this paper by reinforcing the call for additional research into MC as complex, intertwining *process over time*, rather than the mainstream's fixation on rational, optimising tools for business success (Burns, 2000). The present contribution, albeit a small one, portrays how MC routines of one organisation evolved over a relatively short period of time into broadly adopted (software) routines across most of a particular industry. In so doing, we also highlighted how the creativity and pro-activity of one particular person catalyses the emergence (and subsequent multi-adoption) of revolutionary MC practices, embedded in software routines, and broadening organisational know-how. Our case study thus illuminates how MC (software) routines can be an important carrier of organisational know-how over time, mobilising both continuity and (potential for) change. However, this is a single (and largely anecdotal) case study; so, first, we would most certainly recommend that more case studies are undertaken in this area, and adopting a similar (processual) approach. There are multiple other angles from which a more social, political and institutional lens can supplement our knowledge and understanding of the MC process, and we certainly encourage such research in the future. Only through more case studies will we really be in a position to further extend our understanding and conceptualisation of MC (routines) as process over time. This includes recommendation for more empirical (and theoretically-informed) studies of the day-to-day processes through which MC routines are (re)produced (Ahrens & Chapman, 2002), and how knowledgeable agents draw upon and reproduce these routines in specific settings (Conrad, 2005). It would, we contend, also include a recommendation to undertake more studies of (theorising) how particular MC techniques and tools are 'brought into' the day-to-day reproduction of organisational practice, as well as how they interplay through time to mobilise and underpin both continuity and/or change (Englund et al., 2011).

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