Kuhnian philosophy and the long-term sustainability of contemporary businesses

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Samevatting

Hierdie artikel verken Thomas Kuhn se filosofie oor paradigmas en paradigmaskuiwe ten opsigte van die langtermynvolhoubaarheid van moderne vervaardigingsbesighede. Die navorsing het ten doel om ondersoek in te stel na vier areas van belang: Eerstens, om te bepaal hoe Kuhn paradigmas en paradigmaskuiwe geïdentifiseer het. Tweedens, om te redeneer of paradigmas en paradigmaskuiwe, soos geïdentifiseer deur Kuhn, wel in besigheidsbestuur voorkom. Derdens, om te onderskei of daar ooreenkomste en verskille is tussen paradigmas en paradigmaskuiwe soos gedefinieer deur Kuhn en paradigmas en paradigmaskuiwe soos ondervind en ervaar in besigheidsbestuur. Laastens, om te fokus op die gebruik van hierdie inligting om die langtermynvolhoubaarheid van ’n vervaardigingsesigheid positief te beïnvloed.

Abstract

This article explores Thomas Kuhn’s philosophy of paradigms and paradigm shifts in relation to the long-term sustainability of contemporary manufacturing businesses. The research would aim to explore the following four areas of interest: Firstly, to define the nature and role of paradigms and paradigm shifts, according to Kuhn. Secondly, to argue that paradigms and paradigm shifts, as defined by Kuhn, do occur in business management. Thirdly, to determine that, if some differences are present, the observable paradigms and paradigm shifts in business management do not differ dramatically from paradigms and paradigm shifts as defined by Kuhn. Lastly, to determine how the presence of paradigms and paradigm shifts in business management can positively influence the long-term sustainability of contemporary manufacturing businesses.

Keywords

Business management, Contemporary businesses, Crisis, ISO 9001:2008, ISO 9001:2015, Kuhnian Philosophy, Long-term sustainability, Management paradigm, Paradigms, Paradigm shifts, PESTEL, Quality Management System, Revolution, Total Quality Management.

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Introduction

Thomas Kuhn is considered by many to be the man who almost singlehandedly changed the way the world looked at science. Not only through the "infectiousness" of one of his key concepts (i.e. the paradigm), but also in the way in which we think about humankind's most organised attempts to understand the world (I would add: theoretically) (Naughton, 2012:1).

There has been much discussion about whether Kuhn's paradigms can be found outside of the natural sciences (e.g. in the social sciences).[1]

In this article, I hypothesise that paradigms and paradigm shifts do occur in the field of business management. In my opinion, they are not only confined to the natural sciences, as Kuhn (1963: 353) originally intended them to be, but they are also present in several other sciences. However, concerning the current article, I will limit myself to arguing that paradigms and paradigm shifts are present in the area of business management, therefore in a scientific sub-section of business studies. From a business point of view, in my opinion, understanding what constitutes a paradigm and when a paradigm shift is required, is a necessity to maximise stakeholder value and to ensure long-term sustainability. The influence of a paradigm shift in technology on long-term sustainability, as an example, is also discussed below (see the Kodak example).

The central question the article aims to explore is whether a Kuhnian understanding of paradigms and paradigm shifts in business management can help support the long-term sustainability of contemporary businesses. There are, however, also questions emerging from the primary subject, such as: What is the nature and role of paradigms and paradigm shifts as defined by Kuhn? Are there paradigms and paradigm shifts in business management? Are the paradigms and paradigm shifts observable in business management similar to/comparable with the paradigms and paradigm shifts described by Kuhn? Otherwise, how do they differ?

The purpose of this article is fourfold. The first is to define paradigms and paradigm shifts according to Kuhn's point of view. The second part of the article will focus on detecting paradigms and paradigm shifts in business management. The third part will

[1] Kuhn (1970:175) himself seems to support this possibility when, in the postscript to "*The structure of scientific revolutions"*, he states that a paradigm "stands for the entire constellation of beliefs, values, techniques, and so on shared by the members of any given community".

concentrate on comparing Kuhnian paradigms and paradigm shifts to paradigms and paradigm shifts that occur within contemporary manufacturing businesses. The fourth part will focus on how to apply the knowledge gained in the first three sections to assist with the management of companies with the aim of promoting long-term sustainability.

What follows next is an investigation into paradigms and their shifts as defined by Kuhn.

Paradigms and their shifts in Kuhnian philosophy

In "*The structure of scientific revolutions*", Kuhn links science and the development of scientific theory to the presence of paradigms and paradigm shifts. Kuhn also regards the presence of paradigms as a demarcation criterion, to define a discipline as scientific (if a paradigm is present) or non-scientific (if absent). Kuhn's (1963:352) original argument and philosophy state that paradigms are at present operative in the natural sciences only. Kuhn explains what he takes a paradigm to be:

> "It is, in the first place, a fundamental scientific achievement and one which includes both a theory and some exemplary applications to the results of experiment and observation. More important, it is an open-ended achievement, one which leaves all sorts of research still to be done. And, finally, it is an accepted achievement in the sense that it is received by a group whose members no longer try to rival it or create alternatives for it." (Kuhn, 1963:358)

Kuhn (1963:352-354) further explains that paradigms are exclusive. There can be only one paradigm at a time for the practitioners of any given speciality. Paradigms, when out of date, are replaced by new paradigms. However, when receiving a paradigm, the scientific community commits itself, more or less consciously or not, to the view that the fundamental problems thus resolved have, in fact, been settled once and for all. Paradigms determine a developmental pattern for the mature sciences that is unlike the one familiar in other fields. Kuhn (1963:352) notes that, for example in the arts, we still find a wide variety of schools and approaches, which is similar to the pre-paradigm phase of a mature science. Paradigms are also a relatively late acquisition in the course of scientific development.

Perhaps the most crucial link that Kuhn established was the link between the characteristics of scientists (the human factor) and the existence of paradigms and paradigm shifts. In his analysis, Kuhn found roughly five characteristics of ("normal") scientists that are linked to the presence of paradigms in science and scientific theory. These characteristics are: Scientists are not open-minded, they know the outcome of their scientific studies in

advance, new theories are not necessarily accepted, scientists are trained using textbooks and approved methods, and so they stick to pre-established problem-solving techniques (Kuhn, 1963:363). All these factors seem to support the continuity of the established paradigm.

At some stage in the puzzle-solving activity of normal science, anomalies might arise and, if unresolved, they might lead to alternative theories. Kuhn (1970:52) refers to the initial phase of these alternatives as anomalies. These anomalies, when recognised and acted upon with continued research under the current paradigm, might lead to inducing a paradigm change. Otherwise, the loop closes only when the existing paradigm theory is adjusted so that the anomalous has become the expected. For the scientist, this process of paradigm change starts with the perception that something has gone wrong in his/her experimentation, the sign usually being that the achieved results were not as expected. It is important to note at this stage that Kuhn (1963:365) does state that "the practice of normal puzzle-solving science can and inevitably does lead to the isolation and recognition of anomaly". However, the finding of alternative theories is not the purpose of normal science, and all anomalies do not necessarily lead to formulating alternatives but may constitute only disturbances.[2]

According to Kuhn the prerequisite for a change in paradigm to occur is the presence of a crisis (something has gone wrong):

> "The transition from a paradigm in crisis to a new one from which a new tradition of normal science can emerge is far from a cumulative process, one achieved by an articulation or extension of the old paradigm. Rather it is a reconstruction of the field from new fundamentals, a reconstruction that changes some of the field's most elementary theoretical generalisations as well as many of its paradigm methods and applications." (Kuhn, 1970:84-85)

Kuhn (1970) refers to this resulting transition to a new paradigm as a scientific revolution.

What are the advantages of having a new paradigm? Does it bring improvement? From an ontological point of view of scientific research, Kuhn's (1970:206) opinion was that there is no real progress through revolutions. Coletto (2009:162) also concludes that, when considering long-term scientific development, for Kuhn we have neither a final goal nor a clear direction. From a "practical" point of view, however, Kuhn (1963:360) admitted that

[2] It is important to emphasise that although anomalies might be the starting point for looking for alternatives, in themselves they do not constitute alternatives.

new paradigms usually help "solving our puzzles better". This practical goal seems to be more or less the only advantage brought about by the new paradigm.

Kuhn (1970:92) uses the political concept of a revolution to describe (radical) scientific changes. Both scientific and political revolutions experience the sense that their institutions cannot adequately solve the crucial problems created in their communities. In both cases, this knowledge of malfunction can lead to crisis and crisis is a prerequisite for revolution. According to Kuhn (1970:93), political revolutions aim to change institutions in ways that the organisations themselves prohibit, more often than not by using techniques of mass persuasion, often including force. There are similarities with scientific revolutions. The resulting changed paradigm is irreconcilable with the previous paradigm, it necessitates a redefinition of the corresponding science, it leads to new scientific research and this research will eventually lead to another paradigm change in time to come.

The next question is to enquire whether Kuhnian paradigms and paradigm shifts can be present in other areas of study, outside of the natural sciences. It is also possible that we may find, in business management, not exactly what Kuhn defined as "paradigms" but something similar, some kind of exemplars or models that may not be called "Kuhnian" but may still be called "paradigms". In the following section, I will focus on the presence of any sort of paradigms and their shifts in business management.

Are paradigms and their shifts present in business management?

The Business Dictionary defines a paradigm as an "intellectual perception or view, accepted by an individual or society as a clear example, model, or pattern of how things work in the world"[3].

From a business point of view, most companies would use some or other management system to help them navigate through the daily functions of operating and being a business[4]. Business management as a discipline probably started in the Middle Ages, and picked up speed during the Industrial Revolution. Early influencers were people such as Adam Smith, followed by Taylor, Fayol, Barnard, Marx and Engels to name but a few. After the Second World War, Japanese companies started with quality management systems based on statistical quality control processes. This focus on quality led to the elaboration of systems

[3] Paradigm definition: http://www.businessdictionary.com/definition/paradigm.html

[4] The business that I manage and partly own is LTM Refractories. Our business model is described later in this article.

such as Just in time (JIT) and the Toyota production system (TPS). Western companies started their quest for quality management systems in the 1920's. Early pioneers were people such as Deming, Dodge, Juran and Roming. The International Organisation for Standardisation (ISO[5]) initially started in 1926 as the International Federation of the National Standardizing Associations (ISA). It was disbanded during the Second World War and was re-organised as ISO in 1946. ISO is not the only business management standard in the world today. Other standards include Total Quality Management (TQM), Six Sigma, Quality Circles, etcetera. In the late 1980's, most businesses in South Africa used the SABS 0157 Standard as a business management system. SABS 0157 was withdrawn in 1991 and replaced by SABS ISO 9001. The current ISO standard is ISO 9001:2015 Standard for Quality Management Systems (QMS). It is also the standard to which LTM Refractories subscribes. In essence, the ISO 9001 Standard[6] is an intellectual perception or view (model), accepted by more than 1.1 million companies worldwide concerning how businesses should function. By this definition, ISO 9001:2015 can be regarded as a business management paradigm.

A study conducted by Uyar (2008) of the top 500 Turkish industrial enterprises noted that almost 77% of these companies implemented the ISO management system. It is only but one example, but in my opinion is further evidence that the ISO system can be considered a business management paradigm. Uyar, in the same study, further found that companies which implemented a quality initiative outperformed companies that did not implement a quality initiative when using financial performance as a basis. This achievement complies with Kuhn's view and definition of paradigms, as discussed in a previous section: they improve our "puzzle-solving". Also, the substitutions of previous paradigms mentioned above show that there have been paradigm shifts in this field, pointing towards a Kuhnian understanding of "revolutions".

In addition to a Western point of view (paradigm), there are also Eurasian (Grinin, Ilya & Korotayev, 2014:38-39) and Confucian East Asian (Grinin, Ilya, & Korotayev, 2014:

[5] Martincic, C.J., 1997. History of ISO: http://www.sis.pitt.edu/mbsclass/standards/martincic/isohistr.htm

[6] ISO (International Organization for Standardization). ISO 9001 standard. https://www.iso.org/iso-9001-quality-management.html

104-111) points of view on business management. I, therefore, admit that different management systems may exist side by side in business management and this does not exactly fit Kuhn's view of paradigms in the natural sciences. I would, however, suggest that ISO certification in more than 1.1 million companies globally would constitute sufficient evidence that the ISO system is adequately represented across Western, Eurasian and Confucian East Asian businesses to consider it the main or predominant business management paradigm.

We could, therefore, provisionally conclude that paradigms and paradigm shifts are present in business management, and thus in an area of study that falls outside of the natural sciences. In the next section, we need to deepen our analysis to determine whether these "paradigms" and their "shifts" in business management are sufficiently similar to Kuhn's notions of paradigms and revolution. Should this not be the case, we would have to admit that we are speaking of two realities that (apart from a name) have little in common.

Comparing the two types of paradigms

I would like to start this section with a brief note on the "human factor". The characteristics of scientists that Kuhn identified in his analysis are also found when analysing the behaviour of business managers. Managers are not always open-minded to new ideas; we think that we know the outcome of our business ventures in advance. New theories in business management are not necessarily or readily accepted; managers are trained according to pre-existing standards, methods and textbooks and tend to resort to pre-existing problem-solving techniques. (A case in point is the example of the conduct of Kodak's managers as briefly explored in one of the next sections). We may, therefore, say that the attitudes of scientists and managers are similar in many respects.

Secondly, Kuhn defines a paradigm as a scientific achievement, and a paradigm in business management can also be viewed as an achievement. The achievement might not be highly scientific, but it can lead to higher profitability, successful implementation of social and corporate responsibility programmes, or development of new markets, products or technologies. For Kuhn, as mentioned above, the presence of a new paradigm results in the possibility of solving puzzles better. As mentioned above, the business management paradigm also aims to assist a business with the chance of doing business better by solving the "puzzles" that emerge regularly.

Thirdly, the ISO 9001:2015 paradigm in business management is further entrenched through the international certification of the system. The certification process makes it an *accepted* achievement, and it effectively limits companies from looking for rival or alternative methods. Here again, similarities with Kuhn's definition of paradigms emerge.

In my opinion, this certification process also aims to prevent paradigm shifts. (The ISO standard does give companies the option not to go through an official certification process. However, in most business-to-business commerce, ISO certification is a necessity). After the revision of the ISO 9001 Standard from 2008 to 2015, Nigel Croft, Chair of the ISO subcommittee that developed the revised standard, referred to the revision process as an evolutionary rather than a revolutionary process (Du Toit, 2015). Here we can sense something of what Kuhn (1963:362) regards as the *modus operandi* of a puzzle-solver or chess player. Absorbed in normal science, the puzzle-solver can consider articulations and refinements of the accepted paradigm, but not revolutionary substitutions. The paradigm acquired through prior training provides the rules of the game, describes the pieces with which it must be played and indicates the nature of the required outcomes. It is precisely the intention of the certification process: making sure that businesses play and stay within the rules of the game (i.e. the same paradigm). Here we can note another similarity with Kuhnian paradigm shifts: they are usually perceived (by those who produce them) as "the final" solution.

Although we can notice these similarities, the paradigms in business management do not always match the descriptions used by Kuhn. For example, I already mentioned the fact that there is not one single paradigm for business management; we have Western, Eurasian and East Asian management systems. Businesses can even choose which paradigm to use when it comes to product lifecycle. An out-of-date paradigm for one business, for example, the technology used in the product manufactured, can be the perfect current product paradigm for another business[7]. The out-of-datedness of a paradigm is determined by how successful a business adapts to that specific paradigm.

Unlike Kuhn's definitions for scientific paradigms, businesses can still choose which paradigms to follow. It is therefore not a case such as in scientific theory, where the current paradigm is the ruling paradigm and all previous paradigms have been removed to lesser-

[7] Although this was not the case in my Kodak example, it can be the case in my Turbostop™ example discussed later in the text.

used sections in libraries. One could still wonder, however, if Kuhn's view of the unique paradigm ruling over a discipline for a period was plausible even in the natural sciences. On this point, Feyerabend (1970:207) suggested to Kuhn that the history of physics during the 19th century shows that at least three rival paradigms were active and interacted on the scientific scene. Feyerabend further (2007:208) notes that these different paradigms were far from being quasi-independent. Their active interaction brought about the downfall of classical physics. Strauss (2009:5-7) provides a brief yet useful survey of paradigms that are nowadays simultaneously present in several fields of study, including the natural sciences.

What have we learned from Kuhn and my analysis so far? For the most, the definitions of paradigms as defined by Kuhn show similarities with business management paradigms. One area, which I think Kuhn did not consider, was the possibility of having sub-paradigms within or as part of a discipline. This is an important distinction to make from a business management perspective. Whereas Kuhn mostly considered only one paradigm to be active in a scientific discipline, the same cannot be said for business management. If we consider business management to comprise environmental, economic and societal areas, each being influenced by its own paradigm, then business management would provide the main paradigm, and each of the areas would supply a "sub-paradigm"[8] of the business management paradigm.

The next section will focus on comparing the two types of paradigm shifts: In the natural sciences and in business management.

Comparing the two types of paradigm shifts

As mentioned above, the only progress brought about by a new paradigm, according to Kuhn (1963:360) and (1970:206), is an improved ability to solve "our puzzles". I am of the opinion that this is not much different from a business management point of view. Leaving aside evaluations of a possible "ontological" progress, in business management, there are clear and

[8] If speaking of "sub-paradigms" may seem too "daring" to some, or too far from Kuhn's views, we could simplify the issue by considering the following. Kuhn draws his arguments and examples from sub-disciplines of physics (optics, chemistry, etcetera). If we shift the discussion to a discipline such as business management (or public governance), requiring constant interaction with other disciplines (law, economics, etcetera), the paradigms that need to be taken into account are multiplied. I have called them "sub"-paradigms in the sense that, in the present context, they "serve" the main purposes of business management and are dealt with from that specific point of view. Nothing, however, prohibits that they simply be regarded as paradigms in their own right, co-paradigms that are needed in business management.

defined practical goals and directions for a business to pursue. It can be goals such as 10% EBITDA, or the successful implementation of social responsibility programmes or the execution of Broad-Based Black Economic Empowerment programmes, and so on. In this sense, new paradigms can assist in achieving these practical and short-term goals more easily.

For Kuhn, furthermore, paradigms are not permanent even though they are usually perceived as permanent. I am of the opinion that a business management paradigm, such as ISO 9001:2015, is regarded as permanent from a business perspective. Yes, there might be a revision of the standard every six to eight years, but for the businesses certified to ISO 9001:2015, this standard has become the norm. ISO 9001:2015 has become their management paradigm. Revisions are supposed to improve the standard, thus providing an evolutionary (not revolutionary) type of improvement.

Maybe being trapped in the current business management paradigm is not such a bad thing (for Kuhn this was "normal science"). Companies, when wholly embracing TQM/QSM, do find tremendous value in the management system (Amsden *et al.*, 1996:6) and (Uyar, 2008:27). The question remains whether this management system is sufficient to address the long-term sustainability[9] of a business.

We have seen from Kuhn's (1963:360) analysis of the history of science that growth in scientific knowledge (better puzzle-solving capability) only occurs after a paradigm shift has taken place. One of the most significant problems businesses face is complacency: being content with market share, profitability, product range, customers, and so on. In my opinion, sections 4.4.1 and 10.3 of the ISO 9001:2015 standard try to address complacency through the introduction of the idea of continuous improvement. The question is whether continuous improvement leads to just further puzzle-solving exercise or a better puzzle-solving activity. We have seen from Kuhn's historical analyses that in order to move to a better puzzle-solving position, a paradigm shift is required at some stage.

Yet subscribing to ISO 9001:2015 effectively counteracts the possibility of a paradigm shift. According to Kuhn (1963:365), a paradigm shift only occurs through the discovery of anomalies that call established beliefs and techniques in doubt. This is followed by a period of crisis, and according to Kuhn (1970:91), this is the only time during which the possibility of a paradigm shift is considered. Continuous improvement, when measured

[9] Long-term sustainability is defined in the next section.

against Kuhn's historical analysis, will not be sufficient to result in a paradigm shift. Only a period of crisis will lead to a paradigm shift.

However, in business management, I would argue that it is not good practice to wait for a crisis. The following, in my opinion, might be a fundamental difference between paradigm shifts in science and paradigm shifts in business management. From a Kuhnian perspective, a shift occurs when the scientists eventually figure out that something is fundamentally wrong with what they have been taught. Similarly, the manager/business owner/entrepreneur is not trained to question the present management paradigm or to imagine alternatives. However, for a business to be sustainable in the long term, alertness for possible paradigm shifts might be required.

For Kuhn, looking at scientific development, this paradigm shift was an almost automatic and inevitable process. It happened when it happened, and it could hardly be anticipated or delayed. However, I would argue that managers need to go out and actively identify possible incoming shifts and even search for desirable paradigm shifts. Sitting around, waiting for a change to occur "naturally", is not conducive to long-term sustainability. Feyerabend (1970:201), in his interpretation of Kuhn's works, rightly states that Kuhn has failed to clarify what the aim of science is. Perhaps this important element should be considered in business management as well. Among the important aims of a business is long-term sustainability. We want to achieve long-term sustainability, even if it requires paradigm changes. Feyerabend (1970:205) notes that if the change of paradigms were our aim, we would need to accept that "proliferation and tenacity"[10] do not occur in separate phases of science (i.e. normal and revolutionary) but go hand in hand. The possibility of a paradigm shift, then, should not be reserved for rare occasions that nobody can predict or even evoke. It should be regarded as an ever-present opportunity that continually accompanies business activities[11].

[10] "Proliferation" refers to the invention or production of new paradigms and "tenacity" refers to the determination to "stick to" or articulate the already established paradigm instead of adopting the new one.

[11] It is possible to argue that Kuhn too said something similar. In a sense, the scientific community is not just quietly waiting for the next revolution but works actively towards it, even if it is not always conscious of the process. In fact, continued research and experimentation lead to detecting anomalies that, in turn, might lead to a crisis followed by a revolution. Furthermore, when a change of paradigm is in view, the scientific community does not merely sit back and wait. It usually debates its merits;

Paradigms and long-term sustainability

To understand the effect of paradigms and paradigm shifts on long-term sustainability, it is crucial to define long-term sustainability[12]. A description of the contemporary manufacturing business is also necessary to aid this understanding process[13].

Sustainable development terminology has grown significantly over the past few years. Glavič and Lukman (2007:1884) have done groundbreaking work in reviewing sustainability terms and their definitions, resulting in clarifying the meanings and applications of 51 terms and their definitions. Sustainable systems introduce interconnections between environmental protection, economic performance and societal welfare, guided by a political will and ethical and ecological imperatives. The implementation of such a system leads to a sustainability policy. Glavič and Lukman (2007:1877) characterise the sustainability policy as a four-tier system, with the base principles (level 1) comprising the economy, environment and society. Level 2 comprises approaches to be followed, e.g. pollution control; level 3 defines sub-systems, e.g. environmental management strategy and level 4 comprises sustainable systems such as sustainable consumption systems.

The manufacturing business LTM Refractories is taken here as an example. LTM Refractories specialises in the development and manufacturing of monolithic refractory castables and precast shapes, and metallurgical fluxes for the high-temperature industry. LTM Refractories sources 90% of its required raw materials locally in South Africa. The manufacturing process comprises high and low-energy mixers, forming equipment, bagging units and drying equipment. The labour force comprises a combination of semi-skilled and

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and while part of the community might be reluctant to the change, there will be a part that actively promotes the revolution.

[12] Long-term sustainability as a business concept has gained considerable attention following revelations about global warming and dwindling natural resources. At its most basic level, long-term sustainability suggests that a company will improve its chances of survival in the future by ensuring that resources used by the business are responsibly managed and maintained. http://www.wisegeek.com/what-is-long-term-sustainability.htm

[13] Our business model is, in essence, defined through our production method and size classification (in this case medium-sized manufacturing), our products (refractories and metallurgical products) and our markets, which is high-temperature industries. The management of the business, however, requires knowledge of and access to a wide variety of other speciality functions, e.g. human resources, safety, quality, strategy, finance, sales and marketing, law, economics, product design and development, manufacturing process, waste disposal, etcetera.

skilled workers, depending on the complexity of the manufacturing process. Apart from ISO 9001:2015, the management team also makes use of other tools to determine the strategic intent of the company.

One such tool is PESTEL.[14] It is a marketing tool for analysing the effect of the macro-environment on the organisation or business. PESTEL stands for:

P-Political

E-Economic

S-Social

T-Technological

E-Environment

L-Legal

All of the above factors play an essential role in the day-to-day functioning of the business, as well as in the strategic intent and long-term sustainability[15] of the business. As noted before, each area is influenced by its paradigm. The business functions within a specific political environment, currently under ANC rule. The economic and social environment is affected by Broad-Based Black Economic Empowerment[16] and Employment Equity[17] goals. From a technological point of view, the current technology standard, patents

[14] PESTEL definition: https://www.professionalacademy.com/blogs-and-advice/marketing-theories---pestel-analysis.

[15] A more philosophical tool that can be used is Dooyeweerd's theory of modal aspects. Dooyeweerd (1955) lists 15 aspects: the arithmetic, spatial, kinematic, physical, biotic, feelings, logical, historical, linguistic, social, economic, aesthetic, juridical, ethical and faith aspect. De Vries (2002: 12) notes that Dooyeweerd's modal aspects can be applied to the ISO standard, for example. "The standard has a certain number of pages – an arithmetic aspect. It may be available for free or at a certain price – an economic aspect. It may be beautifully or awfully designed – an esthetical aspect. We can distinguish these aspects of entities or activities in reality. Related to each aspect, there are 'laws' that should be honoured. For the first aspects, these are laws of nature. For instance, mathematical laws of adding, subtracting, multiplying, etc. apply to the arithmetic aspect. For later aspects, these 'laws' are normative principles that man, in his freedom, can obey, ignore or oppose. This exercise shows that the aspects approach can be used both as a checklist (in order not to forget aspects that might be relevant) and as a normative tool (how to do things 'good')".

[16] Broad-Based Black Economic Empowerment Act (53 of 2003) as amended by the Broad-Based Black Economic Empowerment Act (46 of 2013) and any amendments thereto.

[17] Employment Equity Act (55 of 1998).

and raw material availability and a specific market (high temperature) determine the product range. The manufacturing process must adhere to strict environmental laws such as the Air Quality Act[18] and manufacturing standards such as the OSHACT[19]. Almost all of these business functions are regulated by law, and each one of them has an impact on the long-term sustainability of the business.

Using Glavič and Lukman's (2007) sustainability development model as discussed above, we, as a management team, must use (among others) economic, environmental and societal principles to formulate a long-term sustainability model. It is essential to understand that in the model these base principles or aspects are not mutually exclusive, they are all critical in supporting long-term sustainability. In the next section, I will provide an example of the importance of one of these aspects on long-term sustainability. In the limited space of this article, I will focus only on economic sustainability.

Paradigm-shifts and sustainability: A concrete example

The question to ask is how paradigms and paradigm shifts influence this long-term sustainability aim. If we put a Kuhnian spin on the matter, the problem changes to what will happen if a crisis is experienced in one of the paradigms. According to Kuhn, a paradigm shift will occur when a crisis is experienced. Let us take the expiry of a patent as an example of a crisis and a subsequent change of paradigm.

LTM Refractories manufactures Turbostop™ under licence from Foseco, an international company with registered offices in the USA, UK and Germany. Foseco has registered patents for their Turbostop™ technology in most countries, including South Africa. When the patent expires, it opens the door for all refractory companies that have precast capabilities, to enter the market with this product design. The value in use, under the patent, then changes to supplying the product as cheap as possible to move market share away from the initial patent holder. A product that enjoyed protection under a patent no longer enjoys that protection. The barrier to entry, therefore, falls away.

How LTM Refractories adapts to such a paradigm shift will depend on how prepared we are for the anticipated paradigm shift. We could move our clients to a product that enjoys protection under a new patent. If the customer does not want to change products, we can

[18] National Environmental Management: Air Quality Act (39 of 2004).

[19] OSH Act (85 of 1993).

reduce the selling price to protect market share, if we are under pressure to do so. The direction of movement depends on the size of the impact of the crisis experienced and on the options available to overcome the crisis and to adapt to the new paradigm.

The long-term sustainability of the business is directly influenced by all paradigms active in the business model as well as by all possible paradigm shifts that could affect the business model. As a management team, it is essential to identify the paradigms active in all areas of business. It is similarly crucial to analyse and understand the role of the active paradigm to gain an understanding of what possible crises could lead to a paradigm shift. Part of this process is to pro-actively identify action plans to deal with a crisis and subsequent paradigm shift when it occurs. If we continue with the use of patents as a technology paradigm, for example, our long-term sustainability is not only influenced by how we react to our licensee patents that expire, but also by how we respond to opportunities created when patents of other companies expire. Success in business means anticipating and adapting quickly and efficiently to paradigm changes. The next section is an example of what happens when a paradigm change is not anticipated or acted upon.

How to ignore paradigm shifts: The Kodak example

Paradigm shifts, caused by revolutions, are also present in subsections of business management and can be best described by using a real-world case study. A case in point is Kodak's response to the digital photography revolution. Lucas and Goh make the compelling analyses in their research and conclude that:

> "Kodak's middle managers, culture and rigid bureaucratic structure hindered a fast response to new technology, which dramatically changed the process of capturing and sharing images. Film is a physical, chemical product, and despite a succession of new CEOs, Kodak's middle managers were unable to make a transition to think digitally. Kodak has experienced a nearly 80% decline in its workforce, loss of market share, a tumbling stock price, and significant internal turmoil because of its failure to take advantage of this new technology." (Lucas & Goh, 2009:46)

The change of paradigm from conventional photography to digital photography created a revolution in Kodak's historical business model. It was a revolution that they did not see coming, or expected, and they were ill-equipped to deal with the consequences of the

revolution. Many other businesses suffer the same fate as Kodak when revolutions occur in their industries.

A possible objection

This anticipation and adaptation to paradigm changes introduce a new problem to both science and business; namely, that science and business are placed in a situation of constant revolution. Lyotard claims to have shown that consensus is only a particular state of discussion (in the sciences), not its aim:

> "Its end, on the contrary, is paralogy[20]. Postmodern science, by concerning itself with such things as undecidable, the limits of precise control, conflicts characterised by incomplete information, 'fracta', catastrophes, and pragmatic paradoxes – is theorising its own evolution as discontinuous, catastrophic, non-rectifiable and paradoxical." (Lyotard, 1984:60)

In other words, revolution is for Lyotard the permanent situation of science. According to Rorty (1984), Lyotard argues invalidly from the current concerns of various scientific disciplines to the claim that science is somehow discovering that it should aim at permanent revolution, rather than at the alternation between normality and revolution, made familiar by Kuhn. Rorty states that:

> "To say that 'science aims' at piling paralogy on paralogy is like saying that 'politics aims' at piling revolution on revolution. No inspection of the concerns of contemporary science or contemporary politics could show anything of the sort. The most that could be shown is that talk of the aims of either is not particularly useful." (Rorty, 1984:33)

Rorty (1984:39) further argues that Lyotard shares a fundamental point with both Feyerabend and Hesse, the point being that there are no compelling epistemological differences between the aims and procedures of scientists and those of politicians.

Can Rorty's critique be applied to my proposals, as expressed above? Am I proposing a "permanent revolution" for businesses? Will my proposals, for the sake of

[20]"Lyotard regards reason not as a universal and immutable human faculty or principle but as a specific and variable human production; 'paralogy' for him means the movement against an established way of reasoning" Paralogy definition: https://en.oxforddictionaries.com/ definition/paralogy

sustainability, make business unsustainable? I would reply that I suggest a more nuanced approach to achieving long-term sustainability in business; that is, anticipating and adapting quickly and efficiently to paradigm changes. This approach, I would argue, is not about being in constant revolution, but rather about being on constant alert. This continuous alertness can also be described as an ongoing awareness. It is the awareness that long-term sustainability is influenced by paradigms and paradigm shifts. It is the awareness that a crisis may lead to a revolution; the recognition that management should be alert enough to react to these changes in a manner that will be conducive to long-term sustainability.

Conclusion

At the start of my research on Kuhn's philosophy and the possible influence that it might have on the long-term sustainability of businesses, a few prominent questions came to mind. Questions such as: Do we find paradigms and paradigm shifts outside of the natural sciences (in business), and can we compare paradigms and their shifts, as understood and explained by Kuhn, to paradigms and paradigm shifts in business management? Of equal importance was the question, how do paradigms and their shifts influence the long-term sustainability of a business?

It is my conclusion that paradigms and their shifts can be found in areas outside of the natural sciences, and specifically in my field of study. ISO 9001:2015 was defined as a management paradigm and compared to Kuhn's definitions of paradigms. A similar comparison was made between Kuhn's view of paradigm shifts and revolutions in business. The result of the comparison was that, although some differences are present, there are considerable points of similarity among the compared items. It allowed me to use Kuhn's philosophy to explore the problem of long-term sustainability in business management.

How then can we apply the insight gained through this research to support long-term sustainability? Before we could answer this question, we had to gain some understanding and definition of long-term sustainability for a specific group of people, or in our case, for a specific business organisation. A description of the contemporary manufacturing business hopefully assisted with this understanding. It is essential to understand what a sustainability model would comprise for our business model.

The most crucial issue to understand, as was demonstrated by the Kodak case study, is that the human subject is responsible for the existence of paradigms and their shifts, as well as for the effectiveness in identifying and promptly reacting to possible paradigm shifts.

Awareness of these realities and processes (paradigms, crises, revolutions) was identified as a crucial attitude. The aim of this awareness, I have suggested, is not for a business to be in a state of constant revolution, but (for its managers) to be in a state of constant alert, in other words, being pro-active in recognising and anticipating the next revolution. This, I have argued, is the crucial factor for promoting long-term sustainability. In all this, it can be said that Kuhn's philosophy has still played a relevant role.

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