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Developing a Strategic Cost Management Model for a Potato Packing Facility

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Abstract

Purpose: The purpose of the study was to solve a real-life business problem by developing a new customised strategic cost management (SCM) model for the case study entity — a South African potato packing facility.

Design/method/approach: The study followed a pragmatic philosophy where data were collected by observation and semi-structured interviews. The data focused on the following SCM techniques: Business process re-engineering, activity-based management, *Kaizen* costing, total quality management, and target costing.

Findings: The investigation found that, except for target costing, all the SCM techniques belong in a SCM model. The investigation also revealed specific practical operational examples which were firstly analysed according to codes, and secondly aggregated, rewritten, and inductively reasoned in order to illustrate these processes in a new customised SCM model.

Practical implications: After the operational processes were documented, a new customised SCM model was developed for the case study entity. The findings of the study could be helpful when other organisations manufacture, process, or pack various products to make informed management decisions.

Originality/value: The value of the study lies in the likelihood to establish transferability — the process that was followed to develop a new customised SCM model could be replicated.

Introduction

Business managers use cost management to reach their resource inputs and process targets, and to generate information for decision making (Buys, 2021). Cost management differs from traditional management accounting control. The latter compares actual results with predetermined standards to identify variances in cost containment rather than cost reduction; the former emphasises cost reduction, change, and continual improvement rather than cost containment (Drury, 2018). Strategic cost management (SCM) is a deliberate effort to establish a link between cost, financial, and strategic management (Rounaghi *et al*., 2021). Many researchers are misguided when interpreting the term 'cost reduction' as a synonym for SCM (Kumar & Nagpal, 2011). SCM is much more: It involves a process in which business resources and costs are aligned with short-term and long-term plans (Henri *et al*., 2016).

According to DALRRD (Department of Agriculture, Land Reform & Rural Development) (2020), potatoes do not achieve the highest prices, for example, green peas sold more than ten times the price per ton in 2019. From 2021, the production cost per hectare for potatoes ranges between R160 000 (± 9 400 USD) to R240 000 (± 14 000 USD) with farmers receiving no government subsidies (RegenZ, 2022). Additionally, sellers of potatoes are price-takers: They cannot set the price as it does not have enough market power to do so; hence potato sellers must accept the market price (CFI, 2022). This hurdle underlines why managing costs is critical in the potato industry and could be effectively facilitated by making use of a potato packing facility. Ait-Oubahou *et al*. (2019) and Mahajan *et al*. (2017) posit that to guarantee the quality of fresh horticultural products on the consumer's table, sufficient management of post-harvest activities is crucial as horticultural products have short post-harvest lives. The packing speed is, therefore, a critical factor as soon as the prime stage of maturity is reached due to the perishability of the produce (Brueckner *et al*., 2014). The primary goal of food packaging, according to Coles (2003), is to protect the content from damage or other external factors. Excellent packing operations, such as diligent quality control personnel, skilled workers, and

impeccable equipment, are key in preventing bruises when harvested products are packed (Mahajan *et al*., 2017). Toussaint and Vigneault (2006) reiterate that field packing has its advantages, such as reduced handling, a lower possibility of introducing contaminants to the facility, and lower infrastructure cost. However, field packing also has its flaws. Numerous beneficial operations (washing, grading, and sorting) concerning packing lines are not performed. It is, therefore, highly advisable to make use of packing facilities to get a satisfactory product to the market and reduce costs in the process (Regattieri & Santarelli, 2013). The focus of this study was on Facility A, a South African potato packing facility. From the moment the product is harvested until it leaves the packing facility's premises for its intended destination is presented.

A few studies have been conducted on cost management in potato production, including Filipe *et al.* (2018), Gautam *et al.* (2019), Zangeneh *et al.* (2010) and Zangeneh *et al*. (2011). However, a paucity in research focusing on packing facilities and when packaging is the focus of the study, the aim was quality control rather than cost control. That was the case with (amongst others) Ait-Oubahou *et al*. (2019) and Yaptenco and Esguerra (2012). This paucity called for an exploration of cost management techniques in a potato packing facility.

A significant need for a reduction in post-harvest losses and a decrease in packaging and handling costs at the facility was highlighted by the researchers during a casual conversation with the managing director of Facility A where cost management is not applied formally.

The following question must be answered when something needs to be done to reduce post-harvest costs: What actions may solve this real-life business problem? It was, therefore, necessary to develop a structured model for Facility A that illustrates examples on how to improve its cost management. The purpose of this study was to develop a model that was structured according to proposed SCM techniques to enhance cost management at Facility A. Case study data were collected by means of observations and interviews with knowledgeable employees at Facility A. Before a model could be developed, data were needed to (i) obtain an understanding of the

current process, (ii) determine the need for a newly structured and customised SCM model, (iii) evaluate the appropriateness of each proposed SCM technique, and (iv) obtain practical operational examples of SCM. The proposed SCM techniques were business process re-engineering (BPE), activity-based management (ABM), *Kaizen* costing, total quality control (TQM), and target costing. The five proposed SCM techniques provided a structured conceptual frame wherein a customised SCM model was developed.

The paper is organised as follows: The next section provides background on the case study entity's potato packing facility and a literature review which includes the conceptual framework of the study. In the literature review, we further discuss SCM and pay special attention to the different techniques that the researchers included as SCM. As not all SCM techniques were relevant to this case study, we proposed five techniques to serve as the conceptual frame. The section thereafter explains the research method and design, followed by the results and a discussion. The first part deals with the data collected by observation. The second part deals with the data obtained from conducting interviews. The model that was developed illustrates examples of the selected SCM techniques. The paper concludes with a final section.

Background

Potato packing facility

Facility A is a rapidly growing entity with the packaging house stretching over almost 4 500 m^2. This facility is supplied by 280 hectares of potato land, accumulating up to 16 800 tonnes per year. The potato division of the farm employs more than 150 employees (of which more than 20 are permanent and the rest seasonal labourers). The biggest expense in the packaging division is electricity, but management wants to control labour more strictly and ideally reduce the labour force. The latter work with three product types: potato seed, table potatoes, and scrap. The main aim of Facility A is to optimise potato seed (as this achieves the highest prices), and the potatoes not qualifying as seed potatoes to be sold as table potatoes. The scrap (mainly mechanically damaged potatoes) is sold to the local low-end market at a significant discount.

Literature review and conceptual framework

SCM has a broad focus and consequently, available literature does not focus on a single unique definition of SCM (Janjić *et al*., 2017). Normally, SCM is developed by including non-financial information for decision making, where traditional management accounting emphasises financial information and the business context is often overlooked (Mike & Yi, 2009; Ramljak & Rogosic, 2012). According to Ramljak and Rogosic (2012), the combined effect of strategic management accounting techniques is convenient for cost control and cost reduction, as these techniques have a synergistic effect due to a better insight gained by adding non-value activities as well as activities beyond the walls of a facility. Kumar and Nagpal (2011) confirm the above statement by explaining that SCM has a broad focus and not limited to controlling costs and the continual reduction of costs. It provides instead cost information to managers for sound decision making.

Ruan (2020) emphasises that strategic execution is the most critical link in SCM, and SCM efforts are only useful if companies boast good executive abilities. SCM aims to align business resources and costs with business strategies (Henri *et al*., 2016) — critical for companies, especially during challenging economic times (Rounaghi *et al*., 2021). SCM techniques are a necessity in challenging times when companies have to provide their product faster, at a lower cost, and of a superior quality (Apak *et al*., 2012).

The fact that SCM does not have a single unique definition, resulted in the researchers harbouring different opinions regarding the techniques that should be viewed as SCM. Janjić *et al.* (2017) included attribute costing, life-cycle costing, quality costing, target costing, and value-chain costing in their list. Hansen *et al*. (2021) included entertainment risk management, value chain analysis, life-cycle cost management, and just-in-time manufacturing and purchasing. Moreover, Rounaghi *et al.* (2021) list somewhat more techniques, namely activity-based costing, benchmarking, total quality control, in-time production, process re-engineering, non-value-added activities, target costing, and value engineering. Lastly, Drury (2018) included life-cycle costing, target costing, *Kaizen* costing, activity-based management,

business process re-engineering, cost of quality, value chain, benchmarking, environmental cost management, and just-in-time-systems. Note that terminology differs slightly between authors. Nevertheless, a variety of SCM techniques exist.

The reason for listing the various SCM techniques was to select techniques from this list to design a conceptual framework for the study from which an SCM model could be developed. However, not all SCM techniques are suitable for all industries or specific companies due to their unique characteristics. Benchmarking, for example, is a technique that is used when an entity chooses a comparable company or division that is viewed as a leader to compare operations with the aim to improve processes (Apak *et al*., 2012). However, this technique is unrealistic to implement as companies in the packing facility sector are unwilling to share information and collaborate — accurate benchmarking is, therefore, impossible. Just-in-time production (JIT) entails that an entity keeps minimal levels of inventory (Apak *et al*., 2012). However, JIT did not apply to Facility A, as they source potatoes from their own fields and harvest times are fixed. They do not plant in phases throughout the year, as potato harvesting is seasonal (from June to August), forcing them to start planting in November. Life-cycle costing requires cost management from a product's research and development phase to its decline phase (Apak *et al*., 2012; Buchert *et al*., 2015). This technique was not particularly relevant to Facility A, as they have no research and development costs. Furthermore, they do not have a typical product life cycle curve, because their product is a necessity.

The above-mentioned discussion presents a few examples to clarify why not all of the SCM techniques were relevant to Facility A. The researchers only focused on five proposed SCM techniques to design a structure for our model's illustrations: BPR, ABM, *Kaizen* costing, TQM, and target costing.

Business process re-engineering (BPR)

Drury (2018) clarifies that BPR necessitates substantial adjustments to processes by examining current ways and designing new processes that may differ dramatically from the existing conditions (adjustments may include the sequence, elimination, or introduction of activities implemented within a process). Buys and Oosthuizen

(2021) are of the opinion that any re-engineering needs a comprehensive understanding and evaluation of the current operational process. The processes of Facility A have been used for over a decade. Management have likely become complacent with how things are done, as it was designed at the start of the company and it works at an acceptable level. However, with the assistance of BPR and an objective view of the processes, this technique could improve efficiency and reduce costs.

Activity-based management (ABM)

Drury (2018) states that ABM flows from activity-based costing and focuses on an entity's significant activities and cost drivers (rather than departments) to control costs. The primary focus of ABM is to focus on the performance of activities, implying that the effectiveness and efficiency of activities must be monitored (Maluleke & Oberholzer, 2021). When ABM is applied, a company is viewed as a set of interlinked activities that add value to customers, and aim to consume minimal resources in the process of satisfying customer needs, while eliminating non-value-added activities (Drury, 2018). This technique was relevant to Facility A to investigate the possibility of eliminating non-value-added activities.

Kaizen costing

The word '*Kaizen*' refers to a Japanese term that implies a business philosophy of continual improvement of quality and productivity in a process. Continual improvement could only be successful when the organisational structure aligns with the applied principles (Omotayo *et al*., 2020). *Kaizen* costing is a technique used when employees make incremental improvements on a continual basis by increasing the efficiency of the process, and is, therefore, similar to target costing. However, the target is not static (Drury, 2018). This cost management technique seemed relevant to Facility A, as they mostly do not have control over input costs but dominion over resource consumption. – This technique is necessary to continue reducing wastage in any way to affect profits positively, due to rising input costs coupled with an uncontrollable selling price.

Total quality management (TQM)

TQM is another technique that could be applied to improve business performance and business competitiveness (Permana *et al.*, 2021). It entails an inclusive approach where all aspects of an entity form part of the continual quality improvement process with a focus on prevention (proper training and regular maintenance) rather than correcting defects (rework and scrap). TQM categorises costs into prevention, detection, and correction, with the modification being split into internal and external failure. Although costs are incurred to reach this objective, rework, inspection costs, and other costs of correcting suboptimal products produced are reduced (Drury, 2018). TQM was undoubtedly relevant to Facility A, as the quality of their packaged potatoes directly impacts their revenue, and they suffer avoidable quality reductions throughout the process. This method of SCM ultimately established a link to all the above-mentioned techniques to deliver the product as fast as possible and at the lowest possible cost — while maintaining the highest standard.

Target costing

Target costing is a technique that starts with the price customers are willing to pay for a product. After determining that price, the target profit margin should be subtracted from this amount, which sets the production cost that should be targeted (Drury, 2018; CGMA, 2023). This technique was chosen, because Facility A is a price-taker (the market determines the price). As Facility A are unable to influence the selling price but still need to cover their costs and make a profit, this SCM technique seemed suitable.

Current focus

There is a significant need for reducing post-harvest losses and decreasing packaging and handling costs at Facility A. However, before a structured SCM model could be developed, it was important for the researchers — as a first step — to obtain a clear understanding of the current operational process, as suggested in the literature of Buys and Oosthuizen (2021). A clear understanding assisted the researchers in understanding the strategic execution needed (Ruan, 2020); how to align business resources and costs to the business strategies (Henri *et al.*, 2016); and how to

provide potatoes at a lower cost without sacrificing superior quality (Apak *et al.*, 2012).

The second step taken by the researchers was to determine the need for (and urgency of) a new customised SCM model. Thirdly, the researchers needed to determine the appropriateness of the selected techniques described by Drury (2018), CGMA (2023), Maluleke and Oberholzer (2021), Omotayo *et al*. (2020), and Permana *et al*. (2021). Fourthly, it was important to obtain practical operational examples of the possible application of the five SCM techniques. This proved helpful in developing a customised model with illustrated examples.

Research method and design

The study followed a pragmatic philosophy for collecting and analysing data, from where a SCM model was inductively developed and illustrations of examples were included to enhance cost management. A pragmatic research philosophy is suitable when a study focuses on a real-world problem to find a solution (Kivunja & Kuyini, 2017). Pragmatism is, therefore, guided not necessarily by theory but by practical considerations (Henderson, 2011). Consequently, Brierley (2017) together with Davis and Fisher (2018) argue that pragmatism is a unique philosophy that avoids epistemological and ontological arguments. This exploratory case study had no theoretical propositions, but the four above-mentioned steps were formulated from literature (presented and addressed in section 2.3), and the new model was organised according to the concepts of the five selected SCM techniques.

This study was qualitative in nature: (i) Observations, and (ii) semi-structured interviews for data collection were used to suggest a suitable SCM model to Facility A. To enable a comprehensive understanding of the operational process and cost management of Facility A, the participants shared their internal knowledge of the entity.

Firstly, we made use of observations from case study documents, narratives, and field notes while visiting the facility. Observation is an effective data collection tool — especially qualitative data — as researchers are given the opportunity to obtain a variety of information first-hand (Twycross & Shorten, 2016). Observations were

made concerning the whole process to comprehend the packaging process better, and to identify potential areas of improvement. Observing assisted the researchers in asking additional questions to ensure an in-depth study. According to Endacott (2007), observation is common in all approaches when case study data are analysed. A description of the observations made was confirmed during the interviews to enhance the study's credibility.

Secondly, a purposive sampling approach was followed by making use of semi-structured face-to-face interviews as the primary data collection strategy. Data were collected from the most knowledgeable participants, and the credibility of the study was enhanced. The interview with the general manager of Facility A was important to gain a practical understanding of how the process works on ground level and to take inventory of any existing hurdles. The managing director was interviewed, as he has the most experience of accounting and access to practical knowledge, and knows what processes were previously implemented to overcome any limitations regarding expenditure and productivity, and what needs addressing and why. The accountant clarified the current cost management techniques and any relevant management accounting information. Three participants were interviewed by making use of the same semi-structured questions. The same questions were used in the data collection process to assist with the verification of information obtained. By following researchers, such as Bvumbi (2017), Holtzhausen *et al*. (2021), and Maluleke and Oberholzer (2021), themes were identified from the literature and incorporated into the semi-structured questionnaire. The identified themes from the above-mentioned literature were:

- *Theme 1: Understanding the current process.*
- *Theme 2: Need for and urgency of a new SCM model.*
- *Theme 3: Appropriateness of each proposed SCM technique.*
- *Theme 4: Examples of practical operational SCM.*

The conducted interviews were audio recorded, transcribed, coded, and analysed. A process of developing categories and codes from the data was followed. General categories were developed from the data, which were broken into more explicit

codes. For instance, when going through the field notes and transcriptions of the interviews, anything said about, for example, the current process was highlighted in a specific colour. This process helped in performing a thematic analysis to organise the collected data into the above-mentioned predetermined themes.

Results, discussion, and model development

Data collection: Observation

During the visit to Facility A, it was observed that the focus of management was more on the farming operations, and not necessarily on the packing facility. Improvements to cost management was, therefore, beneficial. The layout of Facility A's activities from the moment the potatoes are harvested until the packaged potatoes leave the premises provided a more unambiguous indication of how operations work and the flow of activities.

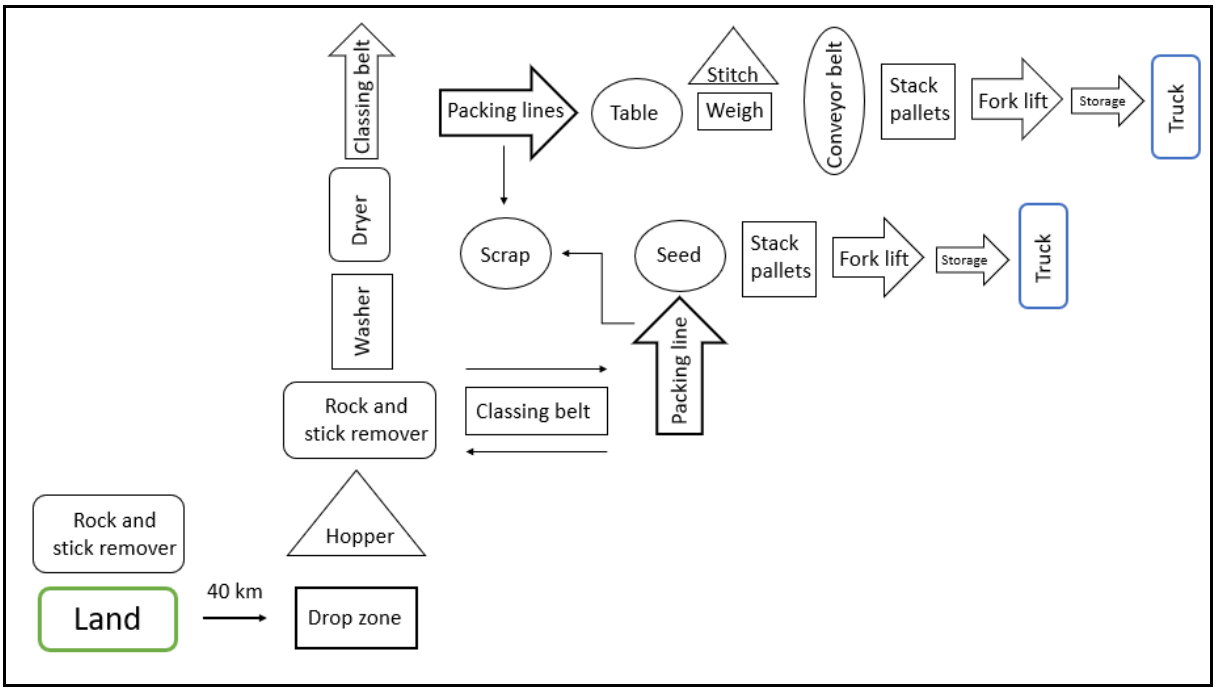

Figure 1: Layout of Facility A

Source: *Own research*

Figure 1 presents the layout of Facility A. The harvested product moves over a de-stoner belt (rock and stick remover) where stones, sticks, and excess soil are separated from the potatoes on their way to the truck or tractor. During this process, manual labourers remove large stones and sticks too big to fall through the gaps of the belt. When a tractor is fully loaded, it takes on the bumpy 40 km trip (it takes

approximately one hour) to the packing facility's drop zone. The potatoes are loaded on the hopper, which feeds the load to where the packaging takes place. The duration of offloading varies between 10 to 30 minutes — depending on the type of vehicle used. It is, therefore, not uncommon to see three vehicles waiting in a row for access to the hopper, which often leads to the last vehicle waiting at a complete standstill for almost an hour.

The potatoes move from the hopper to the packaging line on a conveyor belt. Firstly, they pass over another de-stoner belt where additional stones, sticks, and excess soil are removed by either falling through the belt or by labourers (identical to the previous de-stoning process). The potatoes then cross a classing belt, where the smallest units fall into a different packing line, and are move into the seed division of the packing facility.

The selected seed potatoes then cross another de-stoning belt, after which three sizing belts are reached that split the products into three categories of seed potatoes. Should a potato not fall through one of the sizing belts, it returns to the second de-stoning process. If a potato successfully falls through one of the three sizing belts, it is transported over a conveyor belt into a 25 kg hessian bag (the colour of the bag indicates the potato size). If a potato does not look 'pleasing' or has bruises, manual labourers remove it and places it on the conveyor belt that returns it to the second de-stoning belt. The hessian bags are then sealed, loaded on wooden stack pallets, and transported via forklift to the seed storage division of the facility. These bags are in storage for two to three months until they are ready to be transported by truck to farmers.

When potatoes do not fall through the sizing belt to be classified as potato seed or returned after not being classified into one of the three seed categories, the potatoes are moved to the washing section of the process as table potatoes (if not scrap). The potatoes go through the dryer, followed by another round of classing by means of sizing belts — five sizes are tested (small, small-medium, medium, medium-large, and large). During this stage of the process, some potatoes fall off the production line if a large batch of potatoes comes through and end up on the ground (some lie in the

excess water of the washing machine, while others dry out on the concrete) — these potatoes are not returned to the process.

Potatoes are classified according to size and go on a packing line, a conveyor belt designed for a specific size. The conveyor belt splits into three lanes with paper bags on both sides as well as at the end of the lane. If the majority of the batch are perfect potatoes, the two outside lanes are made available for them to be packaged as first grade. The remaining potatoes flow straight through the middle and are packaged as second grade. Should the majority be perfect potatoes, two lanes are made available for them, in which case the remaining lane is reserved for the other potatoes. Manual labourers sort the potatoes into different lanes. The exact process is followed for every size table potato.

When a bag is full, it is moved to the stitching machine, where another labourer takes the bag and stitches the open end. Empty bags replace stitched bags at the end of the conveyor belt. Stitched bags are placed on a conveyor belt, which moves these bags to another location where a labourer removes them from the conveyor belt and packs them on a wooden pallet, according to size stations. A forklift loads the pallets onto a truck during the evening, and then these pallets are transported to the market.

Data collection: Semi-structured interviews

Open-ended questions were asked during the interviews to prevent "yes" or "no" answers, interviewees had to substantiate their answers. The semi-structured interviews were conducted at the office of Facility A. All of the interviews were audio recorded after consent was obtained from the interviewees.

The audio recordings of the interviews were used to transcribe and code the data into themes and sub-themes. To analyse the recorded feedback, a data table containing the *verbatim* responses of the interviewees was developed. Themes were combined when deemed necessary, especially when comments made by the interviewees were regarded as out-of-context. The interviewees were cross-referenced as follows:

- Interviewee 1 = [1]
- Interviewee 2 = [2]

- Interviewee 3 = [3]

The order in which the interviews took place was entirely random, and not necessarily in the exact order previously mentioned. The following themes were identified to comprehend the feedback received from the interviewees. Each question is linked to a theme.

Theme 1: Understanding the current process

All three of the interviewees explained the process from harvesting the potatoes until they are shipped to the different markets. The aim of the interviews was to confirm that the researchers understood the process correctly in order to summarise the data accurately. Limited additional information was added after the interviews took place.

Theme 2: Need for and urgency of a new SCM model

The interviewees found the question about the need for and urgency of a formal SCM straight forward and easy to answer. All three of the interviewees agreed that a purposeful effort should urgently be made to manage costs effectively in order to achieve cost reduction and better performance. This viewpoint was confirmed by the interviewees who responded as follows: [3] "… at the packing facility there are things we can do, or want to do, to make it more effective in order to reduce the cost … So, I really think we should focus on doing more in a shorter period of time." Furthermore, [1] "… there are always unnecessary expenses …".

Theme 3: Appropriateness of each SCM technique

The five SCM techniques were thoroughly explained to the interviewees. After the comprehensive explanation, the interviewees gave their opinions about the appropriateness of each of the techniques. Their responses are reported below. It is clear that they all agreed that the four techniques, BPR, ABM, *Kaizen* costing, and TQM are appropriate and should be implemented as soon as possible. The appropriateness of target costing was turned down by the interviewees.

Business process re-engineering: [3] "Yes, it is important … there are a few things we can do in that regard …" [2] "Out of a productiveness viewpoint it is an ideal idea for me … we can easily get caught up in the idea that things should be done in a certain way and then you are blind for how things can be done ..."

Activity-based management: [1] "It will have an immense impact …" [3] "… for example the removal of sticks and stones from the potatoes … the better it gets done the first time, the less unnecessary load is transported to the packing facility … you will be shocked to see how much of those stuff is also transported."

Kaizen costing: [3] "… I think it is a good idea, we can try it … there is always new technology to help us, I think it is a smart plan." However, [2] "… I think somewhere you will reach a plateau (saturation) …"

Total quality management: [2] "… It is very important to do proper training to ensure quality throughout, although there are parts in the facility where it is sufficient, but there are parts that need attention." [3] "… the managers have an important oversight roll, but it is a challenging process …"

Target costing: This technique was turned down by all three of the interviewees, as the market price (the price that customers are willing to pay) and the costs are too volatile. [1] "It's going to be too volatile to implement …" [2] "It is a bit tough, because the market price literally changes daily and each market has a different price, transport costs differ, so the target will change too much …" [3] "The market price changes daily; … all of this [cost] is out of our control … In theory it is a good idea, but it isn't practically implementable for us."

Theme 4: Examples of a practical and operational SCM (and development of the model)

The interviewees were asked to provide examples of how and where the techniques could be implemented. The examples they provided were sorted and analysed according to the codes. After an analysis, the examples were aggregated, rewritten, and inductively reasoned to use them as illustrations of possible applications of the techniques. The results are presented here in a narrative format, and serve as the proposed newly structured SCM model.

Business process re-engineering: One way to reduce labour cost is to ensure that there are no excess labourers or repetition of duties, especially non-value-adding activities. One such example is the labourers who remove the sticks and stones from the potatoes when they go over the de-stoning belt. This process is repeated twice. It

could be viewed as a non-value-adding activity (although necessary), but it should only be done once throughout the whole process directly after the potatoes were removed from the ground or after arriving at the facility. We recommend that it happens directly after removal from the ground. This would lead to either lighter loads transported to the facility, or even more potatoes fitting into a load. Instead of deploying four labourers in pairs of two, it would be more efficient to simply place, for example, three labourers at the first removal point. Additional cost would be minimised and time would be used more productively once the potatoes are unloaded at the facility. In addition, we recommend a multi-stage potato remover to be used so that fewer sticks and stones remain amongst the potatoes. Labour cost can be reduced.

Additionally, we recommend the introduction of a bin system where huge potato bins are installed to allow for the packaging process to continue irrespective of the rate of packing. The bins should be strategically placed after the sorting of potatoes is completed to enable the packaging process to continue even when one of the machines breaks down. Another benefit of this addition is that packaging could continue after hours with fewer labourers to package the potatoes stockpiled throughout the day.

Another feature to add to the process is an additional input point at the hopper, so that tractors are not delayed when dropping off their cargoes. If management is prepared to invest capital, we ultimately recommend erecting an additional packing facility closer to the harvesting grounds. Tractors should then transport smaller loads to the new facility. Trucks that could carry approximately two times more than tractors, should travel the entire distance to the 'old' facility. This venture would reduce: (i) wear and tear on the tractors, (ii) prevent vehicles waiting for one another at the drop-off point, and (iii) improve the return time of tractors that would be able to take another load from the land to the 'new' facility.

Activity-based management: Significant expenses in the packaging process are (i) electricity, (ii) fuel, and (iii) labour. The cost drivers of these cost pools are the hours of electricity consumed, kilometres travelled by vehicles, and labour hours

worked, respectively. Activities should be identified that use these cost drivers, and the extent that they are used.

To reduce the electricity bill, management should ensure that all machines and other electronic devices used in the process must be switched off after hours or in production downtime. Another possibility is to increase the number of solar panels and batteries. This would be a significant capital investment initially, but the difference in the electricity bill would be substantial. All this could be done with the goal of reducing the electricity hours consumed and consequently, electricity costs. This exercise will lead to a reduction in the costs of all the activities connected to electricity consumption.

The consumption of fuel could be reduced by keeping the number of trips travelled to town by employees to a minimum. A trip should only be made if an item is indeed not in inventory, and only one trip should be made to meet everyone's needs (the amount of kilometres travelled should be limited to maintain economic fuel consumption).

The number of labour hours worked could not necessarily be reduced, but the overtime hours worked should be kept to a minimum. One and a half hours are paid for every hour worked overtime, and no unnecessary labourers should be included in the process.

Any of these identified major expenses (as well as its cost drivers) could be tracked and controlled without any difficulty, as the cost pools allow for only controlling the specific expense that needs to be controlled by focusing on its associated cost driver — instead of attempting to reduce costs and consumption in general, as it is unclear where the focus should be.

Kaizen costing: It was established that the implementation of *Kaizen* costing would indeed be valuable to Facility A. Resource consumption in the packaging process would be controlled, adverse usage variances would be kept to a minimum, and efficiency and output throughout the process would be improved continually. This technique should be implemented on a seasonal basis. Targets should, therefore, be set at the beginning of each season, as more frequent target changes are not practical

at Facility A. Throughout this process, management should ensure that no unnecessary electricity is consumed, no excess labourers are paid, and no excessive overtime is worked. In addition, they should avoid any wastage of packaging material.

Total quality management: This technique is currently implemented to a certain extent at Facility A, and is critical in this industry. A few refinements should improve the process. Firstly, we recommend that rocks and sticks are adequately removed after harvesting, so that fewer potatoes are left bruised. A speed limit should also be enforced to reduce the excessive bouncing of vehicles (and produce). One labourer should be placed at the washing machine to return any potatoes that fall off the line back during the process. Another labourer should be placed after the washing machine to remove any potatoes that are clearly bruised, so that this does not need to happen at a later stage after scrap potatoes have unnecessarily gone through the entire process. This SCM technique is not prominently linked to expenses, and relates more to an increase in revenue rather than a reduction in costs or reduced consumption that needs to be measured.

Target costing: It was established during the interviews that — although a good idea in theory — target costing is not practically implementable in the business process at Facility A. The main reasons are that the market price changes daily, and additionally, the price for each potato size at each market is different. It would, therefore, be impossible to work with such a variable target. Moreover, it is not practical to implement this technique individually for each potato size or each market, as all of the potatoes unavoidably go through the same process. Another major challenge is that most of the input costs of Facility A are regulated by the South African government, and not controlled by Facility A, as it primarily consists of electricity, fuel, and labour.

Conclusion

A pragmatic research philosophy was followed with the aim to solve a real-life business problem by designing a SCM model by making use of a potato packing facility as a case study example. We collected data by means of observations to gain a

comprehensive understanding of the whole packaging process — from the moment the produce is harvested until it leaves the premises for its intended destination. Semi-structured interviews were conducted to collect additional data to determine the significance of and urgency for a new customised SCM system, to determine the appropriateness of the proposed SCM techniques, and to obtain practical operational examples.

In the study, the whole packaging process was observed and documented. We conclude that the need for a new customised SCM system is significant and urgent. We further conclude that all of the proposed SCM techniques are appropriate, except target costing. The structured model illustrates the following techniques: BPR, ABM, *Kaizen* costing, and TQM.

The developed model was customised for the case study entity. However, the findings of the study could also be helpful to organisations that manufacture, process, or pack various products to inform management decision making. Nevertheless, this case study's inductive reasoning approach did not attempt to generalisation its findings. Nevertheless, the value of this study and its findings lies in the likelihood of transferability — the process followed to develop a new customised SCM model could be replicated. It is, therefore, implied that the research process that was followed to solve the business problem may serve as an example for future studies, where researchers could use this study as a foundation.

During this research study, certain assumptions had to be made. We assumed that the truth was reflected in the opinions of the interviewees. Consequently, the verbal feedback from interviewees was provided in an unbiased manner to ensure that optimal feedback was given with the goal to develop a suitable SCM model. The SCM model is merely a steppingstone for Facility A, as it solely focuses on the packaging process from when the product is removed from the ground. More work remains to be done on the planting and harvesting operations. Similar studies can be extended to more potato packing facilities of various sizes to develop a generic SCM framework that could be suitable to copy on any potato farm. The findings of this study could be

used by other packing facilities of different horticultural products to see whether an SCM model could be developed to suit all business processes.

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