

Pretoria Portland Cement Company Limited (PPC Cement), South Africa

Country: South Africa

ISO member body: South African Bureau of Standards (SABS)

Project team:

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Executive summary

This report presents the results from the assessment of the economic impacts of consensus-based standards in the construction industry. The assessment was carried out on the Pretoria Portland Cement Company Limited (PPC Cement), comprising eight manufacturing plants and three milling depots. Together these facilities are capable of producing almost eight million tons of cement per year. Related products include aggregates, metallurgical-grade lime, burnt dolomite and limestone.

ISO developed a methodology to help assess and quantify the economic value that standards contribute towards a company. This study is based on the principle of capturing data at the operational level where standards have a more direct impact. Interviews with key PPC Cement personnel have assisted us in quantifying the impacts that standards have at a functional level, as well as on the company as a whole.

The company confirmed the importance of standards and the direct impact standards have on sales and costs. At each selected business function, standards made a contribution towards cost savings and sales increases. Apart from the quantitative aspects, there are also the qualitative aspects of standards. Qualifications of suppliers have been raised due to the systematic use of standards by PPC Cement. Implementation of ISO 14001 has resulted in lower energy consumption and a better environmental record. The use of OHSAS 18001 has created a safer working environment for employees and, indirectly, has enhanced the safety of the public. Taken together, the measures above have helped improve the reputation of PCC Cement in the eyes of its customers.

11.1 Objectives and organization of the pilot project

Standards developers claim that standards, once implemented, bring about huge benefits for users and the economy. However, only a handful of studies have proven that standards really do have an impact on the economy of a country. Substantiating and quantifying the true value of consensus-based standards is no small challenge. Though it is difficult to quantify the benefits of standards, it is important to monitor and prioritize standardization activities to raise awareness and improve communication, thereby promoting the use of standards and encouraging stakeholder participation.

The objectives of the study are to :

- Assess the impact of standards that are documentary voluntary and consensus-based, regardless of the nature of the standards-developing organization and
- Provide decision-makers with clear and manageable criteria to assess the value of using standards.

The overall approach is based on value chain analysis. A value chain is a chain of activities within an organization operating in a specific industry. The output of the work of an organization (products and services) passes through all the activities of the chain in a given order, gaining value at each step. The value chain analysis aims to investigate the structure of the value chain and of the activities performed at each step of the chain, with a view to understanding and quantifying the contributions of standards to value creation.

11.2 Introduction of the selected company

South Africa's construction sector has experienced a decade of considerable growth, particularly as a result of the buoyant property market and the government's spending on infrastructure in the mid- to late-2000s. The global recession has since put a dampener on that growth. As we slowly emerge from recession, construction investment is expected to average 9.6 % of GDP (Gross Domestic Product) during the next three years [see : Industry Insight (2010) www.industryinsight.co.za, 2009].

PPC Cement operates within this highly dynamic industry. Because of its well established brand and extensive application of national and international standards, PPC Cement was selected as our assessment company for the study.

Established in Pretoria in 1892, the company has grown to include operations across South Africa, and in Botswana and Zimbabwe. With excess capacity available and a strategy to increase its presence in sub-Saharan Africa, PPC continues to focus on exports to other African countries, especially Mozambique and Angola.

Now, nearly 120 years after its inception, PPC Cement has eight manufacturing plants and three milling depots. Together these facilities are capable of producing almost eight million tons of cement products per year. Related products include aggregates from the company's Gauteng and Botswana quarries.

Furthermore, PPC Lime is southern Africa's foremost supplier of metallurgical-grade lime, burnt dolomite, limestone and related products. PPC Cement has played a vital role in the history and development of southern Africa.

It is a reliable supplier of cement and materials to the civil, commercial and residential sectors throughout South Africa. Its target

market is mainly retail ; the company has a distribution network that is responsible for supplying cement to the building and construction industry, concrete manufacturers, hardware stores and DIY centres. PPC Cement has had to contend with three consecutive years of declining cement demand in its principal markets as cement sales in South Africa dropped more than 20% below 2007 levels. The company's main competitors in the market (for the producers of cementitious material) are Afrisam, Lafarge (South Africa) and NPC-Cimpor.

11.3 Attitude of the company towards standardization

PPC Cement is well established in terms of its industry experience. Product and system standards are implemented within the organization because of their strategic value.

The company manufactures products that must meet regulatory requirements, and standards help PPC Cement to achieve this objective. They allow PPC Cement to apply standardized test methods, which make it easier to demonstrate compliance with regulations, while regulators reference the very same standards in laws that regulate the industry in which PPC Cement operates. The company also applies voluntary standards throughout its organization to achieve consistent quality, a sustainable business and a safe and secure working environment.

PPC also participates in various national and international standards development committees. The company believes that by helping develop national and international standards it will broaden its competitiveness at a national and international level. PPC Cement perceives itself as an influencer in the development of national and

international standards for its industry. This leverage enables the company to introduce or promote changes to standards, and align its processes and technology with the requirements of the new and revised standards.

The company is certified in accordance with the following system standards: SANS 9001, SANS 14001, OHSAS 18001 and SANS 17025 and the following product standards: SANS 50197-1, SANS 50197-2 and SANS 1841. All are international standards that have been adopted as South African National Standards (SANS).

Management's views on the benefits of standards

PPC Cement management across all functions acknowledges that the company derives economic benefits from the application of standards. However, because PPC Cement and its competitors are expected to apply the same standards, it gains no distinct competitive advantage. Management believes that five years ago businesses were not as committed to applying standards as they are today, so any competitive advantage no longer exists.

Management also feels that participating in standards-setting committees provides benefits by enabling the company to influence the content of standards through its understanding of the industry and its requirements. Managers also have earlier access to technical information, which gives them an advantage in preparing their business to meet the new requirements of the standards.

Relationship building with other participants in the industry is another important benefit. By networking with other participants, management can determine how a standard benefits other companies, discuss obstacles in applying standards, and learn how to overcome them when implementing the standards in its own company.

11.4 Analysis of the value chain

11.4.1 Industry value chain

The raw materials used to produce cement are primarily limestone, clay, shale, and silica sand. These are quarried, crushed, and transported to a nearby cement plant. The plant proportions the raw materials to the correct chemical composition and grinds them to a fine consistency. The finely ground “raw meal” is then fed into large rotary kilns, cylindrical furnaces 10 to 25 feet in diameter and 200 to 1 000 feet in length.

The raw meal is heated to about 1 450°C (2 700°F), causing the composition to react and form complex mineral compounds. These compounds exit the kiln as a hard nodular material called “clinker”. Many newer cement plants use the hot exiting kiln gases to preheat the raw meal. Clinker is cooled and ground with approximately 5 % gypsum (which controls concrete setting time) and other minor additives to produce cement.

Concrete is produced by blending cement with fine aggregate (sand), coarse aggregate (gravel or crushed stone), and frequently with small amounts of chemicals called “admixtures.” Admixtures are used to accelerate or retard setting time, control early plasticity properties, increase strength, improve resistance to acid and sulphates, control shrinkage, and improve freeze/thaw cracking. When water is added to the concrete mix at the job site, it forms slurry that coats the surfaces of the aggregate and fills the voids to form rock-solid concrete. The process of hardening or setting is the result of the water hydration chemical reaction of the cement. The properties of concrete are determined by the exact chemical composition of cement used, the additives, and the overall proportions of cement, aggregate, and water.

Concrete is the material of choice for driveways, sidewalks, patios, steps, and for garages, basements, and industrial floors. The walls of ordinary houses, as well as the more massive walls of engineering structures, are now frequently built in concrete, either in continuous mass or in blocks. It is relatively inexpensive to install and provides an attractive, durable surface that is easy to maintain. Proper attention to the standard practices and procedures for constructing exterior or interior concrete can yield a concrete surface that will provide long-lasting, superior performance.

PPC Cement operates in the raw material extraction and cement production segments of the value chain. Its leading competition in the market includes Afrisam, Lafarge (South Africa) and NPC – Cimpor. The residential market and large infrastructure projects tendered by the government constitute the major demand for PPC Cement products.

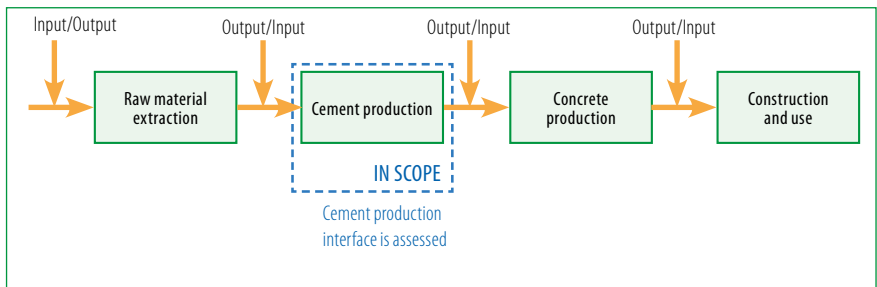


Figure 1 Value chain of cement-based building materials

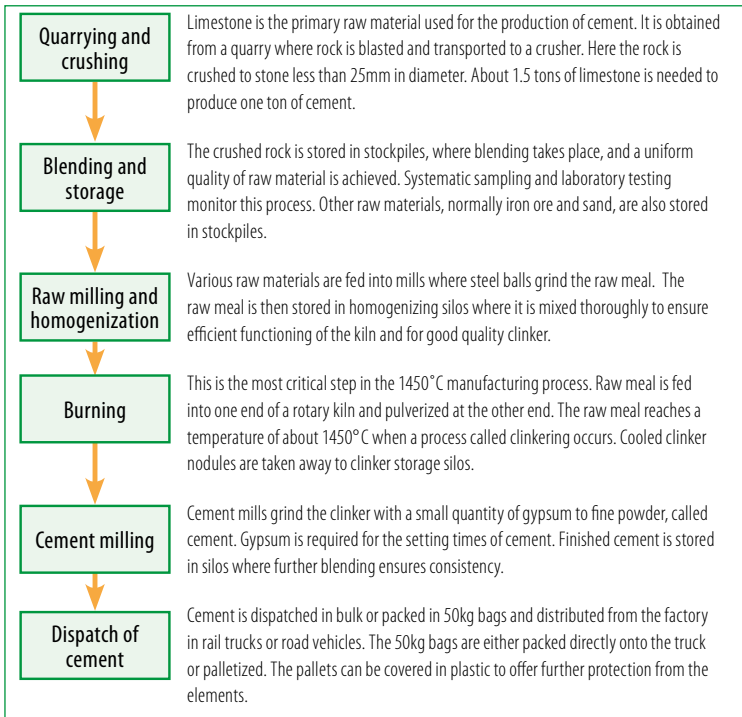


Figure 2 The key process stages in cement production

11.4.2 Company value chain

The model developed by Michael Porter of Harvard Business School is used to analyse the company value chain. This divides the value chain into primary and supporting functions and categorizes company activities into nine different business functions. Using this model, the company value chain for PPC Cement can be described as follows:

Supporting functions in the company value chain :

- A. Management and administration**
- B. Finances**
- C. Human resources**

D. Research and development

Activities include: research and product development – fusion and clinker activation techniques must comply with standards; Cement extender types (fly-ash, slag, silica fume) must be tested for durability of concrete.

E. Engineering

F. Procurement

Activities include: screening and selection of suppliers; negotiating and contracting – major contracts and day-to-day procurement processes follow governmental legislation and guidelines.

Primary functions in the company value chain :

G. Inbound logistics

H. Production/operations

Activities include: training personnel; cement-making processes (mining to production to dispatch of final product); quality control – ensure compliance with internal process control parameters which will ensure compliant product; quality assurance – ensures compliance with SANS 50197.

I. Outbound logistics

J. Marketing and sales

Activities include: marketing; contracting; sales. Has various supporting functions which include:

- Credit
- Maintenance
- Laboratory
- Dispatch

11.4.3 Key value drivers

Key value drivers are capabilities that give companies advantages over their competitors.

Using existing literature together with the data derived from the interview process, we identified the following as the key value drivers for PPC Cement:

- Sales effectiveness
- Relationship building (with suppliers)
- Quality products
- Efficiency of production
- Quality of production processes
- R&D effectiveness
- Maintenance cost reduction.

11.5 Scope of the pilot project assessment

The scope of the assessment was determined after our first round of interviews with company management. The following business functions of PPC Cement were selected to determine the economic benefits of standards:

- Research and development
- Procurement
- Production/operations
- Sales and marketing

The reason for this selection follows the sequence of our interviews at PPC Cement: our initial interview with the quality assurance manager indicated which standards were important to the company, and how they were implemented.

Research and development was chosen because the department uses standards to improve production processes and to keep up to date with technology. Standards clearly have an impact on this function. The main value driver for the **R&D function** is R&D effectiveness, which is an indication of the cost-effectiveness of these activities. This is a relevant value driver because of the need for continuous product development and improvement. The company must comply with SANS 50197, i.e. the manufacturing of cement has to conform to requirements, and the responsibility of the R&D department is to ensure that the manufacturing process is efficient and cost-effective. Other value drivers include competency of staff and R&D costs.

Procurement needs to source supplies from suppliers who are using standards. All standards applied to raw materials will eventually contribute to end-product quality and cost, and therefore standards impact this function as well.

Within the **procurement function**, major and day-to-day contracts follow a preferential procurement framework using legislation and guidelines from governance reports. According to management, the main value driver for procurement is relationship building (with suppliers). Relationship building is entrenched in the quality that suppliers can provide. PPC Cement might forego cost for better quality, better response, etc., since cement manufacturing takes place 24 hours per day, 365 days per year. If a supplier cannot provide raw materials on a weekend, then PPC Cement will use another supplier who can do so.

Production/operations apply stringent standards to contribute to the quality of the end product and regulate the quantity of the volumes produced on the basis of orders received.

The main value driver for the **production/operations function** is the quality of the final product – this influences customer buying

patterns since customers always compare product benefits and value to cost. This is a relevant value driver due to high customer expectations and product options. Other value drivers include the efficiency of production with regard to internal operations as an indication of the cost-effectiveness of production.

Standards also have an impact on **sales and marketing** because the products gain consumer confidence by carrying the SABS trademark. This will affect the sales of the product, which in turn will impact on production/operations.

The main value driver for the **sales and marketing function** is sales effectiveness, that is, to generate more revenue. This is a relevant value driver since all cement manufacturers produce cement to the same minimum standard specifications to meet regulatory requirements.

11.6 Use of standards by the company : Standards used in the company value chain

The company has implemented the following standards :

SANS 9001, which specifies the requirements of a quality management system. The standard motivates the staff of any organization by defining their key roles and responsibilities. It also provides the company with the following benefits :

- Cost savings achieved as a result of increased workforce competence
- Improvements following identification of product and service deficiencies, resulting in less waste, reduced defects and fewer complaints
- Customers benefit from consistent on-time deliveries to the correct specification ; this in turn leads to increased market opportunities.

SANS 14001, an environmental management system that offers an organization a set of environmental goals to achieve continual

improvement and prevention of pollution. Cement-making raw materials sometimes contain trace amounts of toxic elements such as mercury, thallium, iodine, cadmium and other heavy metals. The cement-making process can also lead to trace emissions of POPs (Persistent Organic Pollutants). SANS 14001 implementation allows the company to reduce:

- Quantities of waste sent to landfill
- Energy use (electricity, coal, fuel oil, gas)
- Discharge of effluent contaminants
- Emissions of gases and particulates to the atmosphere, for example, an electrostatic precipitator (ESP) is used to control dust emissions; applying SANS 14001 requirements can reduce or eliminate the impact of dust emissions on the environment
- Levels of raw material used
- Amounts of packaging for purchased goods and product shipments
- Increase the amount of recycled waste – paper, plastic etc.

OHSAS 18001, an international standard for managing health and safety. Workers involved in the production of cement are often at risk of injury, for example, coming into contact with hot clinker or cement, or with machinery. All PPC Cement factories are OHSAS 18001-certified. The company benefits from OHSAS implementation as follows:

- Customer satisfaction – through delivery of products that consistently meet customer requirements whilst safeguarding their health and property
- Reduced operating costs – by decreasing downtime through incidents and ill health, and reducing legal fees and compensation costs
- Improved stakeholder relationships – by safeguarding the health and property of staff, customers and suppliers

- Legal compliance – by understanding how statutory and regulatory requirements impact the organization and its customers
- Improved risk management – through clear identification of potential incidents and implementation of controls and measures
- Proven business credentials – through independent verification of conformity to recognized standards
- Ability to win more business – particularly where procurement specifications require certification as a condition of supplying raw materials.

Many of PPC Cement's factories and depots have been rated by Dekra as five-shield sites. Dekra is an independent European certification body that ensures compliance with internationally recognized standards (OHSAS 18001). Five-shield status is awarded for an audit score of >95 % and a lost-time injury frequency rate of <1.

SANS 17025, specifying the general requirements for the competence of testing and calibration, including sampling. It covers testing and calibration performed using standard, non-standard, and laboratory-developed methods. It is essential for PPC Cement laboratories to be SANS 17025 accredited. This is a prerequisite when trading internationally, in product development and manufacturing, and in the protection of consumers.

PPC Cement applies the following established national standards to its products: SANS 50197-1:2000, SANS 50197-2:2000 and SANS 1841:2008.

SANS 50197-1, a compulsory specification of properties and performance criteria for common cements. Composition and strength are required to be displayed by the manufacturer on the packaging of each cement bag produced. SANS 50197-1 lists the physical and chemical requirements to which cements must comply.

SANS 50197-2, specifying strengths determined in accordance with SANS 50196 – Methods of testing cement (consisting of seven parts) to be carried out by a certification body. SABS is the certification body carrying out audit and certification of PPC Cement.

Cement testing standards used by PPC Cement include :

- **SANS 50196-1**
- **SANS 50196-2**
- **SANS 50196-3**
- **SANS 50196-6**
- **EN 451-1**

PPC Cement also operates its own system of auto-control testing for produced cement to demonstrate conformity to requirements using some of the testing methods mentioned above.

SANS 1841, specifying the requirements for controlling the quantity of contents of products prepacked in accordance with the recommendations of legal metrology legislation (part of the Trade Metrology Act and Regulations). It is intended for use by packers who voluntarily participate in the quantity mark scheme provided for in such legislation. An e-mark scheme has been introduced to support the use of this standard, guaranteeing that a product has been packed in accordance with SANS 1841.

Standards other than listed above, such as those developed by ASTM (American Society for Testing & Materials) are not actively used by the company. R&D uses them for background information and cross-referencing, and should an overseas company wish to import PPC Cement products, the company might be required to test in conformity to ASTM requirements.

In **Procurement**, standards are used to facilitate best practices in structuring supplier contracts, which makes it easier to assess and

engage potential suppliers. When suppliers comply with the relevant standards PPC Cement is confident that the goods and services procured are of a consistent quality (e.g. sand and its chemical compositions must comply with standard specifications). This ultimately contributes to the quality of the end product.

Suppliers must also have SANS Management Systems in place and be environmentally certified. It is no problem if suppliers are not certified at an international level since PPC Cement applies products to the South African environment. If the company has a relationship history with such suppliers, they will be used.

Safety standards are also important. If suppliers work in an unsafe environment, PPC Cement will try to avoid associating with them.

The use of standards within **research and development** contributes towards the department's effectiveness by improving staff competency and minimizing R&D costs.

Standards are used to ensure that manufacturing processes are compatible with, and upgraded regularly to, new technology, thus providing a more efficient manufacturing process.

Research and development is not a profitable function ; money is used to develop new projects which will in turn determine future profit. Standards can have a positive impact on R&D costs if PPC Cement is investigating a potential product.

Within **production/operations** standards help to standardize and streamline manufacturing processes and lower production costs.

Standards are used to manage the quality system, which is essential in ensuring that the final product is of a consistent quality.

Training of production personnel is efficient and easier to manage because standards are a good benchmarking tool.

The use of standards within **sales and marketing** ensures higher sales due to customer confidence in standardized products.

The use of standards also leads to more efficient contractual agreements because defining product specifications and customer requirements make it easier to conclude contractual agreements.

New sales and marketing staff can be trained better because relevant specifications for products and services are standardized.

In its ability to implement standards PPC Cement demonstrates initiative not only in using them to show compliance, but also to improve its business.

11.7 Selection of operational indicators to measure the impact of standards

Selected business functions (BF)	Related activities	Value drivers (if applicable for the BF)	Standards used	Operational indicators	Definition of the indicators
Research and development (R&D)	Research Product development	R&D effectiveness	SANS 50197 ISO 17025 ISO 9001 SANS 1841 ISO 18001 ISO 14001	Personnel costs (direct assessment by manager)	<p>Indicator 1 – Clearer product specifications: Standardized specifications of the suppliers' products make it easier to collect relevant information.</p> <p>Indicator 2 – Better internal information transfer: Using standardized documents and specifications improves dissemination of product and service information within R&D.</p>

Selected business functions (BF)	Related activities	Value drivers (if applicable for the BF)	Standards used	Operational indicators	Definition of the indicators
Procurement	Screening and selection of suppliers Negotiating and contracting	Relationship building	ISO 9001 ISO 14001 ISO 18001	Personnel costs (direct assessment by manager)	Indicator 3 – Better internal information transfer : Internal information about products and services is passed on more efficiently by using standardized documentation and specifications.
Productions/operations	Processing Quality assurance Quality control	Quality of products	ISO 9001 SANS 50197 ISO 18001 ISO 14001 SANS 50196-1 SANS 50196-2 SANS 50196-3 SANS 50196-6 EN 451-1	Personnel costs (direct assessment by manager)	Indicator 4 – Better training : Production/Operations staff can be trained better because relevant product and service specifications are standardized.
Sales and marketing	Marketing activities Contracting Sales	Sales effectiveness	ISO 9001 SANS 1841 ISO 14001 ISO 18001	Sales and marketing costs (direct assessment by manager) Personnel costs	Indicator 5 – Higher sales : Sales are higher due to customer confidence in standardized products Indicator 6 – More efficient contractual agreements : Defined specifications of the company's products and customer requirements make concluding contractual agreements easier.

Table 1 Operational indicators for PPC Cement

11.8 Calculation of the economic benefits of standards

Selected business functions (BF)	Operational indicators (to measure the impact of standards)	Savings/Impacts
Research and development	Personnel costs	Indicator 1 : the reduction in time used to collect relevant information on suppliers' products was 6.8 %. Indicator 2 : the time used to transfer internal information was reduced by 7.5 %.
Procurement	Personnel costs	Indicator 3 : the time used to transfer internal information about products and services was reduced by 0.2 %.
Production/operations	Personnel costs	Indicator 4 : time used to train staff is reduced by 1.32 %.
Sales and marketing	Sales revenue Personnel costs	Indicator 5 : the sales of products will be 2.1 % lower if no standards would be used. Indicator 6 : the time used to negotiate contractual agreements has reduced by 12 %.

Table 2 Economic benefits of standards

Selected business functions (BF)	Financial impact of standards on all BFs in 2009 (%)
Research and development	14.3 %
Procurement	0.2 %
Productions/operations	1.3 %
Sales and marketing	14.1 %
Total financial impact :	2.5 %

Table 3 Financial impacts of standards

The total financial impact of standards is 2.5 % of the company's total revenue (ZAR 5.9 billion) and is based on the impact from standards in the year 2009, on the selected business functions.

11.9 Qualitative and semi-quantitative considerations

There are other intangible aspects to standards that cannot be quantified, but could still be considered in demonstrating the benefits of standards. The production of cement is conducted in a regulated environment; standards enable a company to meet regulatory requirements and ensure a quality product. Making cement is also an energy and resource intensive process with both local and global environmental, health and safety impacts. The use of standards helps regulate these impacts.

Quality

Due to the reliability and quality of PPC Cement's products, there is an increased recognition of the company by its customers. Customers have confidence in the consistency of the product and this makes it easier to market and test the quality of PPC Cement products. Peer recognition from other competitors in the industry is another benefit because the company is also seen as a strong competitor.

The qualifications of suppliers are also raised because of PPC Cement's insistence on the use of standards. Thus, suppliers know exactly what the company requires, and this ensures positive relationships with suppliers in the future.

Environment

The application of environmental standards helps reduce energy use and waste associated with the manufacturing of cement, thus contributing towards a sustainable environment.

By conforming to environmental standards PPC Cement also ensures that it is able to manage and sustain the production of cement in the future, and demonstrates to customers that it cares about the environment.

Health and safety

The application of health and safety standards ensures a safe and secure working environment for employees working within the industry; in turn employees have more confidence working in a safe environment.

Apart from the safety of employees, the use of standards within any company or industry should ultimately ensure the safety of the public. For example, in bridge building it is imperative that only the best cement is used so that it does not collapse.

11.10 Evaluation of results

The overall result showed a total financial impact of 2.5 % of the total company revenue in 2009, which is relatively high. The total impact of standards is calculated on the organizational level by aggregating/consolidating the functional impacts. This percentage (2.5 %) is based on results from selected business functions where we thought standards had greatest impact. The strongest impacts can be seen in research and development, and sales and marketing.

However, this is the result from only one company in the construction industry sector. We would need to sample more companies to obtain a conclusive result across the industry.

Procurement shows a total cost saving representing 0.2 % of total procurement costs. The use of standards primarily saves time in distributing internal information about products and services through standardized documentation and specifications. This leads to more efficient processes which in turn contributes to the quality of the end product.

Productions/operations achieved a total cost saving representing 1.3 % of total production/operations costs. The use of standards pri-

marily saves time in staff training through standardization of product and service specifications. Employees are trained more efficiently when working to an internal quality management system based on standards. Implementing standards within the production process reduces stoppages, wastage of raw materials and inconsistent products, thus ensuring a more efficient production process and a better quality end product.

Research and development achieved total cost savings of 14.3% of total R&D costs. The use of standards primarily saves time in collecting relevant information because suppliers product specifications and customer requirements are standardized. Using standardized documents and specifications also improves the distribution of product and service information within R&D. As technology changes so do the demands of customers; there is thus a need to continuously improve products and services. One way R&D can accomplish this is to review international best practices to determine how best to incorporate them. R&D can also try to influence the development of international standards to benefit PPC Cement.

Sales and marketing achieved a personnel cost saving representing 12% of total sales and marketing costs. The use of standards primarily saves time on contractual agreements due to defined specifications of the company's products and customer requirements. Revenue is also affected because sales of standardized products would be 2.2% lower without the implementation of voluntary standards.

The only way that cement can be sold in South Africa is through conformity to the SANS 50197 standard. PPC and other cement manufacturers operate in a regulated environment; they must all comply with minimum standard specifications in order to sell their product. Because this is considered the "norm" for all cement manufacturers, regulated standards do not present a competitive advantage.

In addition to SANS 50197, non-mandatory standards are also implemented by the company, e.g. those for environmental, health and safety, and quality management. These standards provide a key element in the company's marketing strategy. They inspire customer confidence, and consumers know that PPC Cement strives to reach a level of quality or excellence by using these standards.

However, implementing such standards does not give a discernable competitive advantage, especially if the company is seeking compliance rather than improving its business. If a company is able to use standards in a way that extracts the maximum benefit, then implementing them can indeed present a competitive advantage to the industry. If standards are used as a means to achieve customer confidence, cost-efficiency and an increase in sales revenue, then PPC Cement can definitely promote the further support and monitoring of standards.

Our findings show positive impacts on costs for each selected business function, and on sales and marketing revenue. It would be of value to PPC Cement to systematically examine how standards operate and how the company could further exploit the benefits that arise from their use. This can be achieved by extending the list of operational indicators used in this study to measure the contribution of standards to other business functions in the company value chain. In that way PPC Cement could systematically monitor the impact of standards on its operations.

The company could further improve the impact of standards by incorporating international best practices and by influencing the development of international standards to the benefit of the company. This would in turn serve PPC Cement better because it would raise its visibility in the international arena. In addition, this would enable PPC to compete at an international level and export cement

to Europe, America and other overseas countries, thereby increasing the production and sales of cement.

11.11 Conclusions

PPC Cement is a well-established company driven by the goal of becoming the leading cement manufacturer in the country. It applies national and international standards throughout its organization because of their strategic value. The company also has the required systems in place to support the implementation of these standards. Even though PPC Cement is certified in conformity to both product and system standards, its management is of the opinion that the implemented standards do not bring about a competitive advantage because its competitors also apply the same standards. They do, however, acknowledge that there are economic benefits to be derived from implementing standards.

The study has enabled us to estimate the economic impact of standards on the company. PPC Cement's standards-based management systems make a relatively strong financial impact on the sales and marketing function. This is due to the benefits of implementing non-mandatory standards, which provide a key element in the company's marketing strategy.

Standards contribute to cost savings in all four of the selected functions, and have the greatest impact on personnel costs. The use of quality management standards, e.g. SANS 9001, and health and safety management standards, e.g. OHSAS 18001, contribute to cost savings by helping PPC enhance work force competency and staff training, and by minimizing health and safety risks, thereby reducing personnel costs.

Apart from using standards to ensure cost-efficiency, standards instil customer confidence because they are used at every stage of the cement production process, ensuring a consistent and quality end product. Since standards are used as a means of achieving customer confidence and cost-efficiency, PPC Cement has an incentive to implement and monitor standards still further.

Standards are important to cement manufacture. Indeed, since cement cannot be sold without meeting minimum regulatory standard requirements, all major cement manufacturers must comply. This leaves little leverage for PPC Cement to gain a competitive edge over its competitors. Cement manufacturers differentiate themselves by focusing on aspects such as customer service, pricing and turnaround times, etc., in order to gain market share. The application of standards throughout the value chain makes it possible to build relationships with reputable suppliers of raw materials, saves time in the communication of information of new products and services, and contributes to the quality of the end product.